

Friden 2200/2300 SERIES MACHINES

TABLE OF CONTENTS

	Page
HOW TO USE THE MANUAL	
GENERAL DESCRIPTION	1
PURPOSE AND USE	
PHYSICAL DESCRIPTION	2
General	2
The Writing Machine	2
The Punch	2
The Reader	2
The Translator	2
The Code Selector	2
Covers	3
MACHINE SPECIFICATIONS	5
THE WRITING MACHINE	
Purpose And Use	8
Physical Description	9
General	9
Power Supply Assembly	10
1.8 Amp AC Circuit Breaker	11
1.5 Amp DC Circuit Breaker	11
Motor	12
Power Drive Mechanism	13
Power Frame Assembly	15
Power Frame Casting	15
Keylevers	16
Cam Assemblies	17
Segment Support Assembly	18
Segment Assembly	19
Universal Bar Assembly	20
Typing Train Mechanism	20
Bellcrank	21
Typebar & Toggle Assembly	21
Segment Support Shift Mechanism	21
Case Shift (SCS) Contacts	24
Ribbon Lift Mechanism	25
Ribbon Feed Mechanism	26
Ribbon Reverse Mechanism	28
Manual Color Shift Mechanism	29
Keylever Interlock Assembly	30
Keyboard Locking Mechanism	31
Carriage Assembly	32

Friden 2200/2300 SERIES MACHINES

TABLE OF CONTENTS (Continued)

	Page
Platen Assembly	34
Document Feed And Release Mechanism	36
Print Impression Control Mechanism	38
Main Spring Drum Assembly	39
Escapement Defined	40
Mono-Spacing Escapement Assembly	41
Space Bar Mechanism	43
Field Control Mechanism	45
Governor Assembly	48
Carriage Return Clutch Mechanism	49
Manual Carriage Release Mechanism	50
Carriage Return & Tab (SCRT) Contacts	51
Tab Disabling Assembly	52
Back Space Mechanism	53
Back Space (SES) Contacts	54
JD Terminal Connector (2300)	55
Program Patchboard Assembly (2200)	56
Relay Mounting Bracket (2300)	57
Relay Mounting Bracket (2200)	58
Interlock (SINT) Contacts (2300)	59
Interlock (SINT) Contacts (2200)	60
THE TAPE & EDGE CARD READER	
Purpose And Use	61
Physical Description	62
General	62
Reader Cam Shaft	64
Contact Operating Mechanism	65
Tape Feed Mechanism	66
Reader Tape (SRT) Micro Switch	67
Tape And Edge Card Feed Mechanism - Tape/Edge Card Reader	68
Circuit Breaker Contact Assemblies (SRCC1 And SRCC2)	69
Card Table Micro Switch - Tape/Edge Card Reader	70
Card Table Assembly - Tape/Edge Card Reader	72
Clutch Assembly	73
Clutch Magnet Yoke Assembly	74
THE TRANSLATOR	
Purpose And Use	75
Physical Description	76
General	76
Cam Shaft	77
Operating Bail	77

Friden 2200/2300 SERIES MACHINES

TABLE OF CONTENTS (Continued)

Seekers & Keylever Operating Arms	78
Positioning Bail Assembly	79
Translator Magnet Assemblies	80
Permutation Slides	81
Permutation Restoring Mechanism	83
Translator Timing Contact Assemblies (STC1, STC2, And STC3) (2300)	84
Translator Timing Contact Assemblies (STC1, STC2, STC3, And STC4) (2200)	85
Translator Delay Control (SDC) Contact Assembly (2300)	86
Translator Delay Control (SDC1 And SDC2) Contact Assemblies (2200)	86
Clutch Assembly	87
Clutch Magnet Yoke Assembly	87
THE CODE SELECTOR	
Purpose And Use	88
Physical Description	88
General	88
Front Space Bar Assembly	89
Rear Space Bar Assembly	89
Selector Slides (2300)	90
Selector Slides (2200)	90
Contact Bails	91
Code Contact (SC) Mounting Bridge (2300)	92
Code Contact (SC) Mounting Bridge (2200)	93
Front Contact (SB) Mounting Bridge (2300)	94
Front Contact (SB) Mounting Bridge (2200)	95
Rear Contact (SB) Mounting Bridge (2300)	95
Rear Contact (SB) Mounting Bridge (2200)	95
THE TAPE & EDGE CARD PUNCH	
Purpose And Use	96
Physical Description	96
General	97
Power Shaft	98
Arm Lever Assembly	98
Perforating Mechanism	98
Parity Check Assembly	99
Punch Lock (SPL) Contacts	100
Punch Magnet Assembly	101
Latch Levers	102
Tape Feed Mechanism - Tape Punch	103

Friden 2200/2300 SERIES MACHINES

TABLE OF CONTENTS (Continued)

	Page
Tight Tape (SPT) Micro Switch	103
Tape And Edge Card Feed Mechanism - Tape/Edge Card Punch	104
Card Feed (SCF) Micro Switch - Tape/Edge Card Punch	105
Card Guide Assembly - Tape/Edge Card Punch	106
Clutch Assembly	107
Clutch Magnet Yoke Assembly	108

THEORY OF OPERATION

SECTION 1. THE WRITING MACHINE

Introduction

Power Drive Mechanism	1-1
Keylevers	1-3
Cam Assemblies And Typing Train Mechanism	1-4
Bellcrank Lever And Bellcrank	1-11
Segment Support Assembly	1-13
Segment Support Shifting Mechanism	1-15
Typebar And Toggle Assembly	1-22
Keylever Interlock Assembly	1-25
Keylever Locking Mechanism	1-26
Carriage Assembly	1-27
Main Spring Drum Assembly	1-30
Mono-Spacing Escapement Assembly	1-32
Space Bar Mechanism	1-39
Field Control Mechanism	1-41
Carriage Return Latching And Unlatching Operation	1-43
Tab (Tabulation) Operation	1-55
Skip Tab Operation (Tab Disabling Assembly)	1-60
Manual Carriage Release Mechanism	1-63
Platen Assembly	1-64
Document Feed And Release Mechanism	1-65
Print Impression Control Mechanism	1-69
Ribbon Feed Mechanism	1-71
Ribbon Reverse Mechanism	1-74
Ribbon Lift Mechanism	1-78
Color Shift Mechanism	1-80
Back Space Mechanism	1-82

SECTION 2. THE TAPE & EDGE CARD READER

The Reader	2-1
Reader Clutch	2-9
Reader Cycle	2-15

TABLE OF CONTENTS (Continued)

Registration	Page 2-20
Card Table Assembly	2-22
SECTION 3. THE TRANSLATOR	
The Translator	3-1
Translator Clutch	3-8
Translator Cycle	3-14
SDC Contacts	3-20
STC Contacts	3-22
SECTION 4. THE CODE SELECTOR	
The Code Selector	4-1
SECTION 5. THE TAPE & EDGE CARD PUNCH	
The Punch	5-1
Tight Tape (SPT) Micro Switch (Tape Punch)	5-8
Tight Tape (SPT) Micro Switch (Tape/Edge Card Punch)	5-9
Card Feed (SCF) Micro Switch (Tape/Edge Card Punch)	5-9
Punch Lock (SPL1 And SPL2) Contacts	5-9
Parity Check	5-9

TABLE OF CONTENTS (Continued)

1-20
1-21
1-22

Hardware
Card Table Assembly

SECTION 2. THE TRANSLATOR

2-1
2-2
2-3
2-4
2-5

The Translator
Translator Layout
Translator Cycle
SIX (Source)
SIX (Source)

SECTION 3. THE CODE SELECTOR

3-1

The Code Selector

SECTION 4. THE TAPE & CARD PUNCH

4-1
4-2
4-3
4-4
4-5
4-6

The Punch
Tape Type (SET) Micro Switch (Type I only)
Tape Type (SET) Micro Switch (Type II only)
Tape Type (SET) Micro Switch (Type III only)
Card Punch (Type I) Micro Switch (Type I only)
Card Punch (Type II) Micro Switch (Type II only)
Card Punch (Type III) Micro Switch (Type III only)

Friden 2200/2300 SERIES MACHINES



Figure 1.

PURPOSE AND USE

The 2200/2300 series Flexowriters (Figure 1) are high-speed automatic writing machines. They are used in routine letter writing applications or in complex data processing systems. Basically, the function of the Flexowriter is to produce a tape or edge cards containing information in the form of code holes. Once an operator has prepared a tape or edge cards containing desired information, the tape or edge cards may be re-inserted in the machine at any time to reproduce the original document automatically.

Friden 2200/2300 SERIES MACHINES

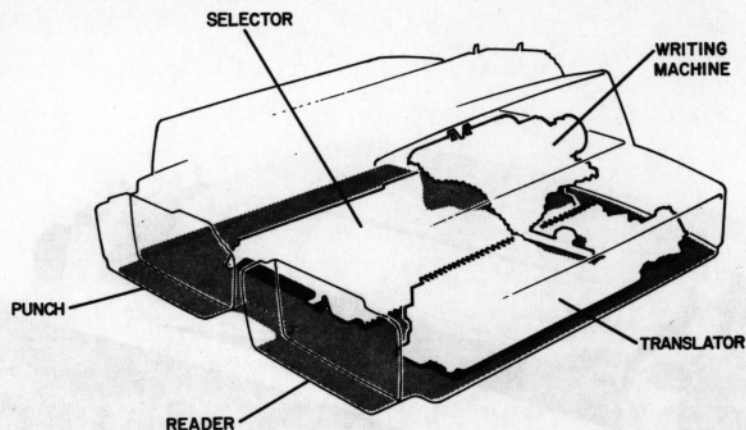


Figure 2.

PHYSICAL DESCRIPTION

General - The Flexowriter automatic writing machine is composed of five basic units: the writing machine, punch, reader, translator and the code selector (Figure 2).

The Writing Machine - The writing machine is the printing unit of the Flexowriter. The writing machine serves as a mount for the punch, reader, translator, code selector and the covers.

The Punch - The punch is mounted on the rear left hand side of the writing machine. It causes the perforation of code holes in tape or in edge cards.

The Reader - The reader is mounted on the front left hand side of the writing machine in front of the punch. It mechanically senses the code holes in tape or in edge cards and converts each code into electrical impulses.

The Translator - The translator is mounted directly beneath the keyboard of the writing machine. It converts electrical impulses received from the reader into a mechanical action to cause printing in the writing machine.

The Code Selector - The code selector is mounted directly beneath the writing machine behind the translator. It converts the mechanical action of the writing machine into electrical signals which are sent to the punch for the perforation of tape or edge cards.

Friden 2200/2300 SERIES MACHINES

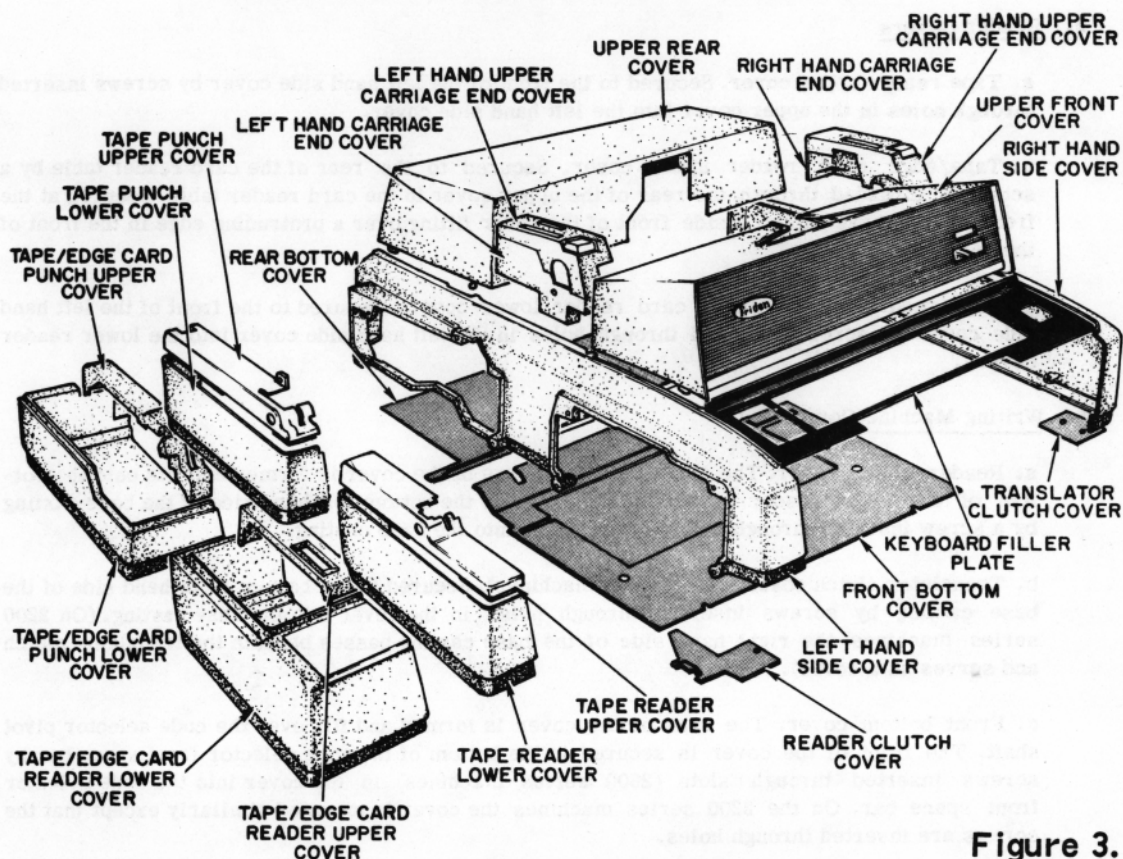


Figure 3.

Covers. - The covers on the Flexowriter are mounted as follows (Figure 3):

1. Punch Covers

- a. Tape punch upper cover. Secured to the rear of the left hand side cover by screws inserted through holes in the upper cover into the left hand side cover.
- b. Tape/edge card punch upper cover. Secured to the rear of the punch card guide by a flat spring attached to the rear underside of the cover. The cover is further secured by a screw inserted through a hole in the upper surface of the cover into the punch die block.
- c. Tape punch and tape/edge card punch lower covers. Secured to the rear of the left hand side cover by screws inserted through holes in the left hand side cover into the lower punch covers.

Friden 2200/2300 SERIES MACHINES

2. Reader Covers

a. Tape reader upper cover. Secured to the front of the left hand side cover by screws inserted through holes in the upper cover into the left hand side cover.

b. Tape/edge card reader upper cover. Secured to the rear of the card reader table by a setscrew threaded through the rear of the upper cover to the card reader table. Secured at the front by a groove in the inside front of the cover fitting over a protruding edge in the front of the card reader table.

c. Tape reader and tape/edge card reader lower covers. Secured to the front of the left hand side cover by screws inserted through holes in the left hand side cover into the lower reader covers.

3. Writing Machine Covers

a. Reader clutch cover. The slotted left hand edge of the cover is formed and fits onto the bottom of the lower reader cover. It is secured to the bottom left hand side of the base casting by a screw inserted through a hole in the cover into the base casting.

b. Translator clutch cover (2300 series machines). Secured to the bottom right hand side of the base casting by screws inserted through holes in the cover into the base casting. (On 2200 series machines the right hand side of the base casting passes beneath the translator clutch and serves as a cover).

c. Front bottom cover. The rear of the cover is formed and fits over the code selector pivot shaft. The front of the cover is secured to the bottom of the code selector front space bar by screws inserted through slots (2300 series machines) in the cover into the code selector front space bar. On the 2200 series machines the cover is mounted similarly except that the screws are inserted through holes.

d. Rear bottom cover (2300 series machines). The front of the cover is formed and fits over the code selector pivot shaft. It is secured to the bottom left hand side of the base casting by a screw inserted through a hole in the left front end of the cover into the bottom of the base casting. The rear of the cover is secured to the bottom rear side of the base casting by screws inserted through slots in the cover into the bottom of the base casting. On 2200 series machines the rear bottom cover is similarly mounted. The rear of the cover is secured to the bottom rear side of the base casting by a single screw inserted through a slot in the cover. It is further secured by screws inserted in holes in the left hand and right hand sides of the cover into the bottom of the left hand and right hand sides of the base casting.

e. Left hand side cover. Secured to the left hand side of the base casting by screws inserted through holes in the mounting projections of the left hand side cover into the mounting projections on the left hand side of the base casting.

f. Right hand side cover. Secured to the right hand side of the base casting by screws inserted through holes in the mounting projections of the right hand side cover into the mounting projections on the right hand side of the base casting.

Friden 2200/2300 SERIES MACHINES

g. Keyboard filler plate. Fits over the keyboard and is retained at the front by two projections which are fitted into slots behind the front of the base casting. It is secured at the rear by screws inserted through holes in mounting tabs into the keylever spring support.

h. Upper front cover. Removably mounted on the left hand and right hand side covers and secured by flat steel springs screw mounted to the bottom of each side of the upper front cover.

i. Upper rear cover. Removably mounted on the left hand and right hand side covers and secured by flat steel springs screw mounted to the bottom of each side of the upper rear cover.

j. Left hand and right hand carriage end covers. Secured to the left hand and right hand carriage end plates respectively, by screws inserted through a hole in the side of each end cover into the carriage end plates. They are further secured by screws inserted in a hole in the carriage end plates into a projection on the inside surface of each lower end cover.

k. Left hand and right hand upper carriage end covers. Secured to the left hand and right hand lower carriage end covers by retaining springs attached to the front and rear inside surface of each upper end cover.

MACHINE SPECIFICATIONS

Operating Speed

145 Words Per Minute

731 Codes Per Minute

Tape

Type: 8 channel paper or Mylar laminated.

Dimensions: 1.000 inch wide; .004 inch thick.

Holes: Code holes .073 inch diameter. Feed holes .046 inch diameter in line with code holes and positioned .394 inch from the guided edge of the paper.

Edge Cards

Type: Preperforated paper or Mylar laminated.

Dimensions: 3.000 inches wide, 7.000 inches long, .007 inch thick.

Holes: Code holes .073 inch diameter. Preperforated feed holes .046 inch diameter in line with code holes and positioned .394 inch from the guided edge of the card. Preperforated .250 inch micro switch operating hole.

Friden 2200/2300 SERIES MACHINES

Accuracy Check

Odd number parity.

Power Control Switches

ON - OFF (2200 series) - A 2-position, butterfly - type switch used to turn the power on and off.

ON - OFF - CP (2300 series) - A 3-position, butterfly - type switch when depressed rearward (ON) turns the power on in the machine. Depression of the CP (card punch) portion of the switch also turns the machine on and is used to perform functions relative to the Hollerith code.

Punch Control Switches

SEL - OFF - ALL - A 3-position, butterfly - type switch when depressed forward (ALL) turns the punch on and causes the punch to continuously perforate each keyboard activity. The SEL (select) portion of the switch is used to selectively control the on and off operation of the punch.

Keylever Control Switches

START READ - Turns on the reader and causes a printing operation in the writing machine.

STOP READ - Stops the reader and the printing operation in the writing machine.

NON PRINT - Used for the reproduction of a tape or edge cards in the punch without a printing operation in the writing machine.

TAPE SKIP - Allows tape or edge cards to pass through the reader with no code punching in the punch nor printing in the writing machine.

TAPE FEED - Causes the punch to perforate the Tape Feed code for as long as the switch is held operated.

Panel Switches (2200 series)

Program Modification Switch 1 - A manually operated, locking type switch used to provide a minor program modification. Its connections are made in the program modification board for the desired modification of the machine's operation.

Program Modification Switch 2 - Same as Program Modification Switch 1. Its connections are also made in the program modification board to provide an additional modification of the machine's operation.

Program Modification Switch 3 - A manually operated, momentary - type switch used to provide a minor program modification. Its connections are made in the program modification board for the desired modification of the machine's operation.

Program Modification Switch 4 - Same as Program Modification Switch 3. Its connections are also made in the program modification board to provide an additional modification of the machine's operation.

Friden 2200/2300 SERIES MACHINES

Panel Switches (2300 series)

STOP CODE - When operated causes punching of the STOP code which stops reader action when sensed in the reader.

AUX CODE - Used in conjunction with a keylever to create and punch certain functional codes.

PRGM MOD - Used to modify various machine operations through terminal connector wiring.

Indicating Lights - 2200 Series

IN 1 - Glows whenever the Flexowriter reader is reading.

OUT 1 - Glows whenever the Flexowriter punch is on.

IN 2 - Glows when an auxiliary input unit connected to the Flexowriter is on.

OUT 2 - Glows when an auxiliary output unit connected to the Flexowriter is on.

Indicating Lights - 2300 Series

OUTPUT 1 - Glows whenever the Flexowriter punch is on.

OUTPUT 2 - Glows when an auxiliary output unit connected to the Flexowriter is on.

Power Supply

A constant voltage power supply with a rated output of 90 VDC when the input is between 90-120 VAC.

Motor

Induction Motor: A 35 millihorsepower single phase induction motor. Operates on either 50 or 60 cycle 115 VAC. Draws 1.2 amperes. Turns at 1725 RPM when run on 60 cycle current; 1425 RPM when run on 50 cycle current.

Dimensions - 2200 Series

Width — 24-1/4 inches

Height — 10-1/4 inches

Depth — 24-3/8 inches

Dimensions - 2300 Series

Width — 22-3/4 inches

Height — 10 inches

Depth — 22-1/2 inches

Shipping Weight - 2200 Series

Approximately 132 pounds

Shipping Weight - 2300 Series

Approximately 105 pounds

Fridon 2500/2300 SERIES MACHINES

Panel Switches (2500 Series)

STOP CODE - When operated causes printing of the STOP code with a stop test action when sensed in the tower.

AXX CODE - Used in conjunction with a keyboard to create and patch certain functional codes.

TRIM MOD - Used to modify various machine operations through terminal connector wiring.

Indicator Lights - 2500 Series

IN 1 - Glows whenever the Flexowriter reader is reading.

OUT 1 - Glows whenever the Flexowriter punch is on.

IN 2 - Glows when an auxiliary input not connected to the Flexowriter is on.

OUT 2 - Glows when an auxiliary output not connected to the Flexowriter is on.

Indicator Lights - 2300 Series

OUTPUT 1 - Glows whenever the Flexowriter punch is on.

OUTPUT 2 - Glows when an auxiliary output not connected to the Flexowriter is on.

Power Supply

A constant voltage power supply with a rated output of 50 VDC when the input is between 10-120 VAC.

Motor

Induction Motor: A 35 millihorsepower kinetic phase induction motor. Operates on either 50 or 60 cycle 115 VAC. Turns at 1725 RPM when run on 60 cycle current. 1425 RPM when run on 50 cycle current.

Dimensions - 2500 Series

Width --- 34-1/4 inches

Height --- 10-1/4 inches

Depth --- 24-3/8 inches

Dimensions - 2300 Series

Width --- 23-3/4 inches

Height --- 10 inches

Depth --- 22-1/2 inches

Shipping Weight - 2500 Series

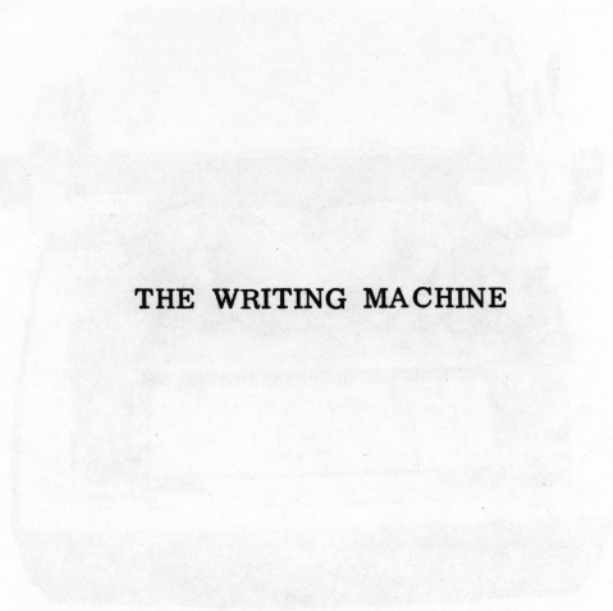
Approximately 122 pounds

Shipping Weight - 2300 Series

Approximately 102 pounds

Friden 2200/2300 SERIES MACHINES

THE WRITING MACHINE



The writing machine (Figure 1) is a device for producing legible characters on a sheet of paper. It consists of a keyboard, a carriage, and a paper support. The keyboard is used to enter the characters to be written. The carriage moves the paper to the right as the characters are written. The paper support holds the paper in place. The writing machine is designed to be used with a sheet of paper that is 11 inches wide and 8 1/2 inches high. The paper is placed in the paper support and the carriage is moved to the left. The keyboard is then used to enter the characters to be written. As the characters are entered, the carriage moves to the right, and the paper is moved to the right. The writing machine is designed to be used with a sheet of paper that is 11 inches wide and 8 1/2 inches high. The paper is placed in the paper support and the carriage is moved to the left. The keyboard is then used to enter the characters to be written. As the characters are entered, the carriage moves to the right, and the paper is moved to the right.

Friden 2200/2300 SERIES MACHINES

PURPOSE AND USE



Figure 1.

The writing machine (Figure 1) is a device for printing documents. Information stored in tape or in edge cards is printed automatically in the writing machine. The writing machine can also print a document by the manual operation of its keyboard. In addition, the writing machine has facilities for controlling operation of the reader, the translator, the code selector and the punch. The writing machine also contains facilities for controlling the operation of auxiliary units to which it may be connected.

Friden 2200/2300 SERIES MACHINES

PHYSICAL DESCRIPTION

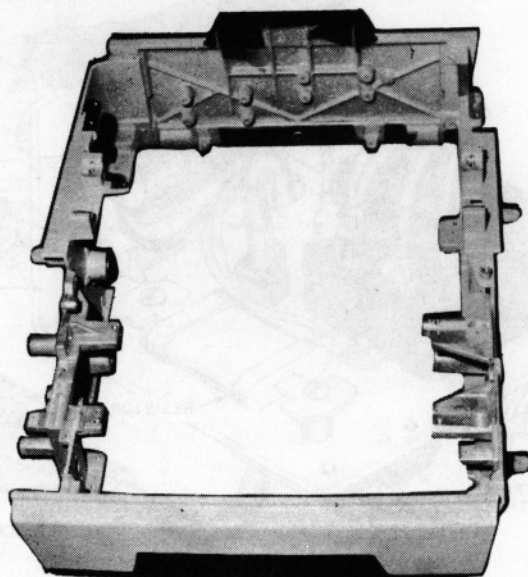


Figure 2.

General. The writing machine is constructed on a base casting which serves as a mount for the reader, the translator, the code selector and the punch. The base casting is mounted on four rubber feet. All the components are mounted on the base casting or within the confines of the base casting (Figure 2).

Friden 2200/2300 SERIES MACHINES

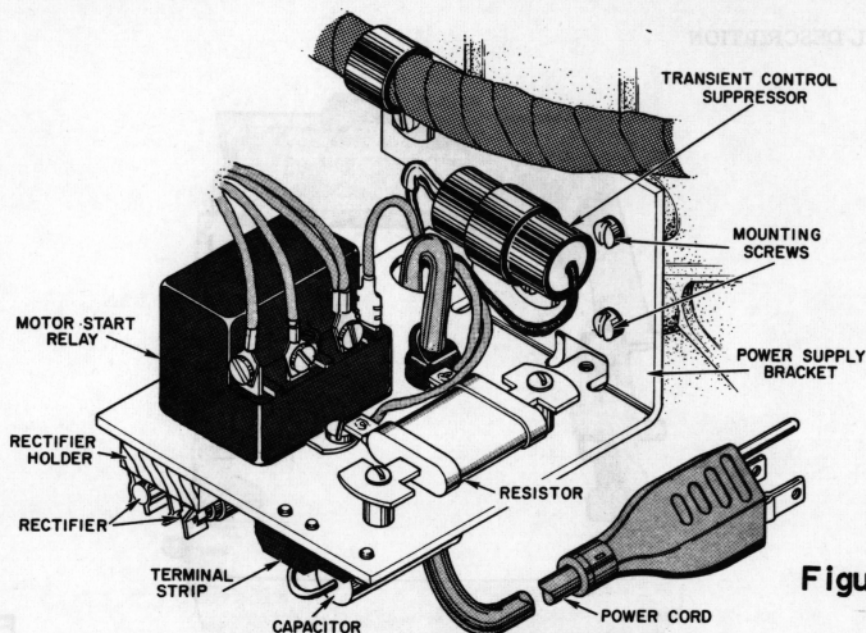


Figure 3.

Power Supply Assembly (Figure 3). The power supply assembly is located on the inner right hand rear part of the base casting. It consists of the following components:

1. Power supply bracket. Mounted by three screws to the inner side of the base casting. (The power supply bracket on the 2200 series machine is mounted by four screws to the inner side of the base casting.)
2. Terminal strip. Mounted by three screws to the bottom of the power supply bracket.
3. 0.1 mfd capacitor (2300 series machines only). Connected to the terminal strip.
4. Rectifier holder. Mounted by two screws to the bottom of the power supply bracket.
5. Rectifiers. Four silicone, 600 V, 1 amp rectifiers are retained by clips on the rectifier holder.
6. Transient control suppressor (2300 series machines only). Retained by a clamp which is screwed to the inner surface of the power supply bracket.
7. A 3 ohm, 30 watt, wire wound resistor is mounted by two screws to the top surface of the power supply bracket.
8. Motor start relay. Mounted by two screws to the top surface of the power supply bracket.
9. Power cord. A three wire power cord fits through a grommet secured in a hole in the power supply bracket. The power cord is electrically connected to the terminal strip and grounded to the power supply bracket.

Friden 2200/2300 SERIES MACHINES

10. 2.0 mfd capacitor (2200 series machines only). Mounted by a screw through its mounting strap to the power supply bracket.

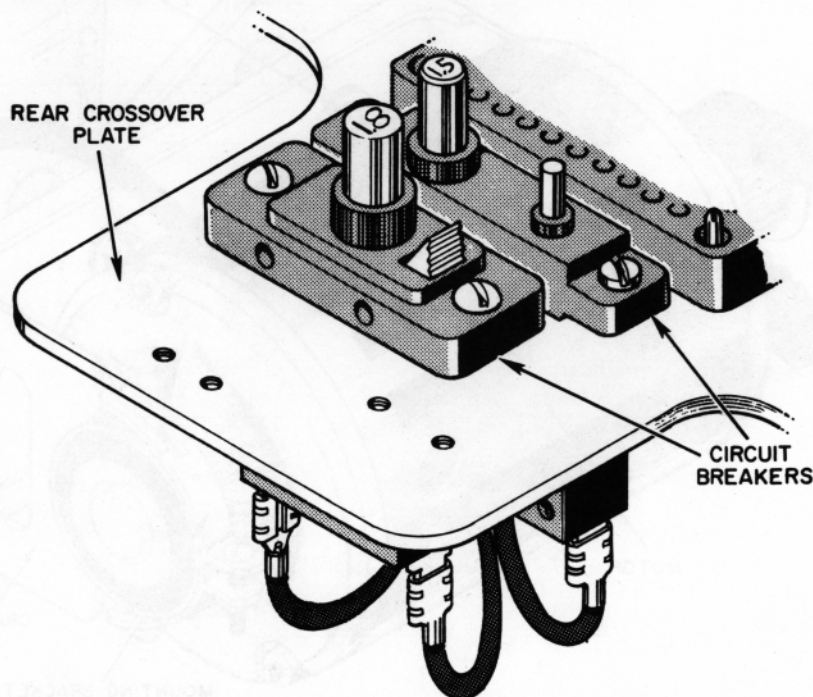


Figure 4.

1.8 Amp AC Circuit Breaker (Figure 4). The 1.8 amp AC circuit breaker is located at the rear right hand side of the writing machine. It is mounted by two screws near the front part of the opening in the right hand end of a rear crossover plate. The rear crossover plate is mounted by two screws to the left hand and the right hand base castings. The 1.8 amp AC circuit breaker is released when the motor circuitry in the writing machine becomes overloaded.

1.5 Amp DC Circuit Breaker (Figure 4). The 1.5 amp DC circuit breaker is located behind the 1.8 amp AC circuit breaker. It is mounted by two screws to the rear crossover plate. The 1.5 amp DC circuit breaker is released when the control circuitry in the writing machine becomes overloaded.

Friden 2200/2300 SERIES MACHINES

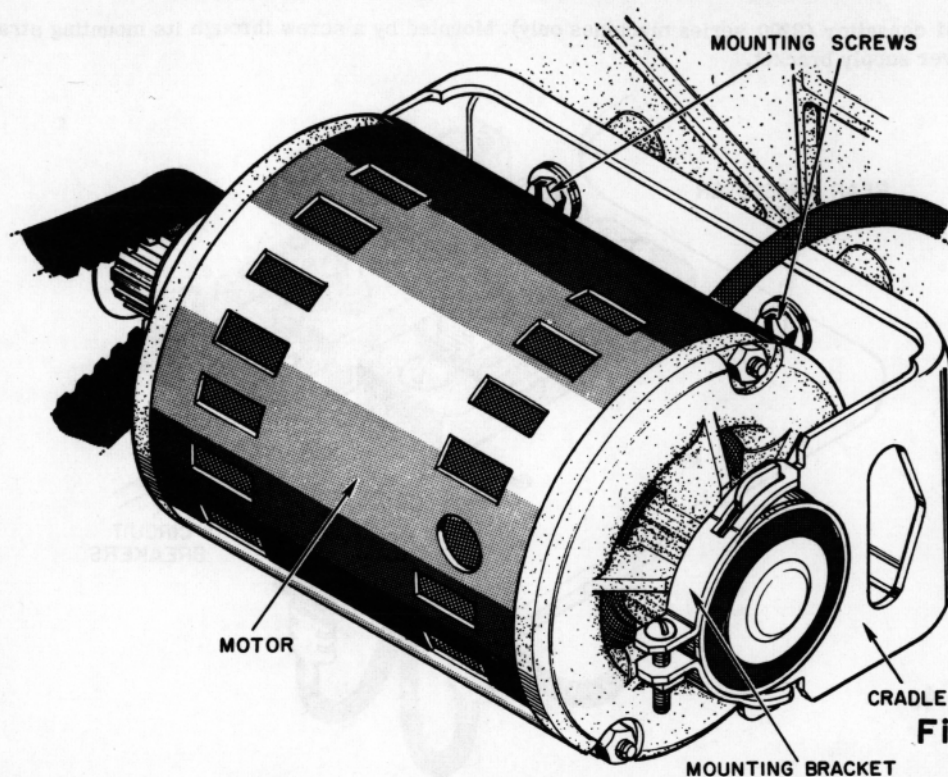


Figure 5.

Motor (Figure 5 and Figure 6). A .035 HP, 115 V AC, 1725 rpm, single phase induction motor is located at the inside rear left hand corner of the writing machine. It is mounted on a cradle by means of motor mounting brackets. The cradle is mounted by four screws to the inner side of the rear base casting. The motor is electrically connected to the motor start relay by three wire leads. All the mechanical power required to operate the Flexowriter is supplied by the motor in the writing machine.

Friden 2200/2300 SERIES MACHINES

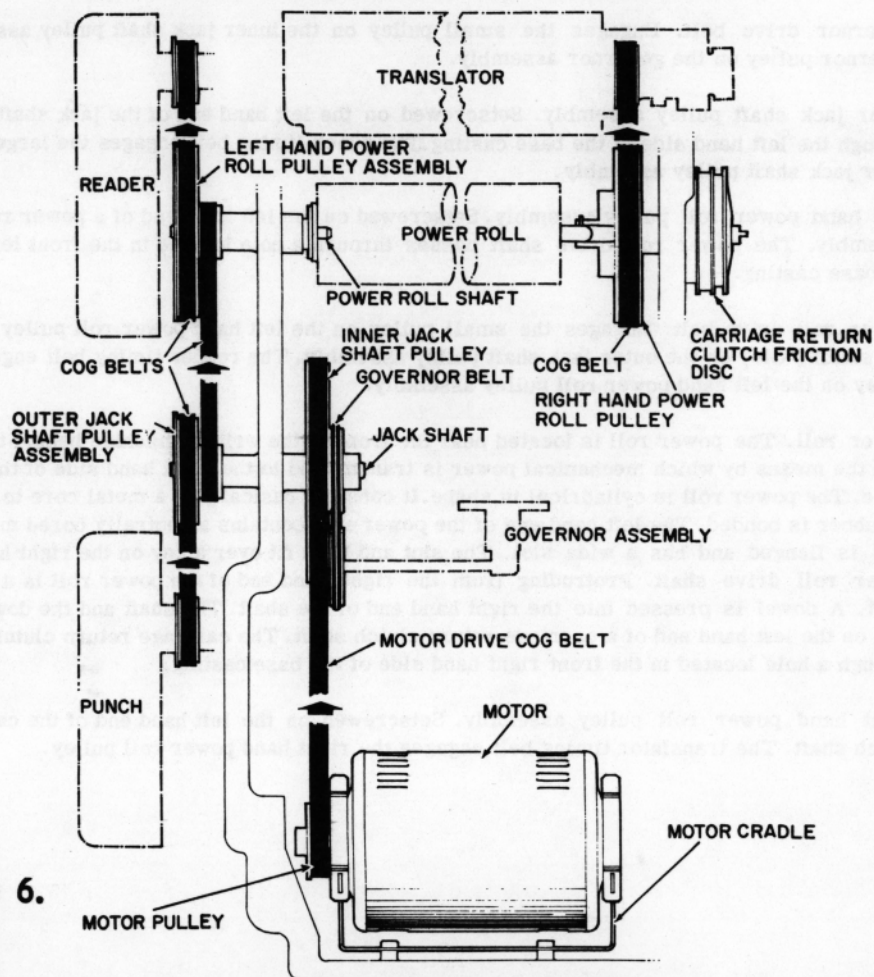


Figure 6.

Drive Mechanism (Figure 6). The power drive mechanism is the means by which mechanical power is transmitted to motivate the clutch mechanisms on three of the basic units of the Flexowriter - the punch, the reader and the translator. The power drive mechanism also causes the operation of components within the writing machine. In their operating sequence, the following components make up the power drive mechanism:

1. **Motor pulley.** Setscrewed on the left hand end of the motor shaft.
2. **Inner jack shaft pulley assembly.** Setscrewed on the right hand end of a jack shaft. The jack shaft passes through a hole centrally located in the left hand side of the base casting.
3. **Motor drive cog belt.** Engages the motor pulley and the large pulley on the inner jack shaft pulley assembly.

Friden 2200/2300 SERIES MACHINES

4. Governor drive belt. Engages the small pulley on the inner jack shaft pulley assembly and the governor pulley on the governor assembly.
5. Outer jack shaft pulley assembly. Setscrewed on the left hand end of the jack shaft which passes through the left hand side of the base casting. The punch timing belt engages the large pulley on the outer jack shaft pulley assembly.
6. Left hand power roll pulley assembly. Setscrewed on the left hand end of a power roll drive shaft assembly. The power roll drive shaft passes through a hole located in the front left hand side of the base casting.
7. Power roll drive belt. Engages the small pulley on the left hand power roll pulley assembly and the small pulley on the outer jack shaft pulley assembly. The reader timing belt engages the large pulley on the left hand power roll pulley assembly.
8. Power roll. The power roll is located near the front of the writing machine behind the translator. It is the means by which mechanical power is transmitted to the right hand side of the writing machine. The power roll is cylindrical in shape. It consists basically of a metal core to which a layer of rubber is bonded. The left hand end of the power roll contains a centrally bored metal plug. The plug is flanged and has a wide slot. The slot and bore fit over a key on the right hand end of the power roll drive shaft. Protruding from the right hand end of the power roll is a spring loaded shaft. A dowel is pressed into the right hand end of the shaft. The shaft and the dowel fit into the slot on the left hand end of a carriage return clutch shaft. The carriage return clutch shaft passes through a hole located in the front right hand side of the base casting.
9. Right hand power roll pulley assembly. Setscrewed on the left hand end of the carriage return clutch shaft. The translator timing belt engages the right hand power roll pulley.

Friden 2200/2300 SERIES MACHINES

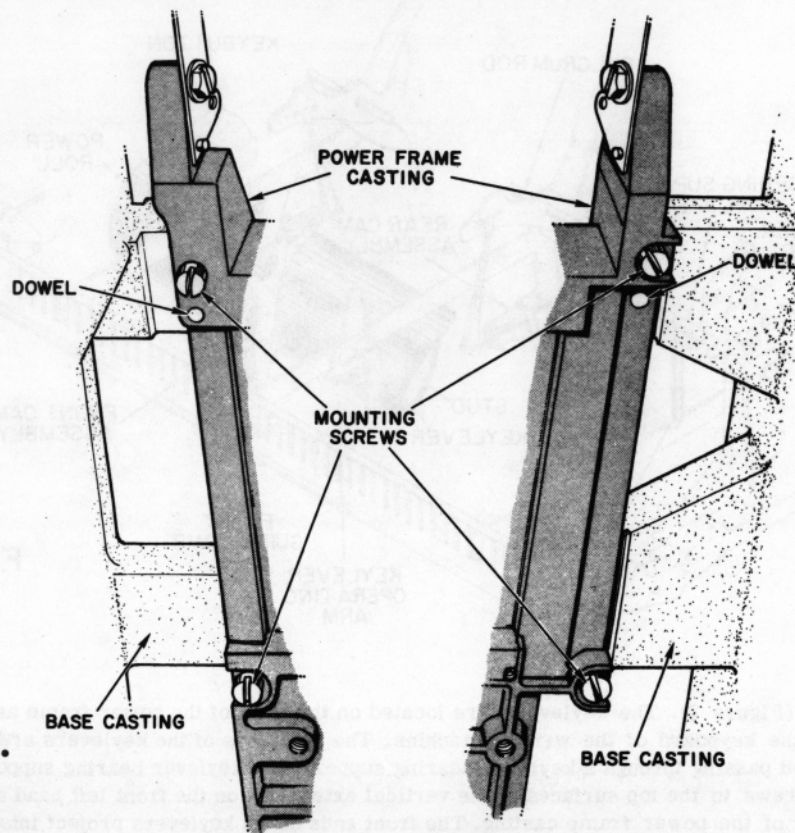


Figure 7.

Power Frame Assembly. The power frame assembly is located in the heart of the writing machine. The following components make up the power frame assembly:

1. Power frame casting. Mounted by two dowels and four screws through the bottom of the power frame casting to the extensions on the left hand side and the right hand side of the base casting (Figure 7).

Friden 2200/2300 SERIES MACHINES

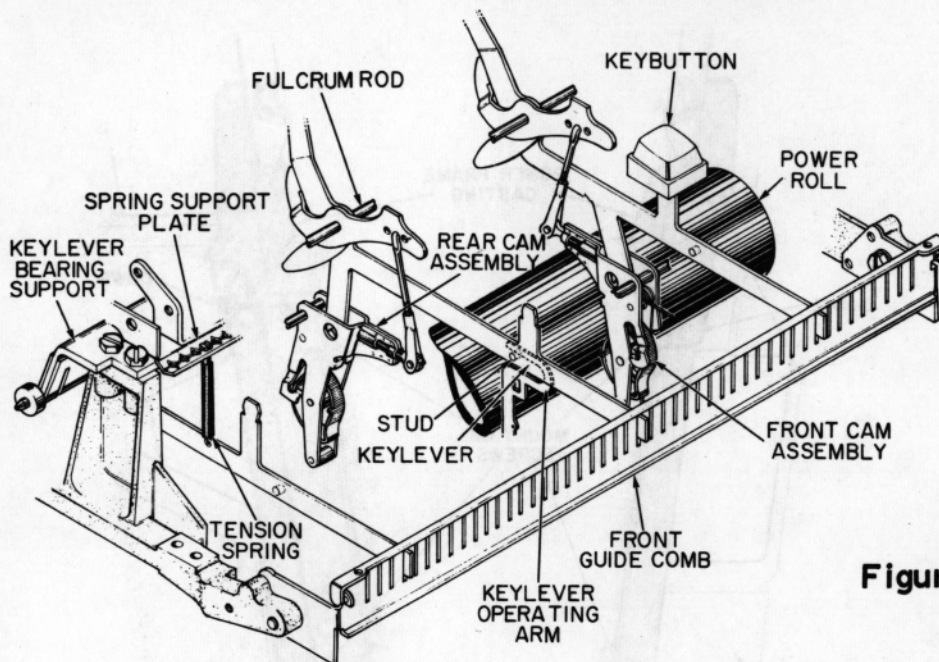


Figure 8.

2. Keylevers (Figure 8). The keylevers are located on the front of the power frame assembly. They make up the keyboard of the writing machine. The rear ends of the keylevers are mounted on a fulcrum rod passing through a keylever bearing support. The keylever bearing support is mounted by four screws to the top surfaces of the vertical extensions on the front left hand and front right hand sides of the power frame casting. The front ends of the keylevers project into the slots of a front guide comb. The front guide comb is mounted by two dowels and two screws to the extreme front ends of the power frame casting. Extending downward near the rear ends of the keylevers are forked extensions. The forked extensions fit over studs in the upper parts of associated cam assemblies. A stud projects from the right hand side of each keylever. The keylevers are under the tension of springs anchored to the keylevers and to spring adjusting screws on the keylever spring support. The keylevers are operated automatically by means of keylever operating arms in the translator engaging the studs on the right hand sides of the keylevers. The keylevers can also be operated manually. Each keylever has a keybutton which designates a printing character or designates a non-printing function in the writing machine.

Friden 2200/2300 SERIES MACHINES

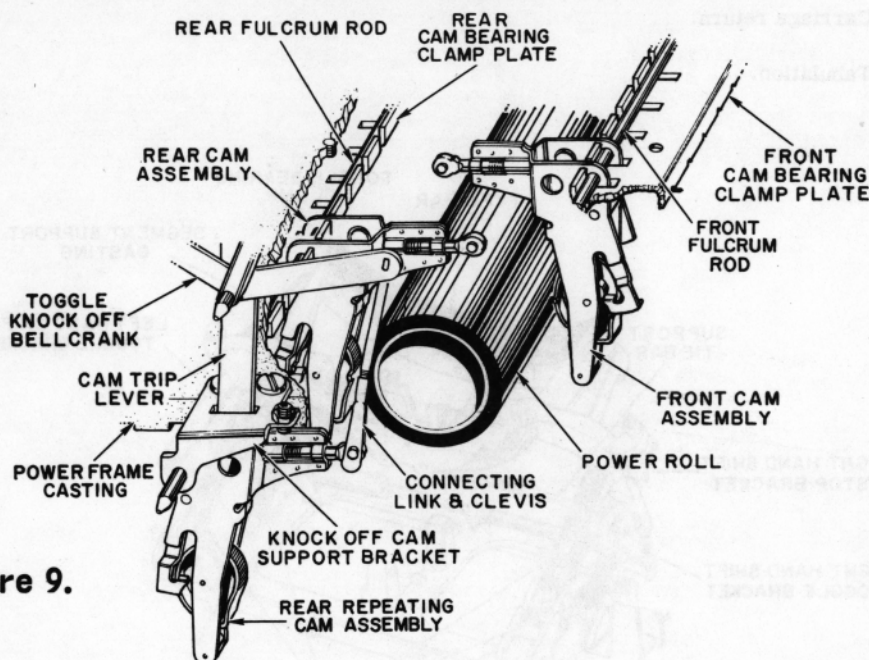


Figure 9.

3. Cam Assemblies (Figure 8 and Figure 9). There are two rows of cam assemblies located under the front part of the power frame assembly. One row of cam assemblies is in front of the power roll—the other row of cam assemblies is behind the power roll. The upper parts of the cam assemblies in front of the power roll are positioned over the bent tabs in a front cam bearing clamp plate. The plate is mounted by five screws to the underside of the power frame casting. The cam assemblies are mounted on a front fulcrum rod passing between the underside of the power frame casting and the front cam bearing plate. The cam assemblies behind the power roll are similarly mounted on a rear fulcrum rod passing between the underside of the power frame casting and a rear cam bearing clamp plate. A cam assembly is operated by the interaction of its associated keylever and the power roll.

The left hand end of the rear fulcrum rod extends beyond the left hand side of the power frame casting. A rear repeating cam assembly is mounted on the extended end of the fulcrum rod. The rear repeating cam assembly is retained on the end of the fulcrum rod by a knock off cam support bracket. The support bracket is mounted by two screws to the left hand side of the power frame casting. Mounted near the left hand end of the fulcrum rod that mounts the rear ends of the keylevers is a cam trip lever and a toggle knock off bellcrank. The bottom of the cam trip lever is forked. It extends downward through a slot in the top of the knock off cam support bracket. The forked end of the cam trip lever fits over a stud in the upper part of the rear repeating cam assembly. The front end of the toggle knock off bellcrank is connected to the repeating cam assembly by means of a connecting link and a clevis. The rear repeating cam assembly is operated by the interaction of the cam trip lever and the toggle knock off bellcrank during the following operations in the writing machine:

Friden 2200/2300 SERIES MACHINES

a. Carriage return.

b. Tabulation.

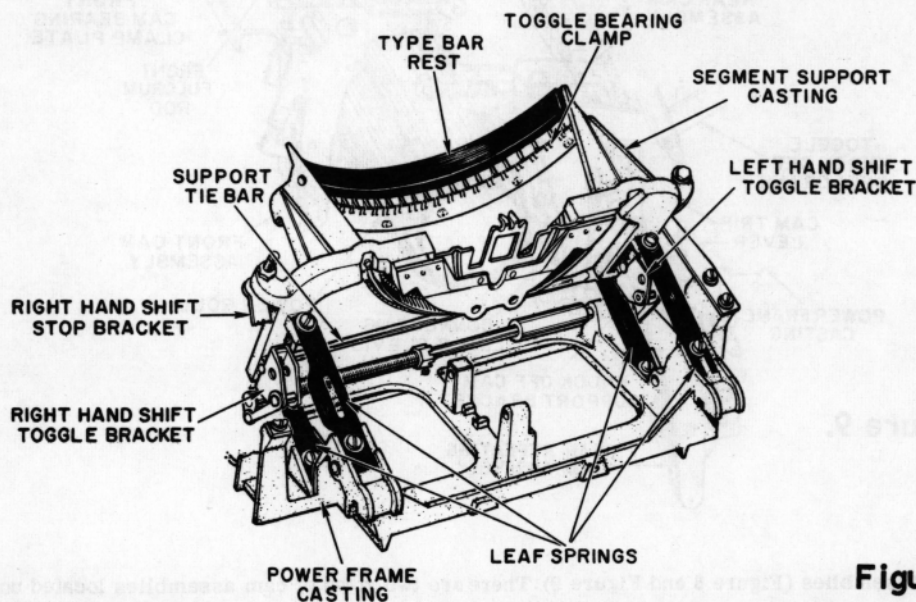


Figure 10.

4. **Segment Support Assembly (Figure 10).** The segment support assembly makes up the top portion of the power frame assembly. It consists of a frame casting, a typebar rest, a toggle bearing clamp, a support tie bar, a left hand and a right hand shift toggle bracket, a right hand shift stop bracket and necessary small hardware. The segment support assembly is indirectly mounted to the power frame assembly. The rear left hand and the rear right hand ends of the segment support assembly are mounted by means of four leaf springs. The leaf springs are screwed to the segment support casting and the power frame casting. The segment support assembly is also indirectly mounted by means of its left hand and right hand shift toggle brackets connected to the shift toggle mechanisms on the left hand and the right sides of the power frame assembly. The segment support assembly has facilities for supporting and mounting the components of the power frame assembly that function immediately prior to the printing of a character in the writing machine. These components are as follows:

Friden 2200/2300 SERIES MACHINES

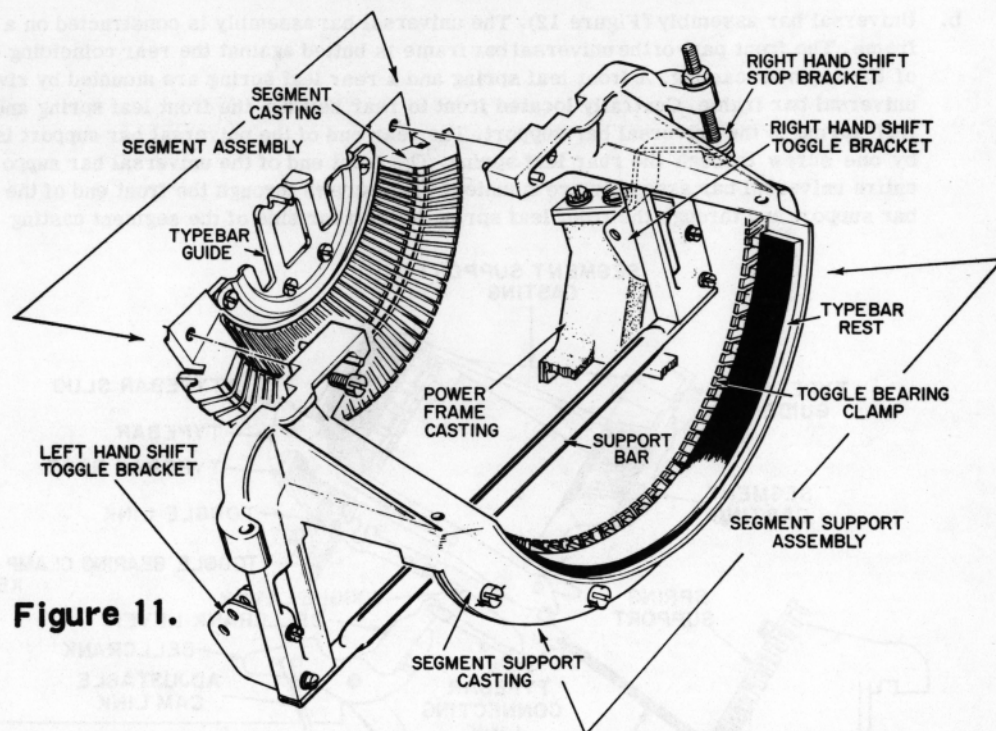


Figure 11.

- a. Segment assembly (Figure 11). Mounted by two dowels and two screws through the top open ends of the segment support casting. The segment assembly is constructed of a C-shaped, multi-slotted casting. A typebar guide is mounted by a dowel and four screws to the front side of the segment casting.

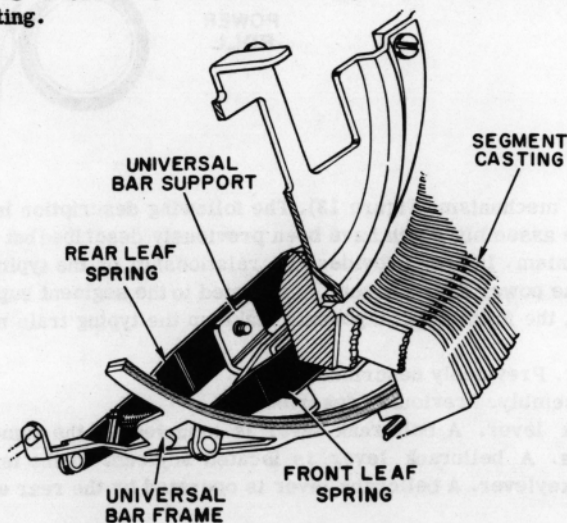


Figure 12.

Friden 2200/2300 SERIES MACHINES

- b. Universal bar assembly (Figure 12). The universal bar assembly is constructed on a C-shaped frame. The front part of the universal bar frame is butted against the rear coinciding curvature of the segment casting. A front leaf spring and a rear leaf spring are mounted by rivets to the universal bar frame. Centrally located front to rear between the front leaf spring and the rear leaf spring is the universal bar support. The rear end of the universal bar support is mounted by one screw through the rear leaf spring. The front end of the universal bar support and the entire universal bar assembly are mounted by two screws through the front end of the universal bar support and through the front leaf spring to the rear side of the segment casting.

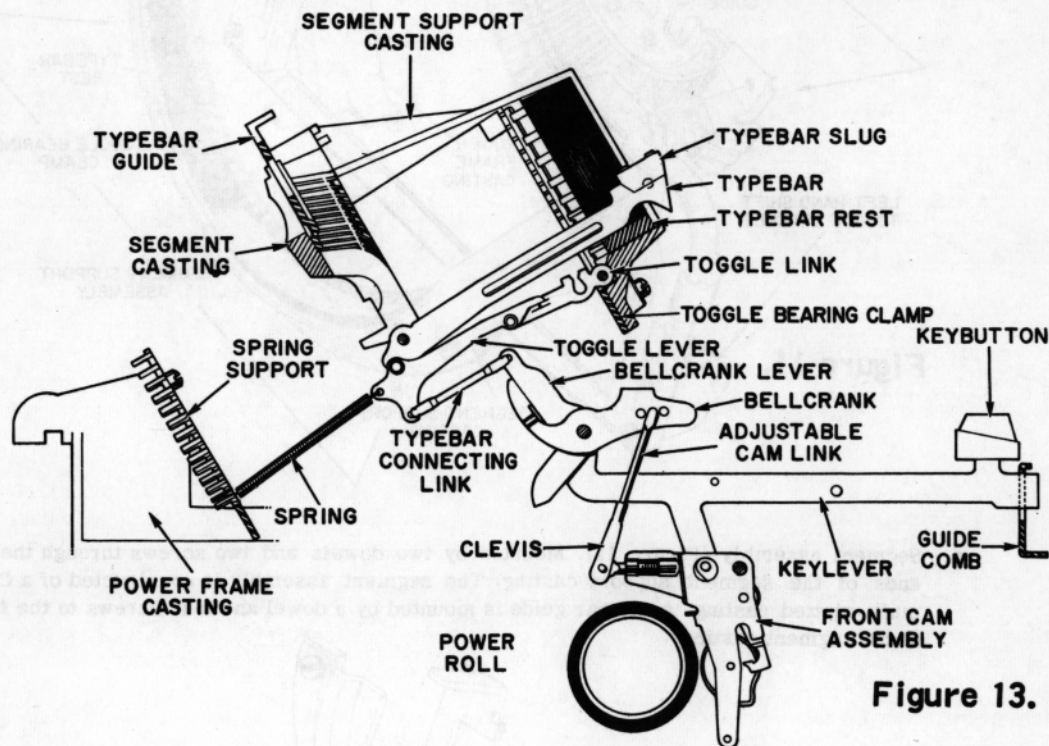


Figure 13.

- c. Typing train mechanism (Figure 13). The following description includes two components of the power frame assembly which have been previously described but which are a part of the typing train mechanism. It also provides the relationship of the typing train mechanism with components of the power frame assembly mounted to the segment support assembly. In their order of operation, the following components make up the typing train mechanism:

1. Keylever. Previously described.
2. Cam Assembly. Previously described.
3. Bellcrank lever. A bellcrank lever is mounted on the same fulcrum rod that mounts the keylevers. A bellcrank lever is located adjacent to the left hand side of each character printing keylever. A bellcrank lever is operated by the rear end of a bellcrank.

Friden 2200/2300 SERIES MACHINES

4. Bellcrank. The bellcrank is also mounted on the same fulcrum rod that mounts the keylevers and the bellcrank levers. A bellcrank is located adjacent to the left hand side of each bellcrank lever. A bellcrank is operated by means of an adjustable cam link connected near the front part of the bellcrank and a clevis connected to the upper part of a cam assembly.
5. Typebar & toggle assembly. The typebar & toggle assembly is the last in a chain of components that make up the typing train mechanism. A typebar & toggle assembly for each printing character is positioned front to rear in the top curved part of the segment support assembly. A typebar & toggle assembly consists of a toggle link, a toggle lever and a typebar interconnected by two shouldered rivets. The front ends of the toggle links are positioned in the slotted upper part of the toggle bearing clamp. The toggle bearing clamp is mounted to the rear side of the front curved part of the segment support casting by five screws through the front of the casting. The typebar & toggle assemblies are mounted on a fulcrum rod passing between the front side of the toggle bearing clamp and the segment support casting. The typebar & toggle assemblies are also mounted on a fulcrum rod passing through the upper curvature of the segment casting and through the rear ends of the typebars positioned in the slots of the segment casting. The front ends of the typebars carry the slugs containing the character printing symbols. In their non-operated position, the front ends of the typebars are supported by the typebar rest. The typebar rest is formed of rubber. It is mounted by four projections on its underside fitted into holes on the curved front surface of the segment support casting. The typebar & toggle assemblies are under the tension of springs anchored to the rear ends of the toggle levers and to a spring support. The spring support is mounted by two screws to the rear left hand and rear right hand ends of the power frame casting.

The typebar & toggle assemblies are individually operated by typebar connecting links connected to the lower rear ends of the toggle levers and to the upper parts of the bellcrank levers. When a typebar & toggle assembly is operated, the front end of its typebar is lifted from the typebar rest. The front end of the typebar travels through the slot in the typebar guide mounted on the segment casting.

5. Segment support assembly shift mechanism. The segment support assembly is raised and lowered by means of two shift toggle mechanisms - one on each side of the power frame assembly. The shifting of the segment support assembly determines the printing of a character when two characters are represented on a typebar slug.

Friden 2200/2300 SERIES MACHINES

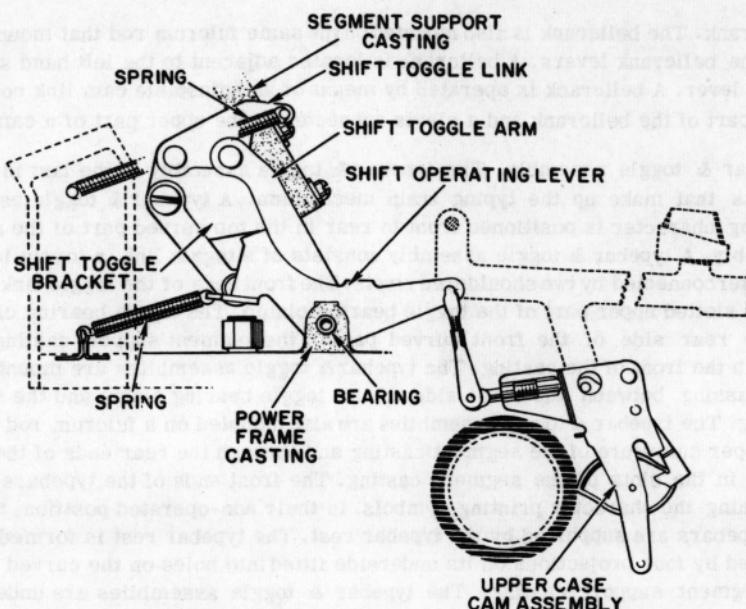


Figure 14.

Each shift toggle mechanism consists of a shift toggle arm, a shift toggle link and a shift operating lever (Figure 14). The upper ends of the shift toggle arms and the central parts of the shift toggle links are joined by shouldered rivets. The rear ends of the shift toggle links contain studs. The studs fit into holes in the rear parts of the left hand and the right hand shift toggle brackets. Each shift toggle bracket is mounted by two nuts and two screws through the rear left hand end and the rear right hand end of the segment support casting. The lower ends of the shift toggle arms are mounted on bearings extending through vertical projections on the left hand and the right hand sides of the power frame casting. Also mounted on the same bearings are the shift operating levers. They are mounted by means of centrally bored holes in their lower parts. Each shift toggle mechanism is under the tension of springs. Tension springs are anchored to the front ends of the shift toggle links and to vertical projections on the left hand and the right hand sides of the power frame casting. Tension springs are also anchored to the rear ends of the shift operating levers and to cotter pins in the left hand rear ends and the right hand rear ends of the power frame casting. The front end of each shift operating lever is connected to its associated cam assembly by means of a link and a clevis. The individual toggling action in a shift toggle mechanism is affected by the operation of its shift operating lever. A shift operating lever is operated by the interaction of its linkage and its associated cam assembly.

Friden 2200/2300 SERIES MACHINES

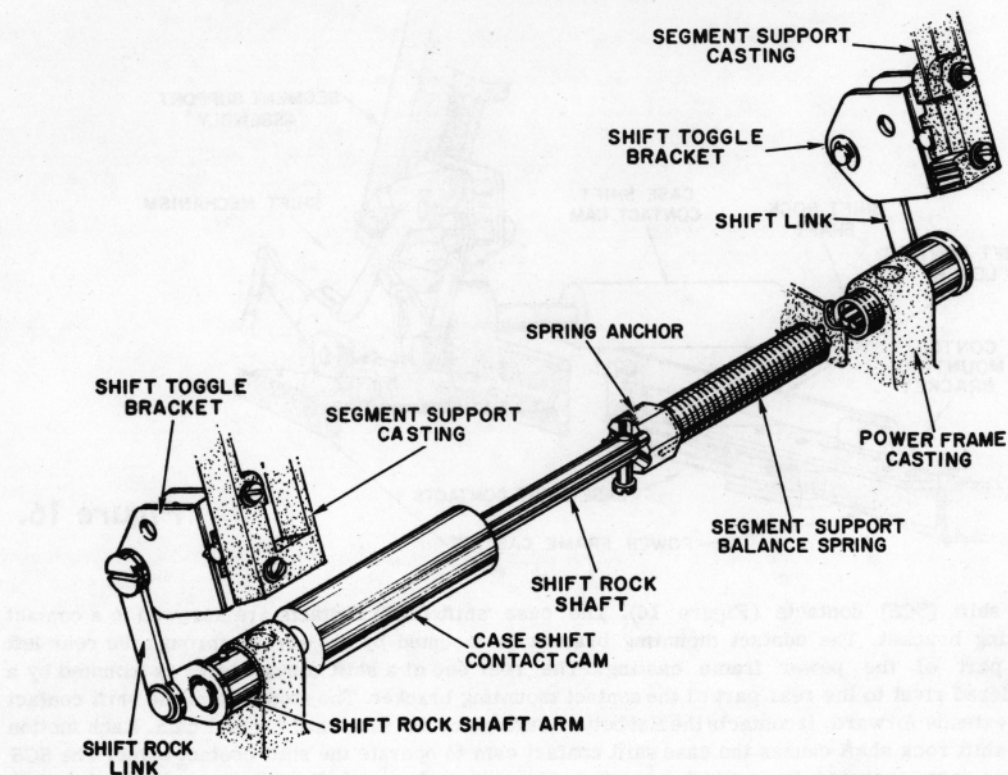


Figure 15.

Extending across the power frame assembly between the two shift toggle mechanisms is a shift rock shaft (Figure 15). The shift rock shaft is the means by which the left hand and the right hand sides of the segment support assembly are moved upward and downward in unison. The ends of the shift rock shaft pass through holes in vertical extensions on the power frame casting. The ends of the shaft are retained in the vertical extensions by shift rock shaft arms. The arms are secured to the ends of the shaft by taper pins. Attached to each shift rock arm is a shift rock link. The shift rock links are connected to the left hand and the right hand shift toggle brackets. Mounted on the shift rock shaft between the vertical extensions on the power frame casting are a segment support balance spring, a spring anchor and a case shift contact cam. The balance spring is closely wound around the shift rock shaft. It is anchored to the right hand side of the power frame casting and to a hexagonal spring anchor. The case shift contact cam is positioned near the left hand vertical extension on the power frame casting. It is secured to the shaft by two setscrews. Because the shift rock links on each end of the shaft are attached to the left hand and the right hand shift toggle brackets, each upward and downward shifting of the segment support assembly motivates the shift rock shaft.

Friden 2200/2300 SERIES MACHINES

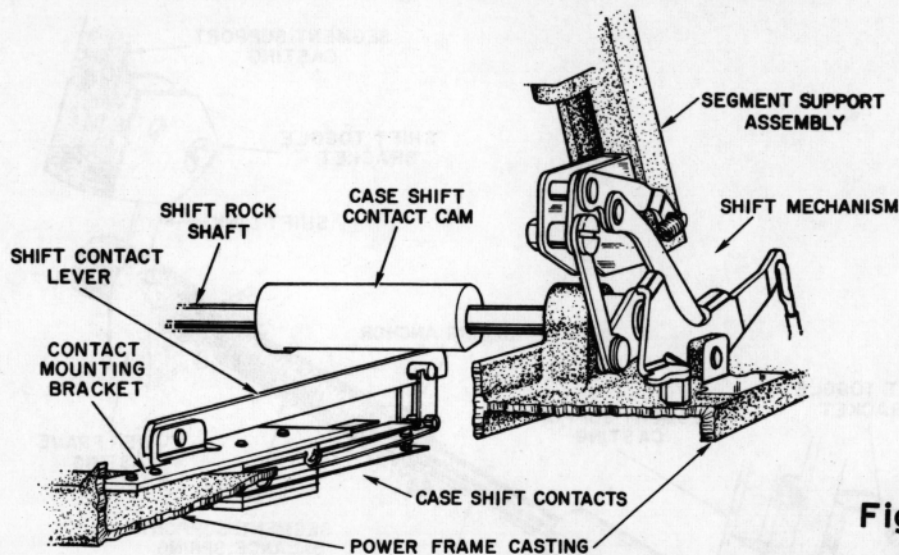


Figure 16.

6. Case shift (SCS) contacts (Figure 16). The case shift (SCS) contacts are screwed to a contact mounting bracket. The contact mounting bracket is mounted by two screws through the rear left hand part of the power frame casting. The rear end of a shift contact lever is mounted by a shouldered rivet to the rear part of the contact mounting bracket. The front end of the shift contact lever extends forward. It contacts the flat bottom surface of the case shift contact cam. Each motion of the shift rock shaft causes the case shift contact cam to operate the shift contact lever. The SCS contacts are operated by contact operators extending from studs on the front end of the shift contact lever to the SCS contacts.

Friden 2200/2300 SERIES MACHINES

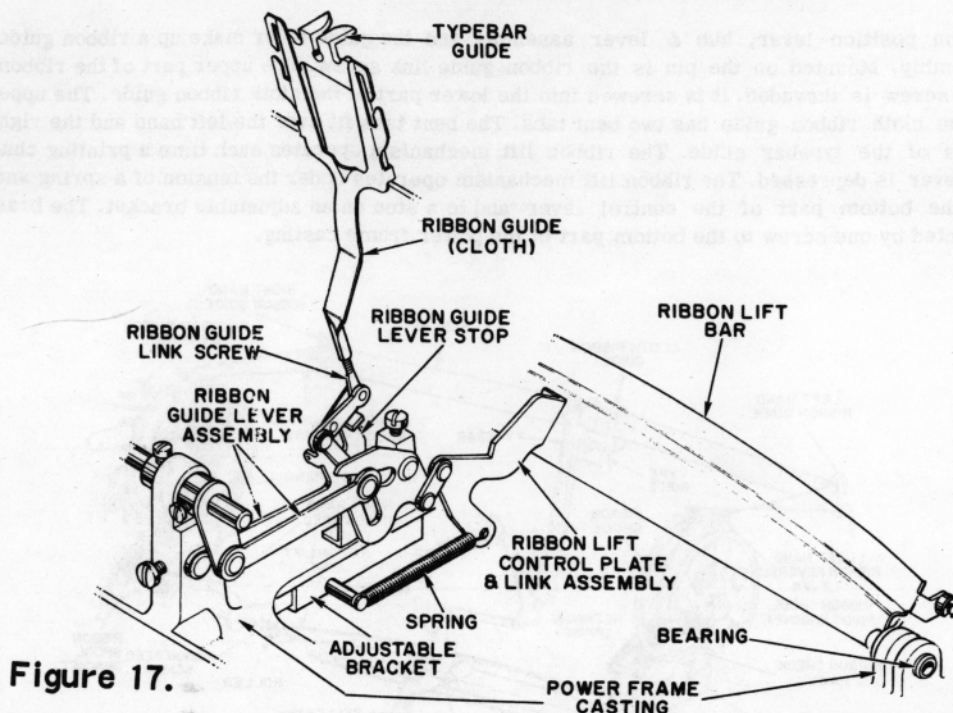


Figure 17.

7. Ribbon lift mechanism (Figure 17). The front surface of a ribbon lift bar contacts the tails of the bellcrank levers. The ends of a shaft protrude from each lower end of the ribbon lift bar. The ends of the shaft fit into the same bearings that mount the lower parts of the left hand and the right hand shift toggle mechanisms to the power frame casting. Centrally located front to rear behind the ribbon lift bar is a ribbon lift control plate & link assembly. The ribbon lift control plate & link assembly consists of three parts interconnected by rivets; a control lever, a control plate link and a control plate. The control lever is the front part of the assembly. It is mounted by two screws to the rear surface of the ribbon lift bar. The control plate is the rear part of the assembly. It is mounted by a stud through a vertical extension on the power frame casting. The stud is retained by a screw through the top part of the vertical extension. The rear part of the control plate is open. The bottom part of a ribbon guide link and the front end of a ribbon position lever are connected by a shouldered rivet. The rivet is contained in the open end of the control plate. Connected by a shouldered rivet to the rear end of the ribbon position lever is a hub & lever assembly. It is mounted by a screw to the left hand end of a ribbon position lever shaft. The end of the shaft protrudes from a hole in the upper part of a centrally located vertical extension on the rear end of the power frame casting. The rear end of a guide lever is mounted by a stud through the left hand side of the same vertical extension. The stud is retained by a screw through the rear of the extension. The upper part of the guide lever and the upper end of the ribbon guide link are also connected by a shouldered rivet. A flat spring is riveted to the front part of the guide lever. The front part of the guide lever is supported by the formed upper end of a ribbon guide lever stop. The stop is mounted by one screw to the power frame casting. A pin is attached to the front end of the flat spring. The pin fits into a hole in the front end of the guide lever. The ribbon guide lever,

Friden 2200/2300 SERIES MACHINES

ribbon position lever, hub & lever assembly and the guide lever make up a ribbon guide lever assembly. Mounted on the pin is the ribbon guide link screw. The upper part of the ribbon guide link screw is threaded. It is screwed into the lower part of the cloth ribbon guide. The upper part of the cloth ribbon guide has two bent tabs. The bent tabs fit over the left hand and the right hand sides of the typebar guide. The ribbon lift mechanism operates each time a printing character keylever is depressed. The ribbon lift mechanism operates under the tension of a spring anchored to the bottom part of the control lever and to a stud on an adjustable bracket. The bracket is mounted by one screw to the bottom part of the power frame casting.

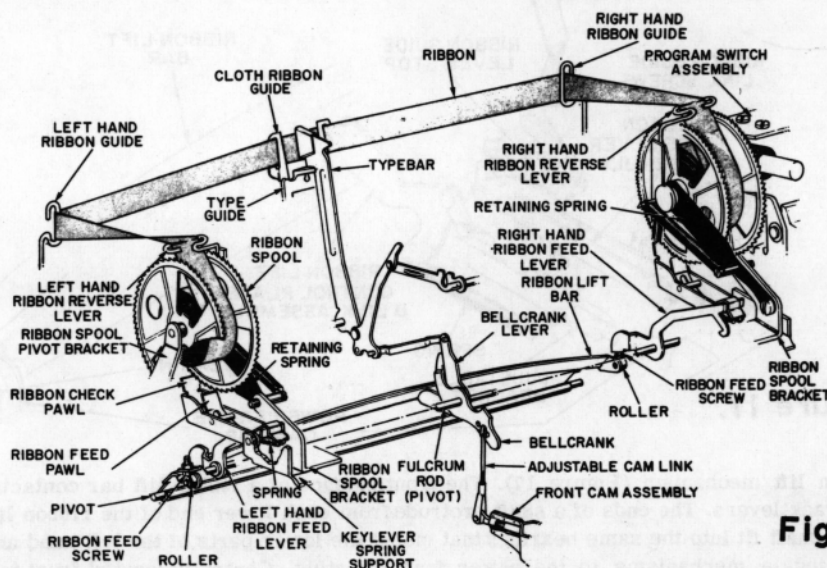


Figure 18.

8. Ribbon feed mechanism (Figure 18). The ends of an inked cloth ribbon are attached to the cores of two ribbon spools. A ribbon spool is located on the left hand side and the right hand side of the power frame assembly. On the left hand side of the power frame assembly the outer side of the ribbon spool is mounted on a pivot stud on the upper end of a ribbon spool pivot bracket. The bracket is mounted by two nuts and two screws through the left hand side of the base casting. The inner side of the ribbon spool is mounted on a pivot stud on the upper end of a flat retaining spring. The retaining spring is mounted by means of a stud and a screw to a ribbon spool bracket. The ribbon spool bracket is mounted by two screws to the top of the keylever spring support. On the right hand side of the power frame assembly, the outer side of the ribbon spool is mounted on a pivot stud on a ribbon spool mounting bracket. The bracket is mounted by two screws to a rear bracket on the program switch assembly. The inner side of the ribbon spool is mounted in the same way as the ribbon spool on the left hand side of the power frame assembly.

The ribbon is threaded through ribbon guides on the left hand and the right hand ribbon reverse levers. The ribbon reverse levers are located adjacent to the inner sides of the ribbon spools. The ribbon is also threaded through a left hand and a right hand ribbon guide. The left hand ribbon guide is mounted by two screws through a left hand bracket to the top of a vertical extension on the rear left hand side of the power frame casting. The right hand ribbon guide is mounted by two screws

Friden 2200/2300 SERIES MACHINES

through the right hand shift stop bracket to the top of a vertical extension on the rear right hand side of the power frame casting. At the rear of the power frame assembly, the ribbon is threaded through the slots in the cloth ribbon guide.

Directly beneath the inner side of each ribbon spool is a ribbon check pawl. The front ends of the ribbon check pawls are mounted on studs on the inner and outer left hand and right hand vertical ends of the keylever spring support. Cradled within the ribbon check pawls are ribbon feed pawls. Each ribbon feed pawl is under the tension of a spring. The spring is anchored to a tab on the bottom part of each ribbon check pawl and to the tab on the front end of each ribbon feed pawl. The front parts of the ribbon feed pawls are formed. They fit over the lugs on the front ends of the ribbon feed levers. The ribbon feed levers are mounted on the fulcrum rod passing through the rear part of the keylever spring support. A ribbon feed screw is retained by a nut in the rear end of each ribbon feed lever. The head of each screw is positioned above a roller on each end of the ribbon lift bar. The front ends of the ribbon feed levers are hooked. They fit over the studs on the inner left hand and right hand vertical ends of the keylever spring support.

Ribbon feed is affected by the interaction of the rollers on the ends of the ribbon lift bar against the screw on the rear ends of the ribbon feed levers and the engagement of a ribbon feed pawl with the teeth on a ribbon spool.

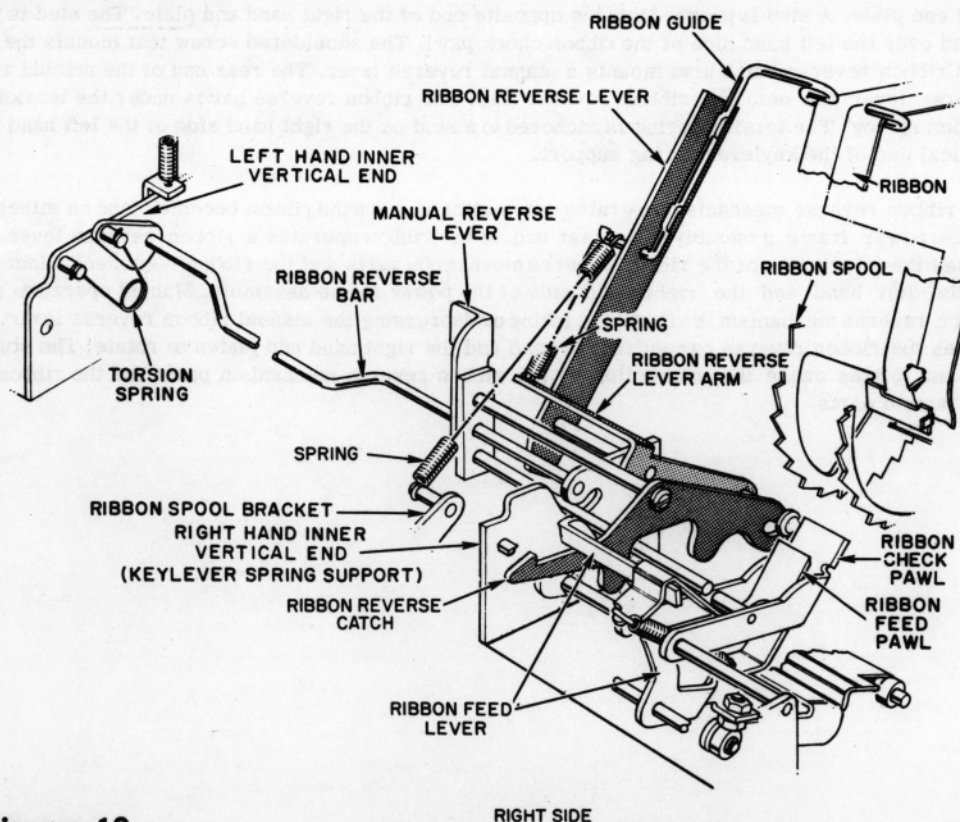


Figure 19.

Friden 2200/2300 SERIES MACHINES

9. Ribbon reverse mechanism (Figure 19). Ribbon reverse lever arms are mounted by their studs through the left hand and right hand inner vertical ends of the keylever spring support. The threaded studs also pass through the lower parts of a left hand ribbon reverse lever and a right hand ribbon reverse lever. The ribbon reverse levers are retained on their studs by nuts. Each ribbon reverse lever is under the tension of two springs. Springs are anchored to the tails of the ribbon guides on the ribbon reverse levers and to the ribbon reverse lever arms. The other springs are anchored to the ribbon guides and to the studs on the upper parts of the ribbon spool brackets. A stud on the rear end of each ribbon reverse lever arm is contained in the rear open end of a left hand ribbon reverse catch and right hand ribbon reverse catch. The left hand ribbon reverse catch is mounted on a stud protruding from a left hand end plate. The stud extends through a curved central slot in the inner left hand vertical end of the keylever spring support. The end of the stud is positioned over the right hand side of the ribbon check pawl. The left hand end plate is pressed onto the end part of the ribbon reverse bar. The left hand end of the ribbon reverse bar fits into a hole in the rear part of the inner left hand vertical end of the keylever spring support. The ribbon reverse bar extends across the power frame assembly.

The right hand end of the ribbon reverse bar fits into a hole in the right hand inner vertical end of the keylever spring support. An end plate is pressed onto the right hand part of the ribbon reverse bar. A right hand ribbon reverse catch is mounted by a shouldered screw to one end of the right hand end plate. A stud is pressed into the opposite end of the right hand end plate. The stud is positioned over the left hand side of the ribbon check pawl. The shouldered screw that mounts the right hand ribbon reverse catch also mounts a manual reverse lever. The rear end of the manual ribbon reverse lever fits onto the ribbon reverse bar. The ribbon reverse bar is under the tension of a torsion spring. The torsion spring is anchored to a stud on the right hand side of the left hand inner vertical end of the keylever spring support.

The ribbon reverse mechanism operates automatically when the ribbon becomes taut on either side of the power frame assembly. The taut end of the ribbon operates a ribbon reverse lever. This causes the interaction of the ribbon reverse mechanism parts and the ribbon feed mechanism parts on the left hand and the right hand side of the power frame assembly. Manual operation of the ribbon reverse mechanism is affected by lifting or depressing the manual ribbon reverse lever. This causes the ribbon reverse bar and the left hand and the right hand end plates to rotate. The studs on the end plates cause the interaction of the ribbon reverse mechanism parts and the ribbon feed mechanism parts.

Friden 2200/2300 SERIES MACHINES

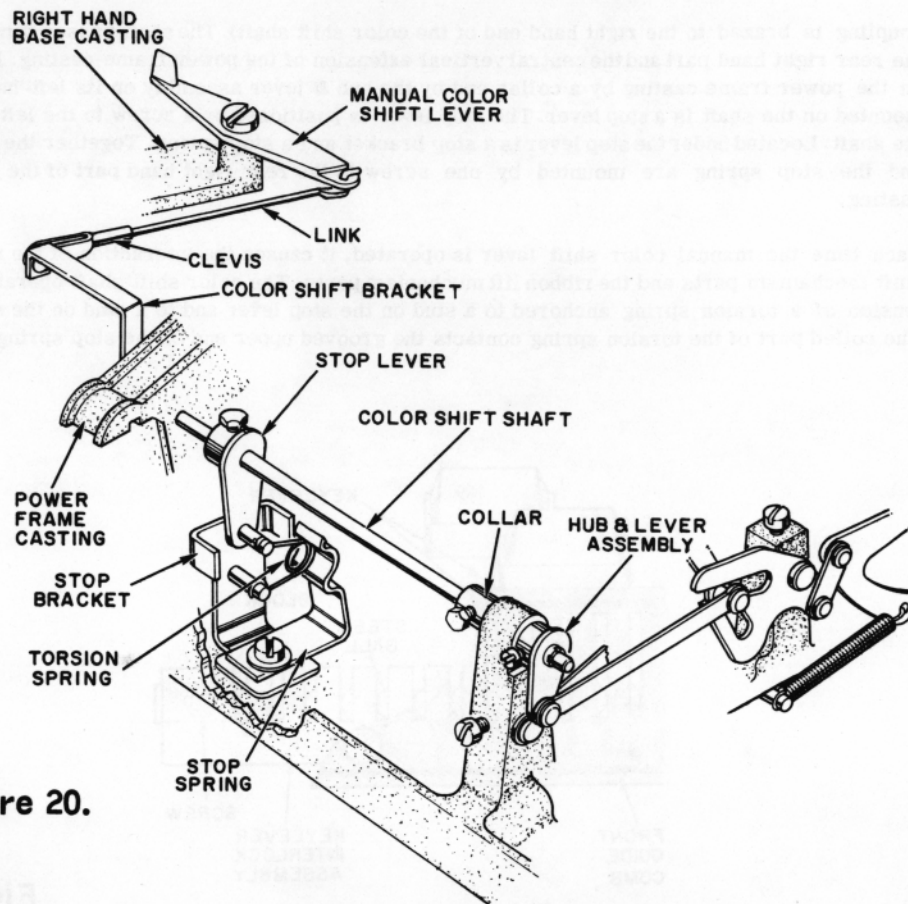


Figure 20.

10. Manual color shift mechanism (Figure 20). The ribbon in the writing machine can be shifted upward or downward. A ribbon consisting of a single color is shifted in order to alternate the wear of its upper and lower parts. A duo-colored ribbon is shifted to select the printing color to appear on a document. Single-colored and duo-colored ribbons can also be shifted in order to prepare a stencil.

The shifting of the ribbon is controlled by the manual color shift lever. It is mounted by a shouldered screw through its center part to the top of the right hand base casting. The right hand end of the manual color shift lever is positioned over the top of the right hand base cover. The manual color shift lever is connected by means of a link and a clevis from its left hand end to the upper part of a color shift bracket. The color shift bracket is brazed to the right hand end of a color shift shaft. (On 2200 series machines the color shift bracket is brazed to the right hand end of a color shift shaft extension. The extension passes through the right hand end of a support bracket. The left hand end of the support bracket is mounted by two screws to the rear right hand side of the power frame casting. The left hand end of the color shift shaft extension fits into the right hand end of a coupling. The end of the shaft is restrained by two setscrews through the coupling. The left hand end of the

Friden 2200/2300 SERIES MACHINES

coupling is brazed to the right hand end of the color shift shaft). The shaft passes through holes in the rear right hand part and the central vertical extension of the power frame casting. It is retained on the power frame casting by a collar and by the hub & lever assembly on its left-hand end. Also mounted on the shaft is a stop lever. The stop lever is positioned by a screw to the left hand part of the shaft. Located under the stop lever is a stop bracket and a stop spring. Together the stop bracket and the stop spring are mounted by one screw to the rear right hand part of the power frame casting.

Each time the manual color shift lever is operated, it causes the interaction of the manual color shift mechanism parts and the ribbon lift mechanism parts. The color shift shaft operates under the tension of a torsion spring anchored to a stud on the stop lever and to a stud on the stop bracket. The coiled part of the torsion spring contacts the grooved upper end of the stop spring.

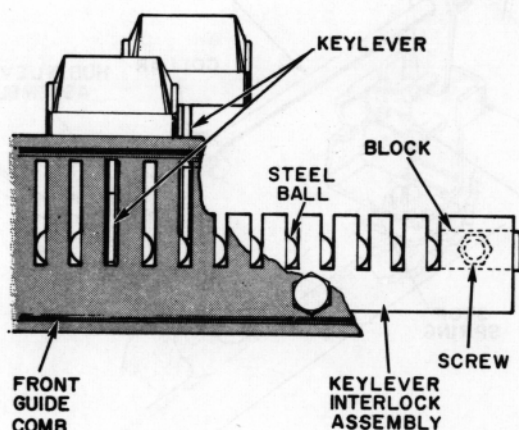


Figure 21.

Keylever Interlock Assembly (Figure 21). The depression of more than one keylever at a time is prevented by the keylever interlock assembly. The keylever interlock assembly is located behind the front guide comb on the front of the power frame assembly. It is mounted by three screws through the front guide comb. The keylever interlock assembly consists of a slotted, hollow rectangular bar. Contained in the hollow of the bar are 51 steel balls. The steel balls are confined by blocks inserted in the ends of the bar. The blocks are secured by screws through the rear ends of the bar. The bottom front ends of the keylevers fit into the upper parts of the slots in the bar. The space unoccupied by the steel balls accommodates the thickness of one keylever. The depression of a keylever causes the steel balls to roll toward the ends of the bar.

Friden 2200/2300 SERIES MACHINES

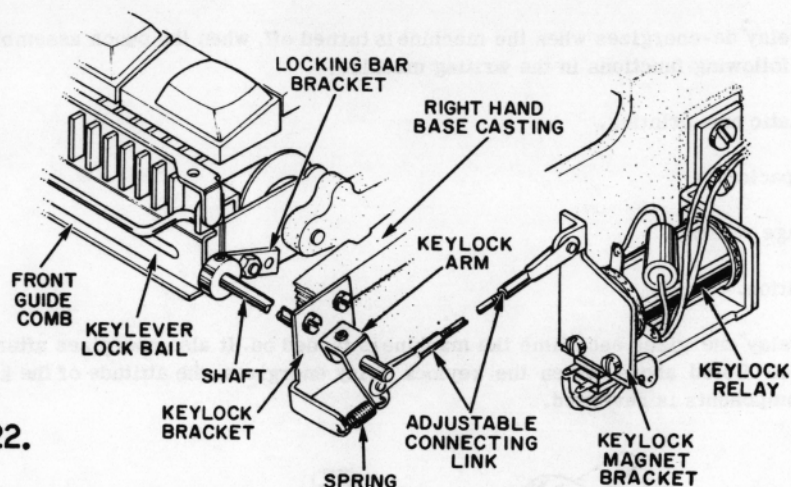


Figure 22.

Keyboard Locking Mechanism (Figure 22). Extending across the lower front side of the front guide comb is a keylever lock bail. A shaft is permanently attached to the rear bottom part of the keylever lock bail. The ends of the shaft pass through holes in the bottom parts of locking bar brackets. The locking bar brackets are mounted by two nuts and two screws through each end of the front guide comb. The right hand end of the shaft also passes through the center hole in a keylock bracket. The keylock bracket is mounted by two screws to the outer right hand side of the base casting. A keylock arm is secured by a setscrew to the right hand end of the shaft. The keylock arm is connected to the upper part of a keylock magnet bracket by means of an adjustable connecting link. The keylock magnet bracket is mounted by two screws to the armature of a keylock relay. The keylock arm is under the tension of a spring anchored to its bottom part and to a bent extension on the keylock bracket.

The writing machine keyboard locks as follows:

1. The keylock relay de-energizes.
2. The relay armature, carrying the keylock magnet bracket, pivots forward - away from the relay magnet.
3. The keylock magnet bracket pushes the adjustable connecting link forward; assisted by spring tension.
4. Together the keylock arm, the shaft and the keylever lock bail are rotated in a clockwise direction by the adjustable connecting link.
5. The top surface of the keylever lock bail is positioned under the front ends of the keylevers - preventing depression of the keylevers.

Friden 2200/2300 SERIES MACHINES

The keylock relay de-energizes when the machine is turned off, when the punch assembly malfunctions, or during the following functions in the writing machine:

1. Automatic non-printing.
2. Backspacing.
3. Carriage return.
4. Tabulation.

The keylock relay energizes each time the machine is turned on. It also energizes after the completion of any function listed above. When the keylock relay energizes, the attitude of the keyboard locking mechanism components is reversed.

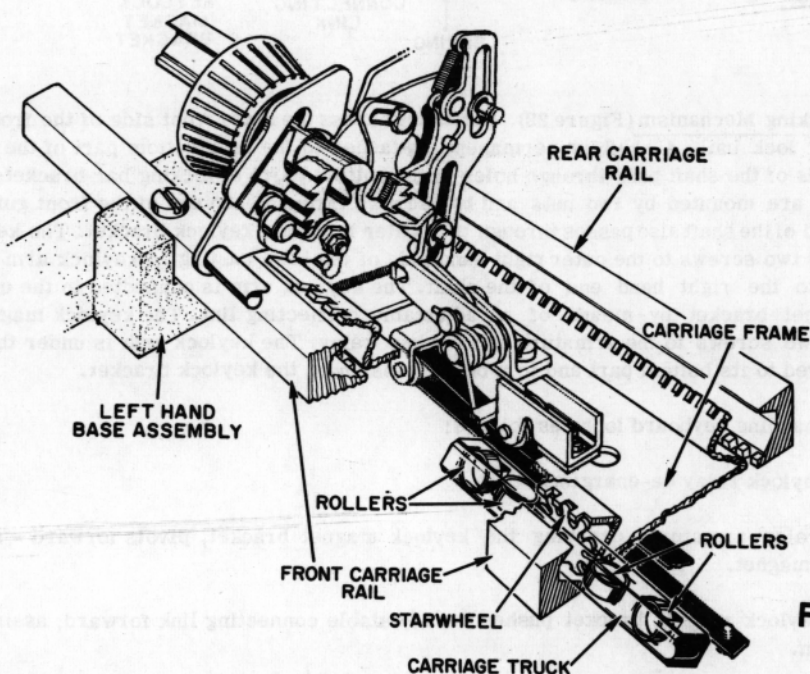


Figure 23.

Carriage Assembly (Figure 23). The carriage assembly is located behind the segment support assembly. It is the carrier for the platen assembly. The carriage assembly also contains mechanism that regulate the positioning of a document in the writing machine. These mechanism and the platen assembly are described in sections which follow.

Friden 2200/2300 SERIES MACHINES

A front carriage rail and a rear carriage rail are each mounted by two screws to vertical extensions on the left hand and the right hand sides of the base casting. The rails are level and parallel to the front of the machine. The inner sides of the rails have V-shaped grooves; the lower edges of the rails are toothed. The front and rear sides of the carriage frame also have V-shaped grooves; the upper edges of the carriage frame are toothed.

Located between the V-shaped grooves in the rails and in the carriage frame are six carriage trucks. Each carriage truck contains four rollers and one starwheel. Two rollers in each truck are positioned perpendicular to the others. The rollers contact the surfaces of the V-grooves in the rails and in the carriage frame. This allows the carriage assembly to move evenly across the writing machine. The starwheels in the carriage trucks engage the teeth on the upper edges of the carriage frame and the teeth on the lower edges of the front and rear rails. The starwheels rotate when the carriage assembly moves. They position the carriage trucks relative to the position of the carriage assembly. This allows uniform support of the carriage assembly each time it moves.

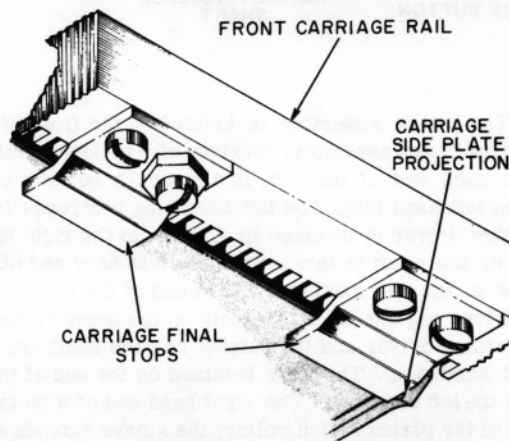


Figure 24.

Two carriage final stops are centrally positioned on the front carriage rail (Figure 24). They are mounted by four screws to the bottom surface of the front carriage rail. The carriage final stops prevent the carriage assembly from moving beyond the point where it could not be supported by the carriage trucks. The final stops contact the projections on the left hand or the right hand carriage end plates when the carriage assembly is in its extreme right hand position or in its extreme left hand position.

Friden 2200/2300 SERIES MACHINES

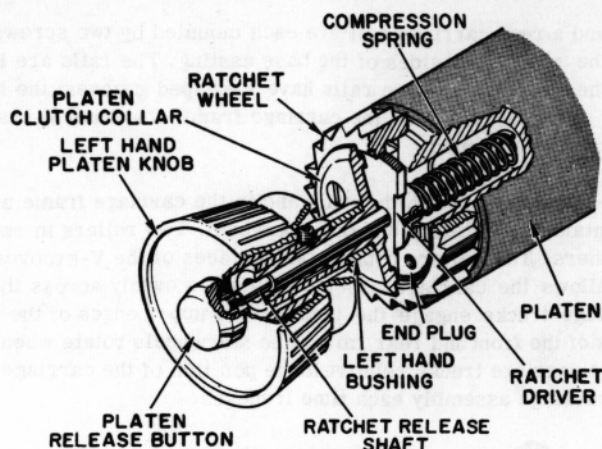


Figure 25.

Platen Assembly (Figure 25). The platen assembly is located on the front of the carriage assembly. The platen, or cylindrical part of the platen assembly, consists of a hollow metal core to which a rubber sleeve is bonded. Pressed into each end of the core is a centrally bored metal plug. A compression spring is located in the bore in the left hand plug. The left hand plug protrudes from the end of the core; the plug has a wide slot. A ratchet driver is mounted by a dowel to the right hand end of a ratchet release shaft; the left hand end of the shaft is threaded. The right hand end of the shaft containing the ratchet driver fits into the slot in the left hand plug. Each end of the ratchet driver has small teeth. The small teeth on the ratchet driver engage the small teeth on the inner circumference of the ratchet wheel. The ratchet wheel, the ratchet driver and the ratchet release shaft are under the tension of the compression spring in the left hand plug. They are retained on the end of the platen by four screws through a platen clutch collar to the left hand plug. The right hand end of a metal sleeve is permanently connected to the left hand side of the platen clutch collar; the sleeve extends over the ratchet release shaft. A left hand bushing on the sleeve is positioned against the platen clutch collar. Located adjacent to the left hand bushing is the left hand platen knob. It is secured by two setscrews to the sleeve. The threaded left hand end of the ratchet release shaft protrudes through a center hole in the left hand platen knob. A platen release button fits into the hole; the button is threaded onto the ratchet release shaft.

Pressed into the bore in the right hand plug is the right hand platen shaft. A right hand bearing on the shaft is positioned adjacent to the right hand plug. Located adjacent to the right hand bearing is the right hand platen knob. It is secured by two setscrews to the right hand platen shaft.

Friden 2200/2300 SERIES MACHINES

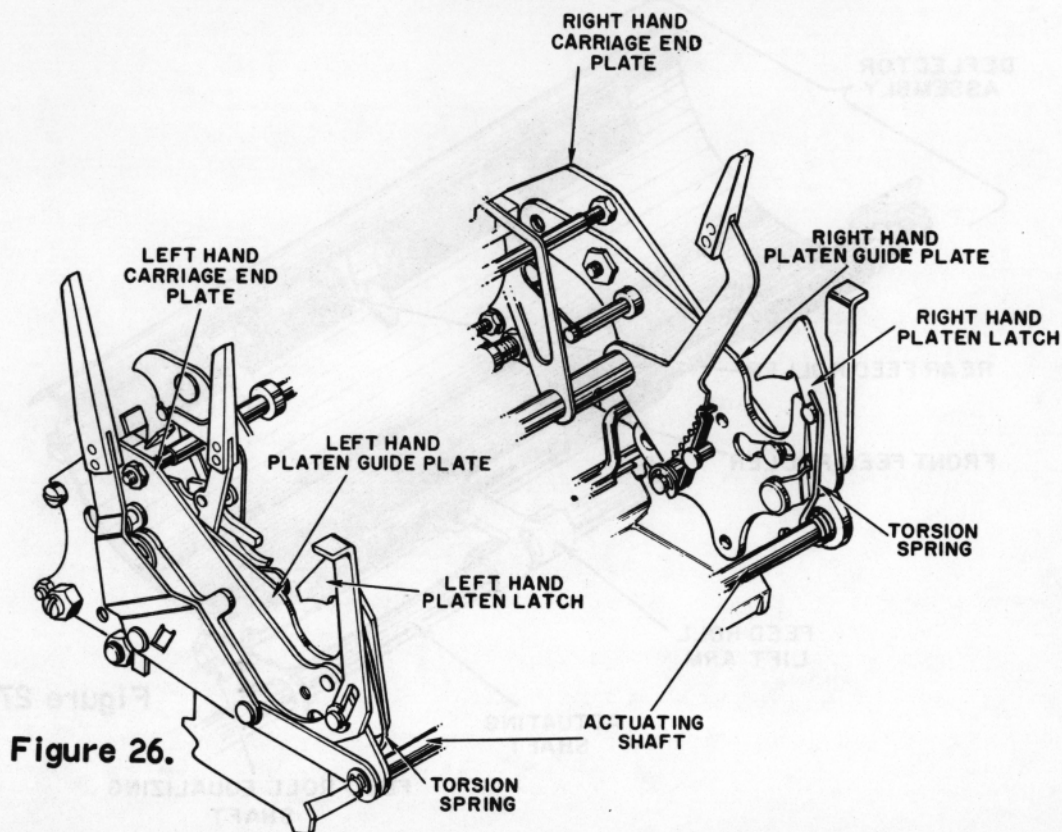


Figure 26.

The platen assembly is removably mounted on the carriage assembly (Figure 26). The bushing on the left hand end of the platen assembly and the bearing on the right hand end of the platen assembly are cradled in the upper front parts of platen guide plates. The platen guide plates are mounted by two nuts and two screws through the left hand and right hand carriage end plates. They are further mounted by means of curved slots in their front parts fitted over studs on the inner sides of the left hand and right hand carriage end plates. A platen latch is mounted by means of a shouldered rivet to the front part of each platen guide plate. The hooked upper parts of the platen latches are positioned over the bushing on the left hand end of the platen assembly and over the bearing on the right hand end of the platen assembly. The latches are under the tension of torsion springs. A torsion spring is mounted on each end of an actuating shaft. The ends of the actuating shaft pass through the lower front parts of the left hand and right hand carriage end plates. One end of each torsion spring contacts a stud on the left hand side of each platen latch; the other ends of the torsion springs are restrained by the bottom parts of the left hand and right hand carriage end plates.

Friden 2200/2300 SERIES MACHINES

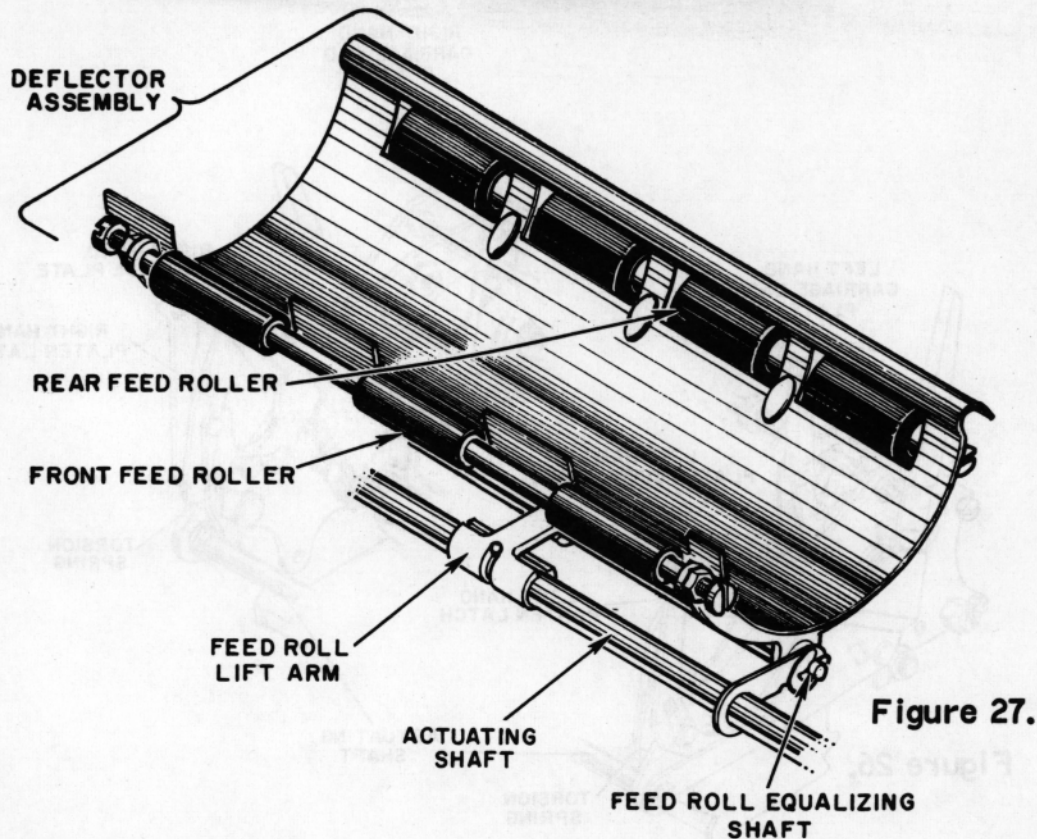


Figure 27.

Document Feed And Release Mechanism. Located under the platen are two deflector assemblies. Each deflector assembly is constructed of a thin metal plate. The plates are formed to coincide with the contour of the platen. Four rectangular windows are spaced along the rear part of each metal plate; the surfaces of four rubber feed rollers protrude from the windows. The surfaces of three smaller feed rollers protrude from three openings in the front edge of each plate. The feed rollers are the means by which a document is held firmly against the surface of the platen. This is to insure the movement of the document with the movement of the platen. The feed rollers are permanently mounted on shafts. Each shaft is mounted by two adjustable cone-pointed screws through the front and rear ends of deflector yokes. The deflector yokes are welded front to rear to the left hand and right hand bottom parts of each plate. The bottom parts of the deflector yokes have forked extensions. The forked extensions fit over recesses near the left hand and right hand ends of feed roll equalizing shafts. The feed roll equalizing shafts are mounted by means of alignment arms to the actuating shaft on the front of the carriage assembly. Each equalizing shaft is further supported by two feed roll lift arms. The front ends of the feed roll lift arms are formed around the actuating shaft. The slotted front ends of the arms fit over pins on the actuating shaft. The rear ends of the arms extend over recesses in the feed roll equalizing shafts (Figure 27).

Friden 2200/2300 SERIES MACHINES

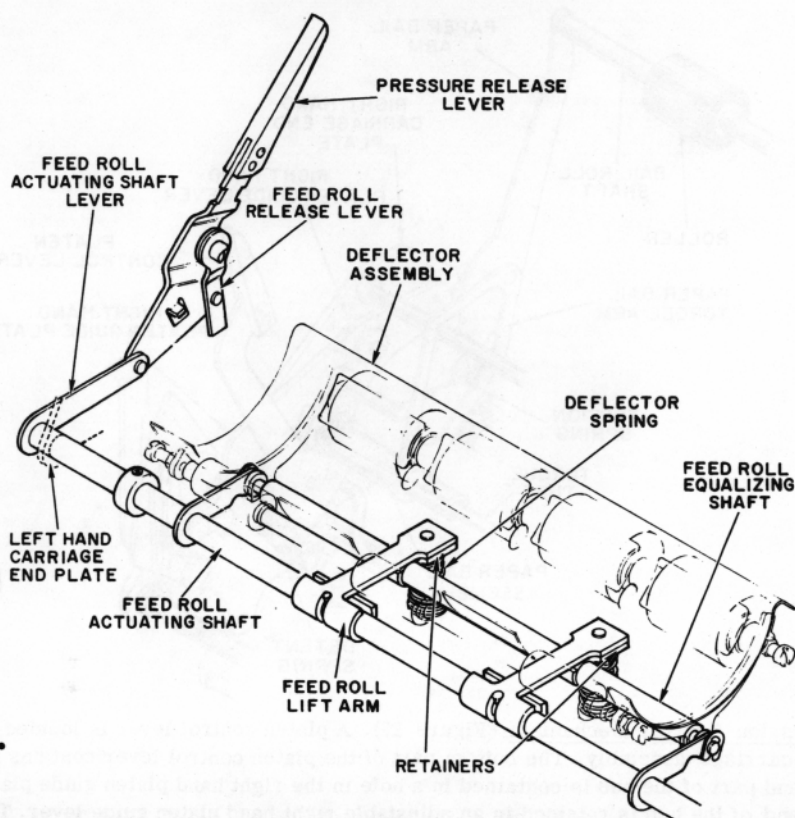


Figure 28.

An equalizing shaft retainer is located under each feed roll lift arm. The retainers are secured by screws to the rear bottom parts of the feed roll lift arms (Figure 28). These screws also mount the upper ends of deflector springs. The lower parts of the deflector springs contact spring mounting studs. The spring mounting studs are pressed into the bottom part of the carriage frame. The feed roll lift arms are under the tension of the deflector springs.

Located on the extreme left hand end of the carriage assembly is a pressure release lever. One end of a feed roll release lever is connected by a shouldered rivet to a lower rear part of the pressure release lever; the other end is secured to a stud on the left hand carriage end plate. Connected by a shouldered rivet to the bottom part of the pressure release lever is a feed roll actuating shaft lever. The front end of the feed roll actuating shaft lever has a rectangular hole. It fits over the rectangular left hand end of the actuating shaft.

When the pressure release lever is moved rearward the feed rollers in the deflector assemblies are raised to the platen. This is the document feed position. When the pressure release lever is moved forward, the feed rollers in the deflector assemblies are lowered from the platen. This is the document release position. The deflector assemblies lower to the point where they limit against the top parts of two deflector stops. Each deflector stop is mounted by one screw to the bottom of the carriage frame.

Friden 2200/2300 SERIES MACHINES

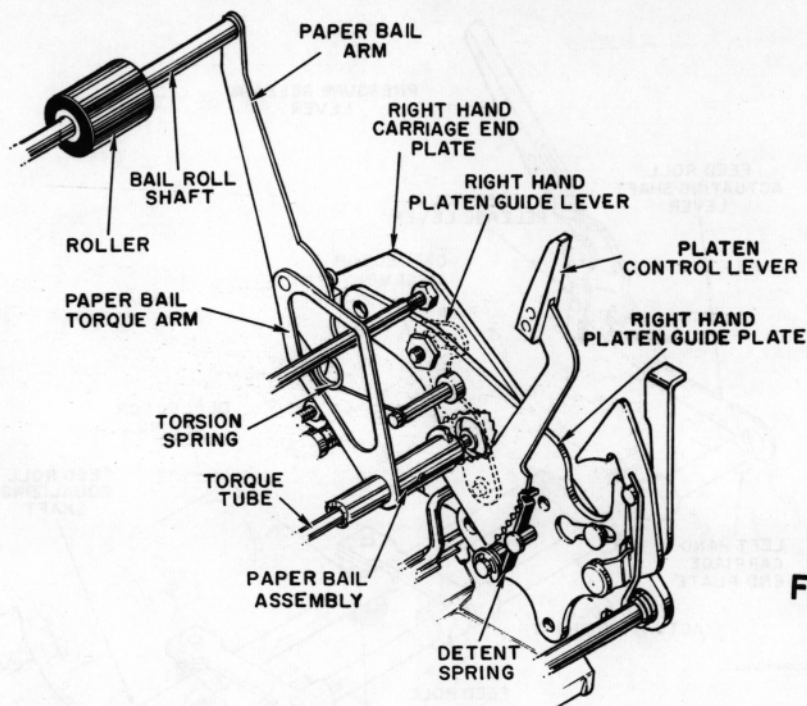


Figure 29.

Print Impression Control Mechanism (Figure 29). A platen control lever is located on the right hand side of the carriage assembly. The bottom part of the platen control lever contains an eccentric hub. The right hand part of the hub is contained in a hole in the right hand platen guide plate. The eccentric right hand end of the hub is retained in an adjustable right hand platen guide lever. The guide lever is mounted by a screw through its lower part to the right hand carriage end plate. The upper end of the guide lever has a curved slot. A screw passes through the slot; the screw extends through the right hand carriage end plate and through the right hand platen guide plate. An eccentric nut is threaded on the end of the screw. The curved lower front edge of the platen control lever has seven equally spaced notches. A detent spring is secured by its lower end to a stud on the lower inner side of the right hand platen guide plate. The upper end of the detent spring engages the notched edge of the platen control lever.

An eccentric hub is also located on the left hand side of the carriage assembly. It mounts in the same manner as the eccentric hub on the right hand side of the carriage assembly. Both eccentric hubs are interconnected by means of a torque tube. The torque tube passes through the lower tubular part of a paper bail assembly located behind the platen assembly.

Located on each end of the tubular part of the paper bail assembly is a paper bail torque arm. Secured by shouldered rivets to the upper ends of the torque arms are paper bail arms. A bail roll shaft is screwed to the upper ends of the paper bail arms. Positioned on the bail roll shaft are three rollers. The paper bail arms are manually operated to raise or lower the rollers. The paper bail arms are under the tension of torsion springs. The torsion springs are anchored to studs on the lower parts of the paper bail arms and to studs on the left hand and right hand platen guide plates. The rollers are

Friden 2200/2300 SERIES MACHINES

lifted from the surface of the platen to allow insertion of a document in the writing machine. In their lowered position, the rollers insure the constant contact of a document against the surface of the platen during printing.

Because the eccentric hubs are contained in the left hand and right hand platen guide plates and because the eccentric hubs are interconnected by the torque tube, manually operating the platen control lever forward or rearward will evenly position the platen assembly front to rear in the carriage assembly. The platen assembly is positioned front to rear to maintain a uniform printing impression on single documents or on multiple form documents.

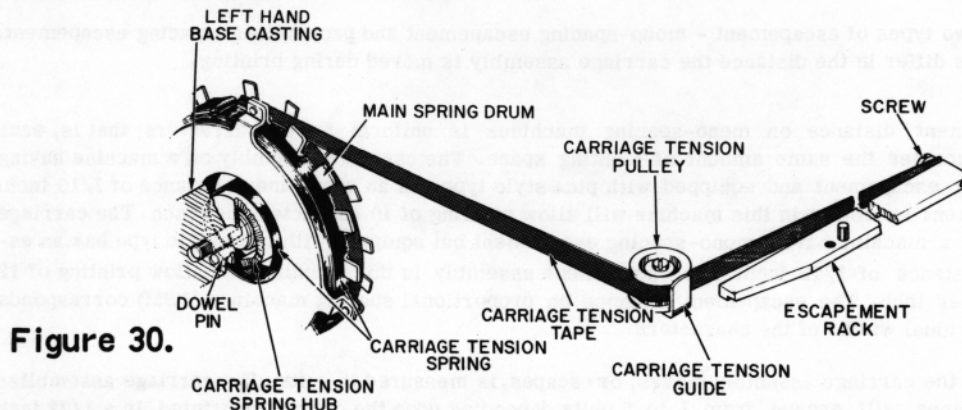


Figure 30.

Main Spring Drum Assembly (Figure 30). The main spring drum assembly is located in the inner rear left hand corner of the writing machine. It consists of a flat steel spring coiled within the confines of two circular metal plates. The two plates make up the main spring drum. One end of the coiled spring is anchored to one of a series of bent tabs on the outer circumference of the main spring drum; the other end of the coiled spring is anchored to the rounded edge of a slot in a carriage tension spring hub.

The right hand end of the carriage tension spring hub fits over a core in the main spring drum assembly. Together, the main spring drum assembly and the carriage tension spring hub are mounted by a shouldered stud to a projection on the inner left hand side of the base casting. An off-center hole in the left hand end of the carriage tension spring hub fits over a dowel protruding from the projection on the base casting. The dowel holds the carriage tension spring hub in a stationary position. This provides an axis around which the spring can wind or unwind.

The looped end of a carriage tension tape is anchored to one of the bent tabs on the main spring drum assembly; the other end of the carriage tension tape is threaded between a carriage tension pulley and a carriage tension guide. The pulley and the guide are mounted by a screw to an extension on the inner left hand side of the base casting. The carriage tension tape extends through the writing machine behind an escapement rack. The end of the carriage tension tape is secured by one screw to the rear right hand end of the escapement rack. The escapement rack is secured to the bottom rear part of the carriage frame. It is a part of the escapement assembly which is described in a succeeding section.

The main spring drum assembly is the means by which the carriage assembly is moved toward the left hand side of the writing machine. It operates during normal printing and during tabulation in the writing machine.

Friden 2200/2300 SERIES MACHINES

Escapement Defined. Each time a character is printed on a document in the writing machine, the carriage assembly moves slightly toward the left hand side of the writing machine. This is necessary in order to position the document to print a succeeding character. The carriage assembly will also move slightly toward the left hand side of the writing machine each time the space bar on the keyboard is depressed. In both instances, the term used to describe the movement of the carriage assembly toward the left hand side of the writing machine is "escapement". Escapement is effected by the operation of the main spring drum assembly. However, the distance the carriage is moved is limited by an escapement assembly. The escapement assembly is described in detail in a succeeding section.

There are two types of escapement - mono-spacing escapement and proportional spacing escapement. The two types differ in the distance the carriage assembly is moved during printing.

The escapement distance on mono-spacing machines is uniform for all characters; that is, each character occupies the same amount of printing space. The carriage assembly on a machine having mono-spacing escapement and equipped with pica style type has an escapement distance of 1/10 inch. The escapement assembly in this machine will allow printing of 10 characters per inch. The carriage assembly on a machine having mono-spacing escapement but equipped with elite style type has an escapement distance of 1/12 inch. The escapement assembly in this machine will allow printing of 12 characters per inch. The escapement distance on proportional spacing machines (PSM) corresponds with the individual widths of the characters.

The distance the carriage assembly moves, or escapes, is measured in units. The carriage assemblies on all machines will escape from 1 to 5 units depending upon the character printed. In a 1/32 inch proportional spacing machine for example, after the lower case letter l is printed the carriage assembly will escape 2/32 inch - or 2 units; after an upper case letter L is printed the carriage assembly will escape 4/32 inch - or 4 units. Other proportional spacing machines exist which use escapement units of 1/36 inch, 1/40 inch, or 1/48 inch. Proportional spacing escapement allows a more natural formation of type styles. Upper case characters are emphasized by having greater width than lower case characters. It also offers greater contrast between lower case characters such as the letter l and the letter m. On machines equipped with mono-spacing escapement, these two letters are designed to occupy the same amount of space. Also, the upper case characters tend to be crowded together, while the lower case letters such as i and l are printed unnaturally wide.

Mono-spacing creates an illusion of vertical lines formed by the even amount of white space between printed characters. These vertical lines prevent easy scanning and rapid reading of printed material. However, mono-spacing escapement is ideally suited in machines used in data processing applications.

Printed material in a proportional spacing machine is easier to read and more attractive to the eye. Proportional spacing escapement is used in machines generally producing impressive, high quality documents. It is the standard escapement used in the model 2304 Flexowriter.

Friden 2200/2300 SERIES MACHINES

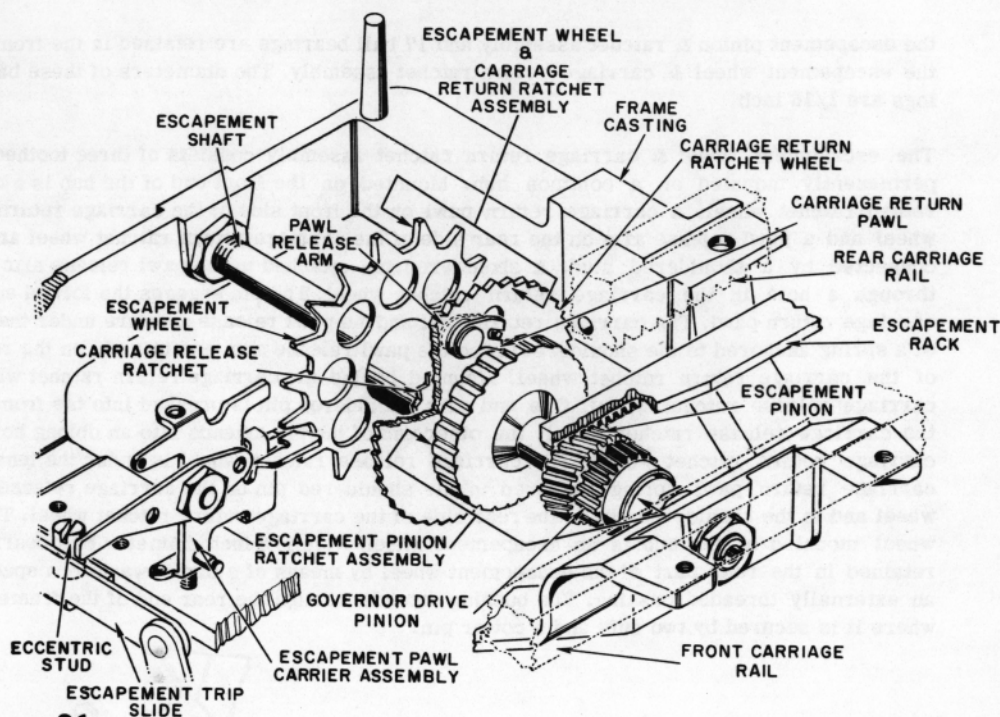


Figure 31.

Mono-Spacing Escapement Assembly (Figure 31). The following is a description of the standard mono-spacing escapement assembly found in all 2200 series machines and in all 2300 series machines with the exception of the model 2304.

The escapement assembly is located under the carriage assembly. It is mounted by two screws to the front carriage rail and two screws and two dowels to the rear carriage rail. All the components of the escapement assembly are assembled within a frame casting. Centrally positioned between the front and rear ends of the frame casting is the escapement shaft. The following components are mounted from front to rear on the escapement shaft:

1. Escapement pinion & ratchet assembly. Machined from a single piece of stock to consist of a governor drive pinion, an escapement pinion and an escapement ratchet. The teeth on the escapement pinion engage the teeth on an escapement rack. The escapement rack is mounted by six screws to the bottom rear part of the carriage frame. Seven 1/8 inch diameter ball bearings are retained in the front end of the escapement pinion & ratchet assembly by a ball race cone. One end of an externally threaded bushing is butted against the ball race cone; the other end of the bushing is secured by two nuts in the front end of the frame casting.
2. Escapement wheel & carriage return ratchet assembly. A center bushing separates the escapement wheel & carriage return ratchet assembly and the escapement pinion & ratchet assembly. The center bushing is also the means by which 17 ball bearings are retained in the rear part of

Friden 2200/2300 SERIES MACHINES

the escapement pinion & ratchet assembly and 17 ball bearings are retained in the front part of the escapement wheel & carriage return ratchet assembly. The diameters of these ball bearings are 1/16 inch.

The escapement wheel & carriage return ratchet assembly consists of three toothed wheels permanently mounted on a common hub. Mounted on the front end of the hub is a carriage return ratchet wheel. A carriage return pawl on the front side of the carriage return ratchet wheel and a pawl release arm on the rear side of the carriage return ratchet wheel are interconnected by a shouldered stud. A shouldered pin attached to the pawl release arm extends through a hole in the carriage return ratchet wheel. The pin engages the forked end of the carriage return pawl. The carriage return pawl and the pawl release arm are under the tension of a spring anchored to the shouldered pin on the pawl release arm and to a pin on the rear side of the carriage return ratchet wheel. Mounted behind the carriage return ratchet wheel is a carriage release ratchet wheel. One end of a shouldered pin is pressed into the front side of the carriage release ratchet wheel; the other end of the pin extends into an oblong hole in the carriage return ratchet wheel. The carriage release ratchet wheel is under the tension of a carriage return pawl spring anchored to the shouldered pin on the carriage release ratchet wheel and to the shouldered pin on the rear side of the carriage return ratchet wheel. The third wheel mounted on the hub is an escapement wheel. Nine 1/8 inch diameter ball bearings are retained in the rear part of the escapement wheel by means of a thrust washer, a spacer, and an externally threaded bushing. The bushing extends through the rear end of the frame casting where it is secured by two nuts and a cotter pin.

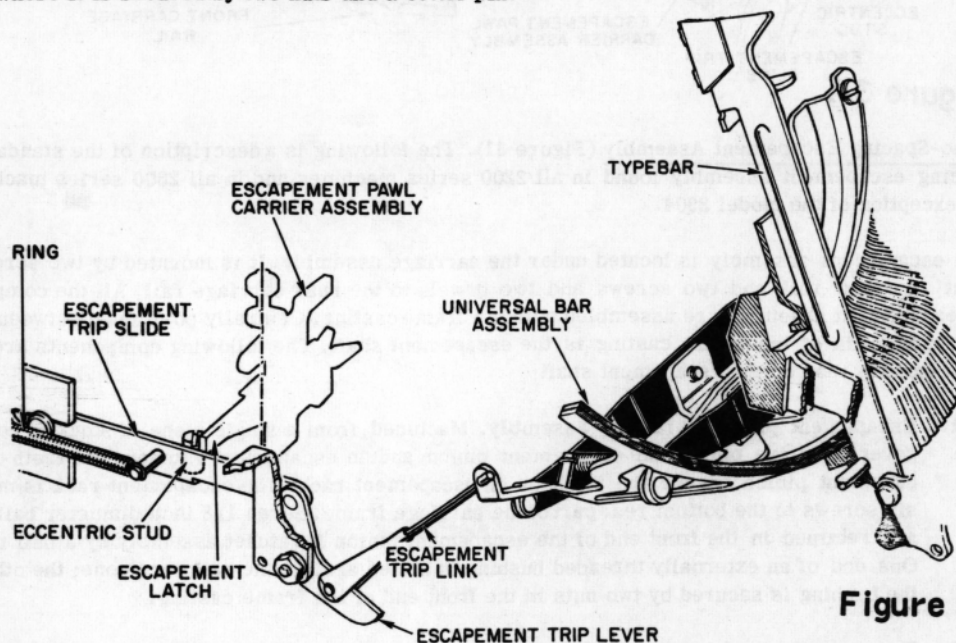


Figure 32.

Friden 2200/2300 SERIES MACHINES

Located in a rectangular opening in the left hand side of the frame casting is an escapement pawl carrier assembly (Figure 32). It is mounted by two cone-pointed screws - one through the top of the casting and one through the bottom of the casting. The escapement pawl carrier assembly consists of a pawl carrier to which a center pawl, a pawl stop and a pawl latch are mounted by a shouldered stud. In home position the center pawl engages a tooth on the escapement wheel. The center pawl is under the tension of a spring anchored to the rear part of the center pawl and to the bottom part of the pawl carrier. The entire escapement pawl carrier assembly is under the tension of a spring anchored to the upper part of the pawl carrier and to a right angle bracket. The bracket is mounted by two screws to the rear side of the rectangular opening in the frame casting.

Associated with the escapement assembly is an escapement trip lever & slide assembly. The escapement trip lever & slide assembly consists of an escapement trip slide to which an eccentric stud is mounted. A trip lever is secured by a shouldered rivet to the front end of the slide. A shouldered rivet near the rear part of the slide is positioned in a slot in the front part of the right angle bracket. The slide is under the tension of a spring anchored to a pin on the slide and to a pin on the right angle bracket. A trip lever is secured by a shouldered stud to the front end of the slide. The trip lever is connected by a link and a clevis to the universal bar assembly. The escapement assembly operates each time the lower edge of a typebar strikes the front edge of the universal bar frame. The interaction of the universal bar assembly, the trip lever, and the escapement trip slide causes the eccentric stud on the escapement trip slide to pivot the pawl carrier assembly on its cone-pointed mounting screws. This causes the escapement wheel to rotate a distance of one tooth. Simultaneously, the carriage assembly moves toward the left hand side of the writing machine a distance equal to the width of one printing character.

Space Bar Mechanism. The space bar mechanism is the means by which the carriage assembly is moved toward the left hand side of the writing machine a distance equal to the width of a printing character, but without printing in the writing machine.

Friden 2200/2300 SERIES MACHINES

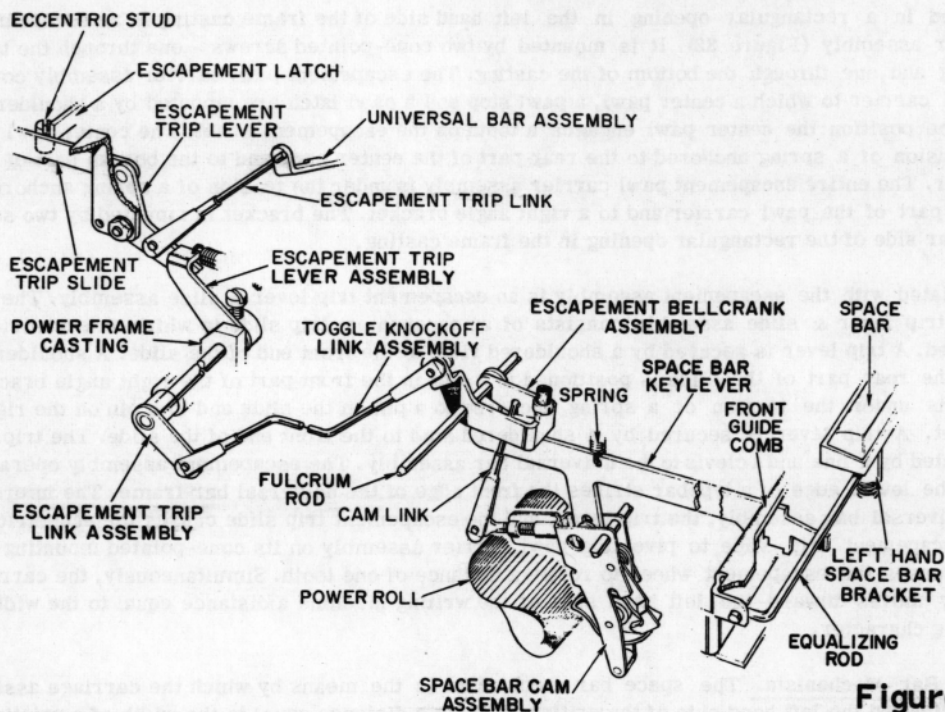


Figure 33.

A space bar assembly is located at the front of the keyboard on the writing machine (Figure 33). It consists of a space bar, a left hand space bar bracket, a right hand space bar bracket and an equalizing rod. The space bar brackets are screwed to the bottom of the space bar. The equalizing rod passes through holes in the space bar brackets. The space bar assembly is mounted by means of its equalizing rod, the ends of which fit into holes in the upper left hand and the right hand ends of the front guide comb. The space bar assembly is further mounted by means of its left hand space bar bracket. The bottom of the bracket is retained by a cotter pin in an extension on the lower front edge of the front guide comb. The space bar assembly is under the tension of a spring coiled around the lower part of the left hand space bar bracket. The spring extends from the upper surface of the extension on the front guide comb to the upper part of the left hand space bar bracket.

The rear end of a space bar keylever is mounted on the fulcrum rod passing through the keylever bearing support. The front end of the space bar keylever protrudes from a slot near the left hand end of the front guide comb. Like the printing character keylevers, the space bar keylever is under the tension of a spring anchored to the space bar keylever and to a spring adjusting screw on the keylever spring support. Also, a stud protrudes from the right hand side of the space bar keylever; the upper part of a keylever operating arm is positioned over the stud. The forked extension on the bottom part of the space bar keylever engages the stud on the upper part of a space bar cam assembly. The cam is located second from the left hand end in front of the power roll. The space bar cam assembly is connected by means of a clevis and a link to an escapement bellcrank assembly. The escapement bellcrank assembly is mounted on the same fulcrum rod that mounts the rear end of the space bar keylever. The escapement bellcrank assembly is connected by means of a toggle knock off link assembly to an escapement trip lever assembly. The escapement trip lever assembly is secured by a dowel to the left hand

Friden 2200/2300 SERIES MACHINES

end of a shaft. The shaft is mounted in bearings in the rear left hand side of the power frame casting. Secured by a screw to the right hand end of the shaft is one end of an escapement trip lever; the other end of the escapement trip lever is positioned over the trip lever secured to the front end of the escapement trip slide. The escapement trip lever is under the tension of a spring anchored to the escapement trip lever and to the spring support mounted on the rear of the power frame casting. When the space bar mechanism is operated, the escapement trip lever contacts the trip lever on the front end of the escapement trip slide. This causes a normal one-tooth rotation of the escapement wheel in the escapement assembly. And, because a typebar has not been actuated, the carriage is moved one unit toward the left hand side of the writing machine without printing.

The space bar mechanism is operated each time the space bar is depressed manually, or is pulled down automatically by its keylever operating arm in the translator assembly.

Field Control Mechanism. Extending across the rear of the carriage assembly is an actuator plate & tab rack assembly (Figure 34). The actuator plate & tab rack assembly is removably mounted on the carriage assembly. It is also interchangeable with other actuator plate & tab rack assemblies.

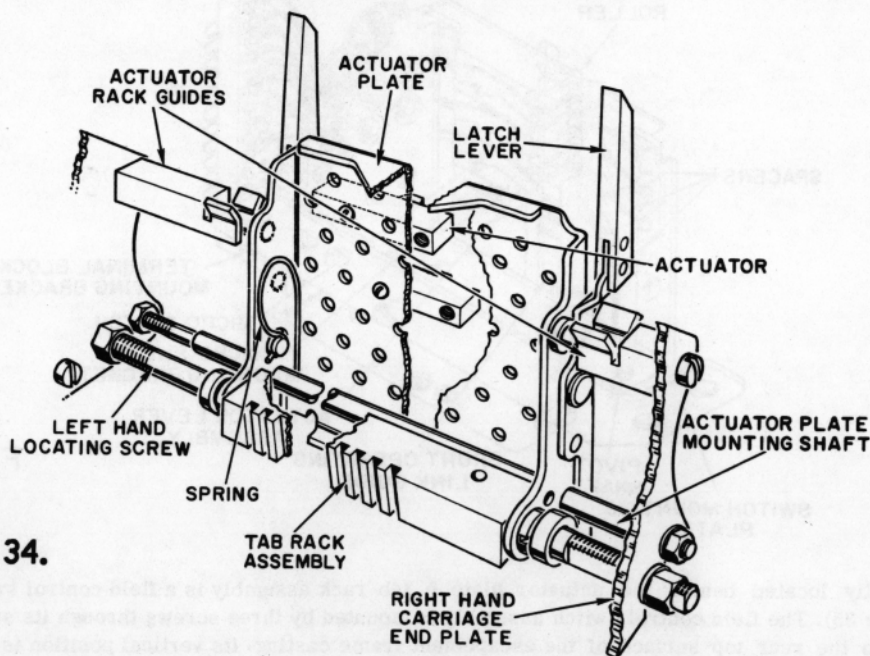


Figure 34.

The actuator plate portion of the assembly consists of a perforated metal plate. Actuators are located in selected positions on the rear side of the actuator plate. Each actuator is mounted by two screws through perforations in the plate. The tab rack portion of the assembly extends across the lower front of the actuator plate. Each end of the tab rack is secured by a factory preset screw and a nut to the lower left hand and right hand ends of the actuator plate. The slots in the front side of the tab rack accommodate tab stops which are inserted in selected positions.

Friden 2200/2300 SERIES MACHINES

The lateral position of the actuator plate and tab rack assembly is determined by the preset screws that secure the tab rack to the actuator plate. The heads of the preset screws contact the heads of left hand and right hand actuator plate locating screws. The actuator plate locating screws are secured by nuts to the left hand and right hand carriage end plates. Studs located on the upper left hand and right hand ends of the actuator plate fit into the open parts of left hand and right hand actuator rack guides. Each guide is mounted by one screw to the upper rear part of the carriage end plates. The actuator plate & tab rack assembly is further mounted on an actuator plate mounting shaft. The slotted bottom ends of the actuator plate fit over the shaft. Each end of the shaft is secured by two nuts to the lower rear parts of the carriage end plates. A left hand and a right hand latch lever is mounted on a stud on each end of the actuator plate. The bottom parts of the latch levers retain the actuator plate & tab rack assembly to the actuating plate mounting shaft. Each latch lever is under the tension of a spring, one end of which is anchored to a stud on the inner side of each latch lever; the other ends of the springs contact the front surface of the actuator plate.

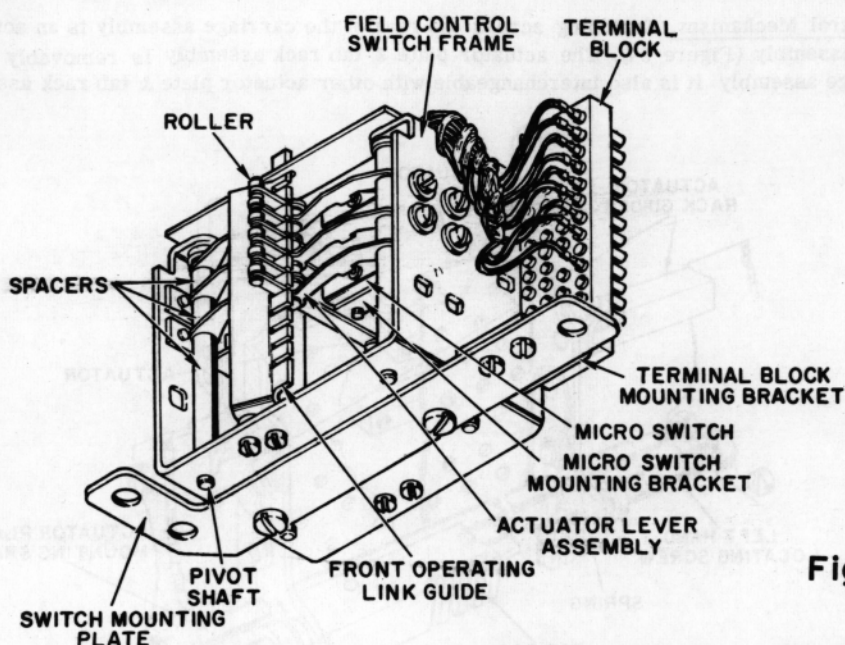


Figure 35.

Centrally located behind the actuator plate & tab rack assembly is a field control switch assembly (Figure 35). The field control switch assembly is mounted by three screws through its switch mounting plate to the rear top surface of the escapement frame casting. Its vertical position is determined by shims. Mounted by two screws on the switch mounting plate is the field control switch frame. Within the field control switch frame are six micro switches, three left hand actuator lever assemblies, and three right hand actuator lever assemblies. Four of the micro switches are located in the upper front confines of the field control switch frame—two on the left hand side and two on the right hand side. The other two micro switches are located in the upper rear confines of the front—one on the left hand side and one on the right hand side. The micro switches are screwed to switch mounting brackets. Each switch mounting bracket is secured by two screws to the frame. The micro switches are connected by wire leads to a terminal block located at the right hand side of the field

Friden 2200/2300 SERIES MACHINES

control assembly. The terminal block is mounted by means of a mounting bracket, four screws, and two double nuts to the switch mounting plate. The left hand and the right hand actuator lever assemblies are mounted on pivot shafts located in the front and the rear corners of the frame. The positions of the actuating lever assemblies relative to the micro switches are determined by spacers on the pivot shafts. The bottom ends of the shafts are retained in a hole in the bottom parts of the frame. The top ends of the shafts extend through holes in the bent upper parts of the frame. Holes in the ends of brackets fit over the top ends of the front and rear pivot shafts. The end of each bracket and the top end of each shaft is secured by two retaining rings to the upper bent parts of the frame.

The front parts of the actuating lever assemblies fit into slots in a front operating link guide; the rear parts fit into slots in a rear operating link guide. A roller is mounted on the front end of each actuating lever assembly. The top part of the front operating link guide fits into a slot in the bracket extending across the two front pivot shafts; the bottom of the front operating link guide is secured by two screws to the front bottom part of the field control switch frame. The rear operating link guide is mounted by two screws to the rear bottom part of the frame.

When the carriage assembly moves during normal escapement, the actuators positioned on the actuator plate contact their associated rollers on the front ends of the actuator lever assemblies positioned in the field control switch assembly. This causes the actuator lever assemblies to operate and to restore their related micro switches relative to the position of the carriage.

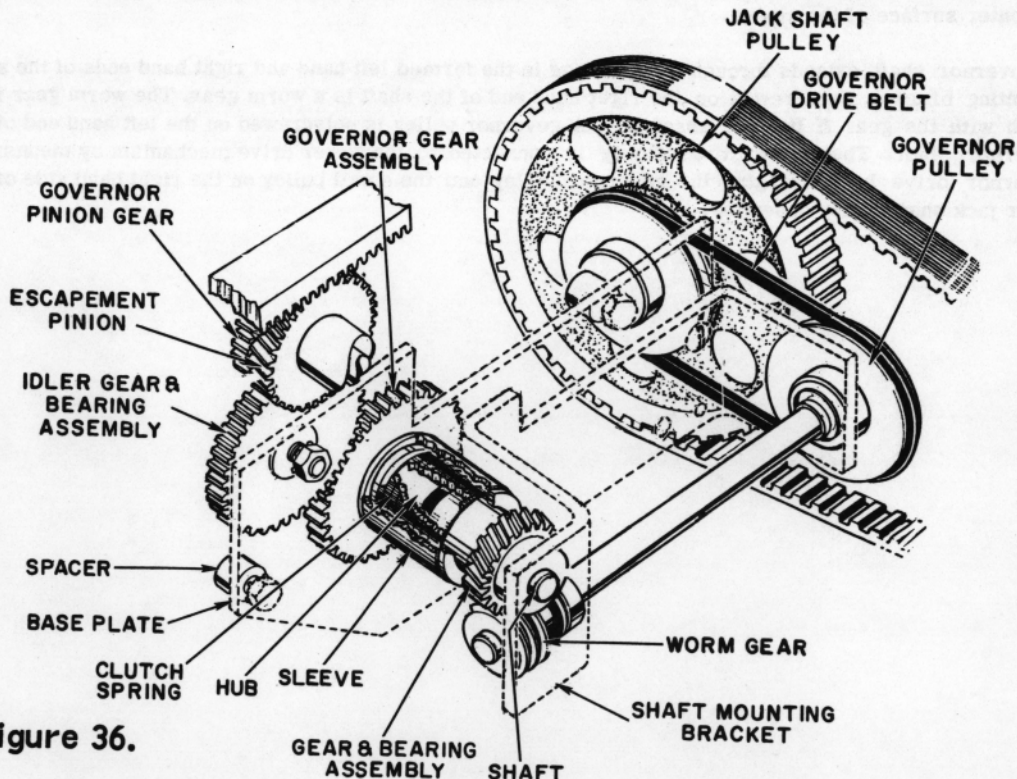


Figure 36.

Friden 2200/2300 SERIES MACHINES

Governor Assembly (Figure 36). The governor assembly controls the speed at which the carriage assembly moves as it is pulled toward the left hand side of the writing machine by the main spring drum assembly during tabulation. Tabulation is described in detail in the Theory section of the Writing Machine.

The governor assembly is mounted by two screws at the front and a screw and a nut at the rear to the left-hand rear side of the power frame casting. The front to rear position of the governor assembly is by means of spacers on the mounting screws. The front part of the governor assembly consists of a base plate connected by two screws and two dowels to a shaft mounting bracket. An idler gear & bearing assembly is mounted by a shouldered stud and a nut to the upper right hand part of the base plate. The idler gear is in mesh with the governor pinion gear on the front end of the escapement assembly. Located diagonally below the idler gear & bearing assembly is a governor gear assembly. It mounts front to rear by means of its shaft in bearings located in the base plate and in the formed right hand end of the shaft mounting bracket at the rear. The gear of the assembly is in mesh with the idler gear.

Mounted on the shaft of the governor gear assembly between the base plate and the shaft mounting bracket are a hub, a clutch spring, a sleeve and a gear & bearing assembly. The hub is setscrewed to the shaft. One end of the spirally wound clutch spring overlaps the hub; the other overlaps the end of the gear & bearing assembly. The close tolerance to which the inside diameter of the spring is held insures a secure grip on both the hub and the gear & bearing assembly. An oil retaining clip fits over the outer surface of the sleeve.

A governor shaft extends through the bearings in the formed left hand and right hand ends of the shaft mounting bracket. Setscrewed on the right hand end of the shaft is a worm gear. The worm gear is in mesh with the gear & bearing assembly. A governor pulley is setscrewed on the left hand end of the governor shaft. The governor assembly is connected to the power drive mechanism by means of a governor drive belt engaging the governor pulley and the small pulley on the right hand side of the inner jack shaft pulley assembly.

Friden 2200/2300 SERIES MACHINES

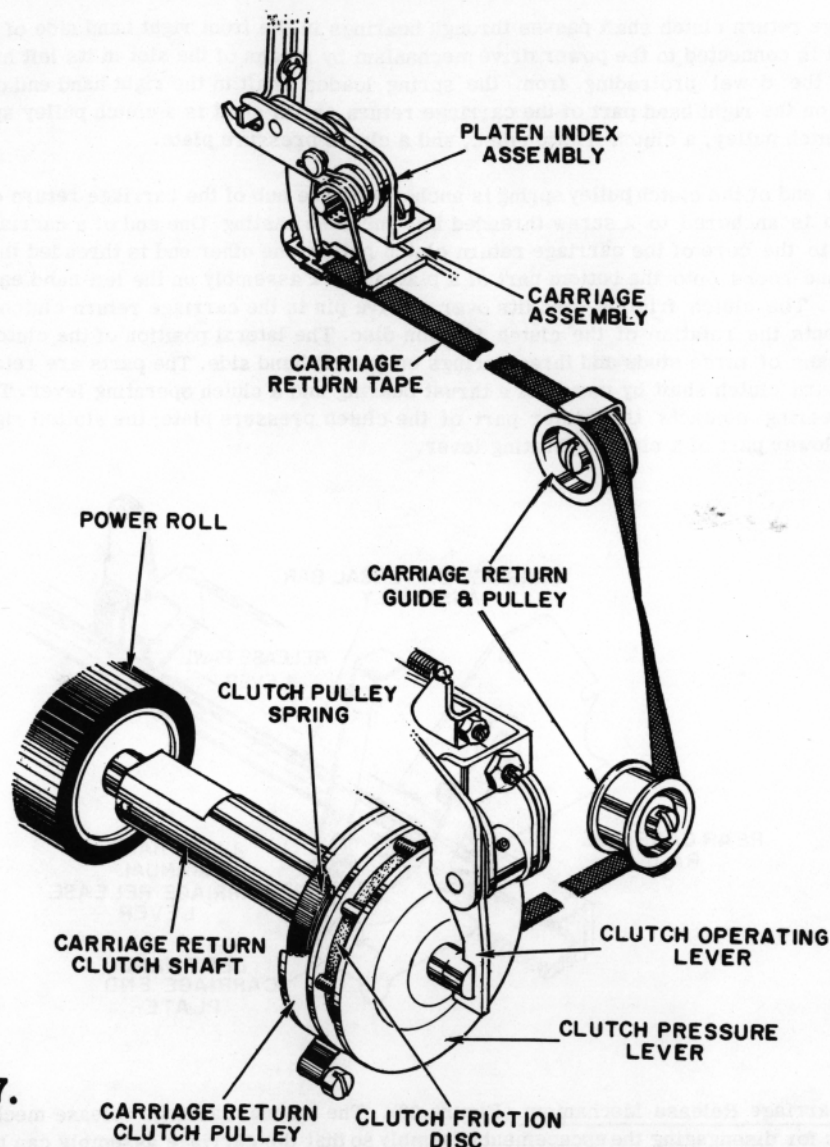


Figure 37.

Carriage Return Clutch Mechanism (Figure 37). The carriage return clutch mechanism is the means by which the carriage assembly is pulled to the right hand side of the writing machine automatically during a carriage return operation. A carriage return operation is described in detail in the Theory section of the manual.

Friden 2200/2300 SERIES MACHINES

A carriage return clutch shaft passes through bearings in the front right hand side of the base casting. The shaft is connected to the power drive mechanism by means of the slot in its left hand end. The slot contains the dowel protruding from the spring loaded shaft in the right hand end of the power roll. Mounted on the right hand part of the carriage return clutch shaft is a clutch pulley spring, a carriage return clutch pulley, a clutch friction disc, and a clutch pressure plate.

The inner end of the clutch pulley spring is anchored to the hub of the carriage return clutch pulley; the outer end is anchored to a screw threaded into the base casting. One end of a carriage return tape is screwed to the core of the carriage return clutch pulley; the other end is threaded through guides and pulleys and hooks onto the bottom part of a platen index assembly on the left hand end of the carriage assembly. The clutch friction disc fits over a drive pin in the carriage return clutch shaft. The drive pin prevents the rotation of the clutch friction disc. The lateral position of the clutch pressure plate is by means of three studs and three springs on its left hand side. The parts are retained on the carriage return clutch shaft by means of a thrust bearing and a clutch operating lever. The left hand side of the bearing contacts the center part of the clutch pressure plate; the slotted right hand side fits over the lower part of a clutch operating lever.

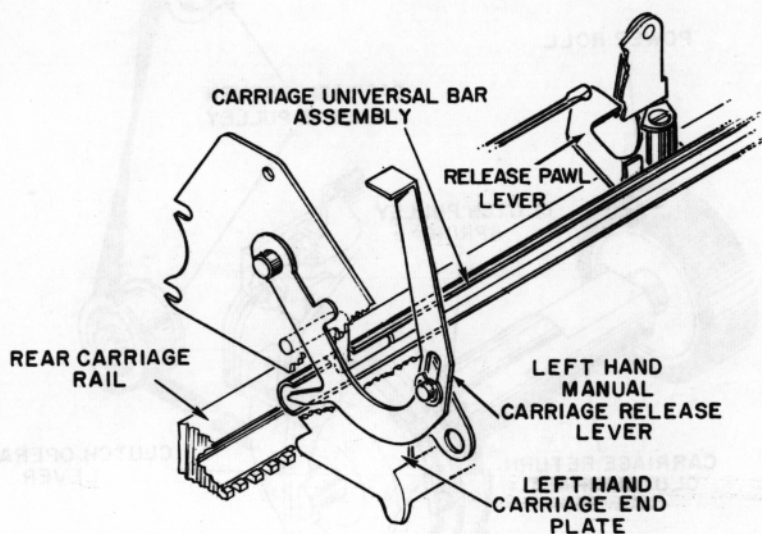


Figure 38.

Manual Carriage Release Mechanism (Figure 38). The manual carriage release mechanism provides the means for disengaging the escapement assembly so that the carriage assembly can be moved toward the left hand side of the writing machine to a desired position.

A left hand manual carriage release lever and a right hand manual carriage release lever are located on the outer sides of the carriage end plates. The upper rear ends and the slotted lower front ends of the levers are mounted by studs on the carriage end plates. Extensions on the lower rear parts of the levers engage the open end parts of a carriage universal bar assembly. The carriage universal bar assembly extends across the rear of the carriage assembly. Its formed upper ends are retained in holes in the carriage end plates. The carriage universal bar assembly is under the tension of a spring

Friden 2200/2300 SERIES MACHINES

anchored to its center part and to the threaded end of a screw. The screw is used for mounting support brackets in the central part of the carriage assembly.

When the manual carriage release levers are either individually or simultaneously depressed, their lower rear extensions pivot the carriage universal bar assembly. This causes the rear center part of the carriage universal bar assembly to contact a release pawl lever. The release pawl lever is mounted by a stud to the top surface of the rear carriage rail. The release pawl lever causes the interaction of associated parts located behind the carriage assembly to disengage the escapement assembly from its normal operation.

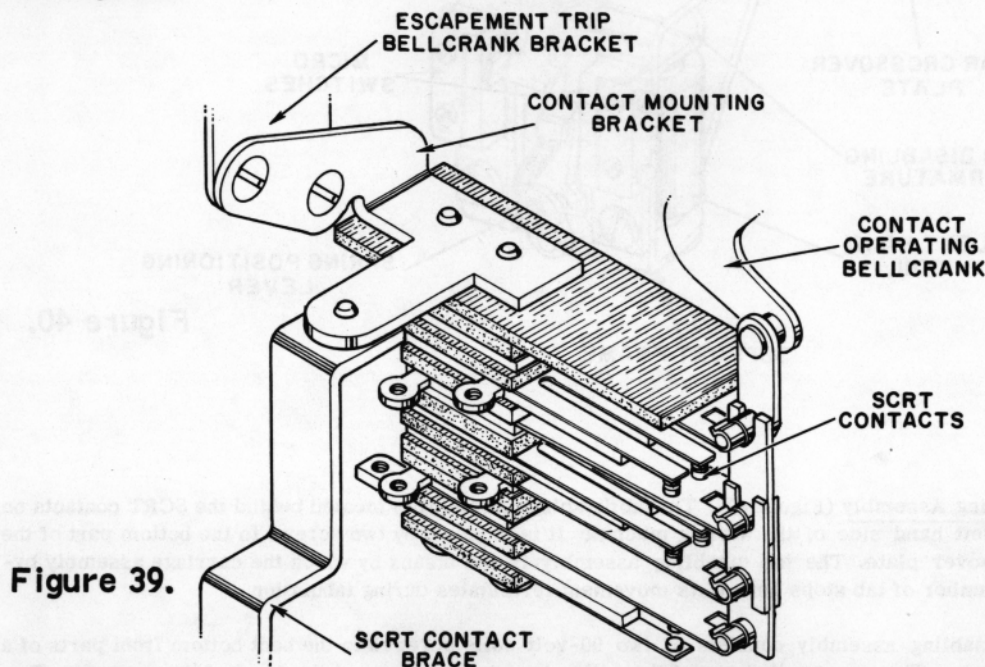


Figure 39.

Carriage Return & Tab (SCRT) Contacts (Figure 39). The carriage return & tab (SCRT) contacts are located between the left hand inner side of the base casting and the escapement assembly. The SCRT contacts are screwed to a contact mounting bracket. The contact mounting bracket is secured by two screws and two nuts to the left hand part of an escapement trip bellcrank bracket. The SCRT contacts are further supported by an SCRT contact brace. The escapement trip bellcrank bracket is screwed to the bottom left hand part of the rear carriage rail. Operators extend from the SCRT contacts to the bottom part of a contact operating bellcrank. The SCRT contacts are operated by the interaction of the operators and the contact operating bellcrank during the following automatic operations:

1. Carriage return
2. Tabulation

When either the carriage return operation or the tab operation terminates, the SCRT contacts restore. When the SCRT contacts operate, the writing machine keyboard locks; when they restore, the keyboard unlocks.

Friden 2200/2300 SERIES MACHINES

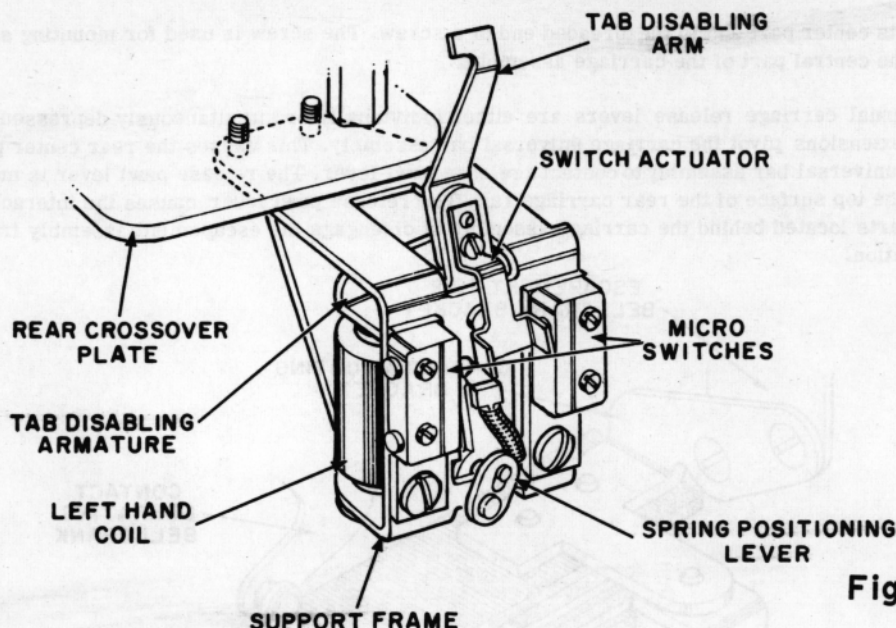


Figure 40.

Tab Disabling Assembly (Figure 40). The tab disabling assembly is located behind the SCRT contacts on the inner left hand side of the writing machine. It is mounted by two screws to the bottom part of the rear crossover plate. The tab disabling assembly is the means by which the carriage assembly bypasses a number of tab stops before its movement terminates during tabulation.

The tab disabling assembly consists of two 90-volt coils screwed to the bent bottom front parts of a support frame. The screws that mount the coils also mount a brace at the front of the assembly. Two micro switches are screwed to the upper rear side of the support frame. A tab disabling armature is mounted on a pivot shaft extending forward from the upper front side of the support frame. A tab disabling arm and a switch actuator mount by a screw and a nut to the top part of the armature. The tab disabling arm extends upward from the front side of the armature. The switch actuator extends downward between the two micro switches on the front side of the support frame. A spring positioning lever is mounted on a pivot stud on the bottom front center part of the support frame. The hole in the upper part of the lever contains one end of a stud which is mounted on the bottom rear side of the armature. A spring is anchored to the top part of the lever and to the center part of the support frame. This spring provides the toggling action required to detent the armature when the armature is attracted by either of the magnets in the coils.

The tab disabling assembly is operated by means of an electrical signal which is generated when a pre-determined code is sensed in the reader assembly.

Friden 2200/2300 SERIES MACHINES

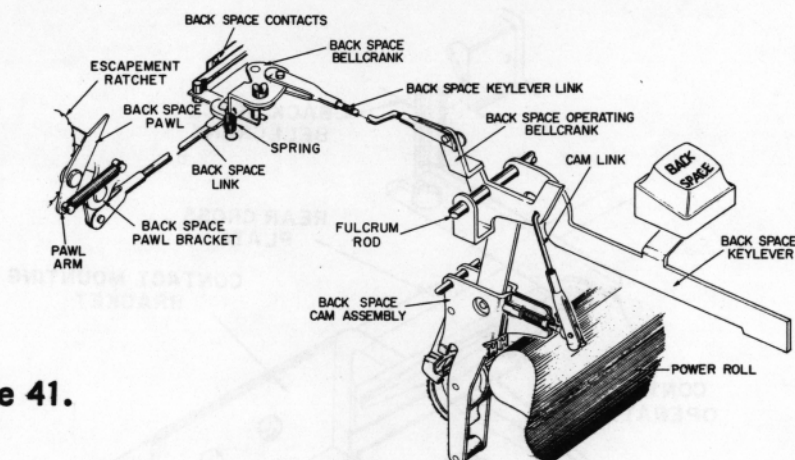


Figure 41.

Back Space Mechanism (Figure 41). The back space mechanism provides the means for automatically positioning the carriage assembly toward the right hand side of the writing a distance equal to the width of a printing character.

Like the printing character keylevers, the rear end of the back space keylever is mounted on the fulcrum rod passing through the keylever bearing support. The front end of the back space keylever projects into a slot in the front guide comb. The hooked upper end of a keylever operating arm in the translator assembly is positioned over the stud on the right hand side of the back space keylever. The forked extension on the rear bottom part of the back space keylever engages the top part of a back space cam assembly.

The back space cam assembly is located first on the right hand end of the cam assemblies behind the power roll. (On 2200 series machines the back space cam assembly is located in the same position but on the left hand side of a row of seven keylever control cam assemblies behind the right hand part of the power roll). The back space cam assembly is connected by means of a clevis and a link to a back space operating bellcrank. The back space operating bellcrank is mounted on the same fulcrum rod that mounts the rear end of the back space keylever. A back space keylever link connects the back space operating bellcrank to a back space bellcrank. The back space bellcrank mounts by a shouldered screw to a bellcrank mounting block. The block is screwed to the bottom part of the rear carriage rail adjacent to the right hand side of the escapement frame casting. The back space bellcrank is connected by means of a back space link to the bottom part of a pawl arm. The back space bellcrank is under the tension of a spring anchored to the back space bellcrank and to the right hand side of the escapement frame casting.

The pawl arm is a part of a back space pawl bracket assembly. The pawl bracket assembly is screwed to the inner right hand side of the escapement frame casting. When the back space mechanism operates, a back space pawl attached to the upper part of the pawl arm engages a tooth on the escapement ratchet. The escapement ratchet is rotated slightly by the back space pawl, simultaneously positioning the carriage assembly an equivalent distance toward the right hand side of the writing machine.

Friden 2200/2300 SERIES MACHINES

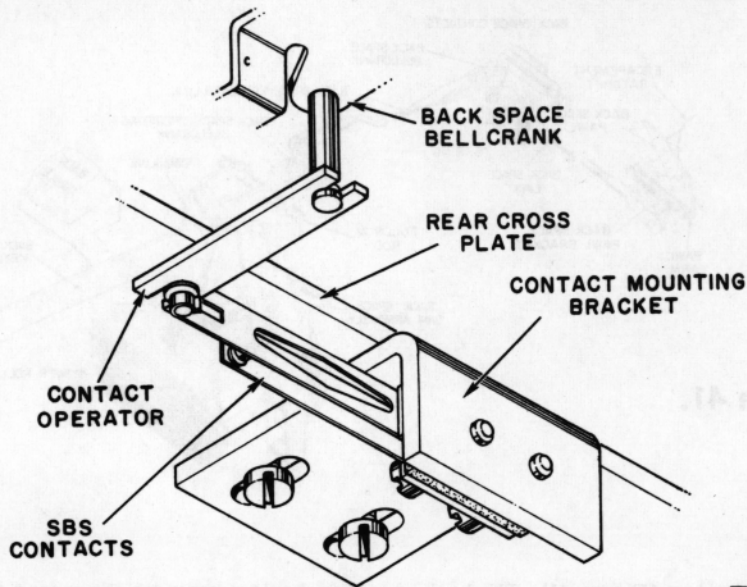


Figure 42.

Back Space (SBS) Contacts (Figure 42) The back space (SBS) contacts are screwed to a contact mounting bracket. The contact mounting bracket mounts by two screws to the right hand bottom part of the rear crossover plate. A contact operator extends from the SBS contacts to a stud on the back space bellcrank. The SBS contacts are operated during the operation of the back space mechanism to lock the writing machine keyboard.

Friden 2200/2300 SERIES MACHINES

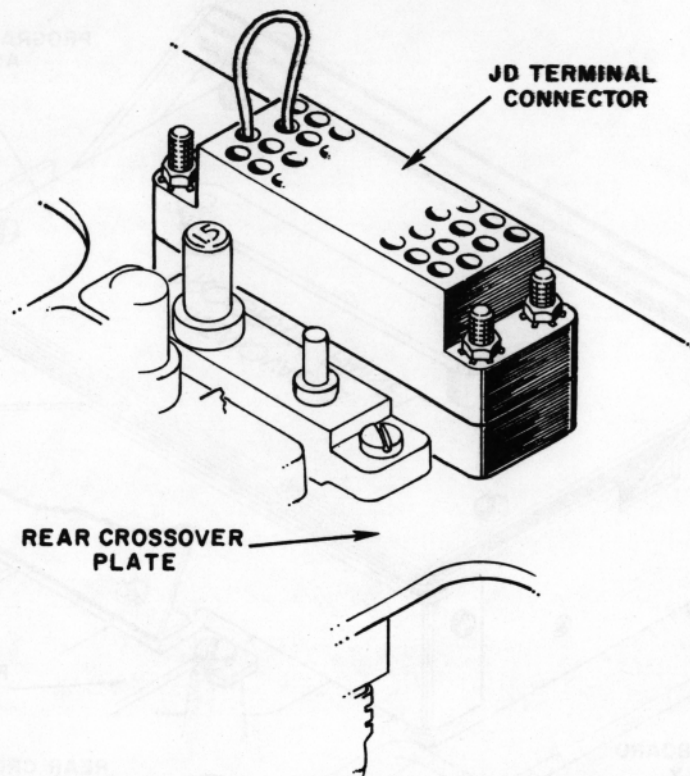


Figure 43.

JD Terminal Connector (2300 Series Machines) (Figure 43). The JD terminal connector is a removable male 50 position Amphenol connector located on the top right hand side of the writing machine. It mates with a female 50 position Amphenol connector mounted on the bottom right hand side of the rear crossover plate. By means of wire leads, the JD terminal connector can be programmed to modify internal functions of the Flexowriter.

Friden 2200/2300 SERIES MACHINES

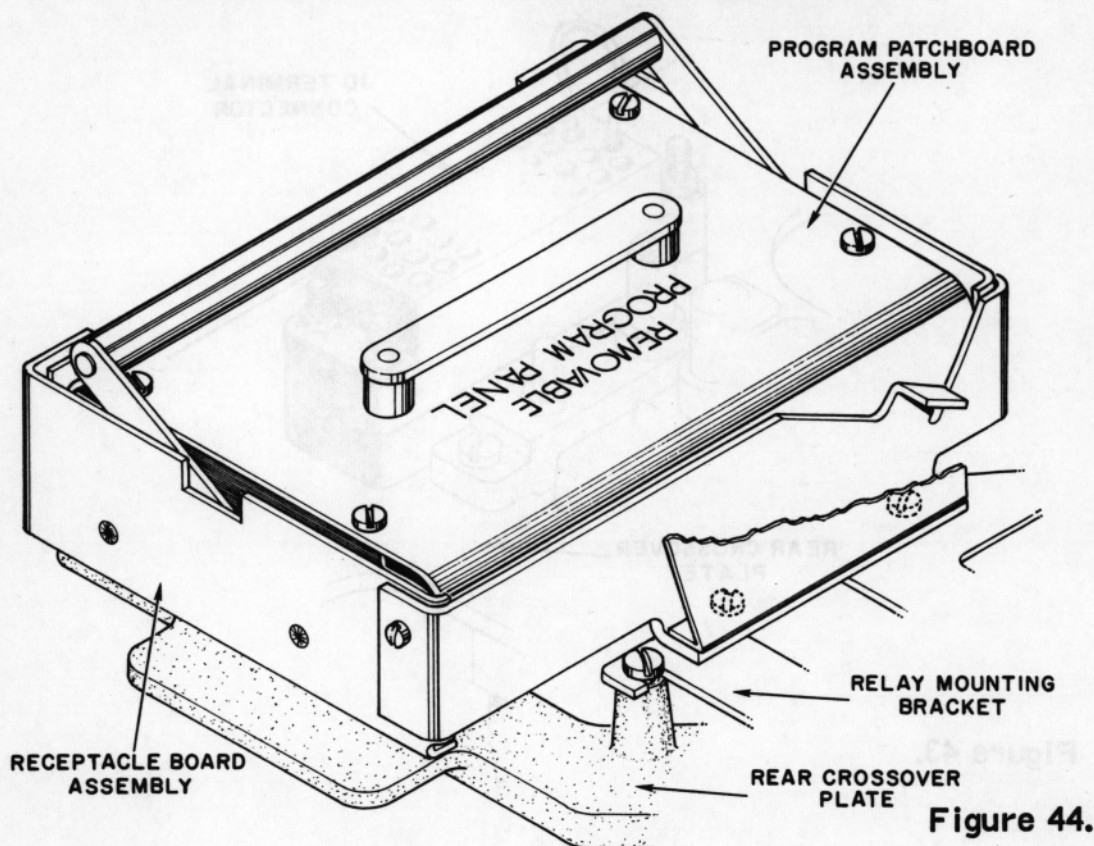


Figure 44.

Program Patchboard Assembly (2200 Series Machines) (Figure 44). The program patchboard assembly is removably mounted in a receptacle board assembly. The receptacle board assembly mounts by means of a support bracket and a screw to the top left hand side of the rear crossover plate. The right hand side of the receptacle board assembly mounts by two screws to the left hand side of a relay mounting bracket. The program patchboard assembly is programmed by means of wire leads to establish control circuits for machine operation.

Friden 2200/2300 SERIES MACHINES

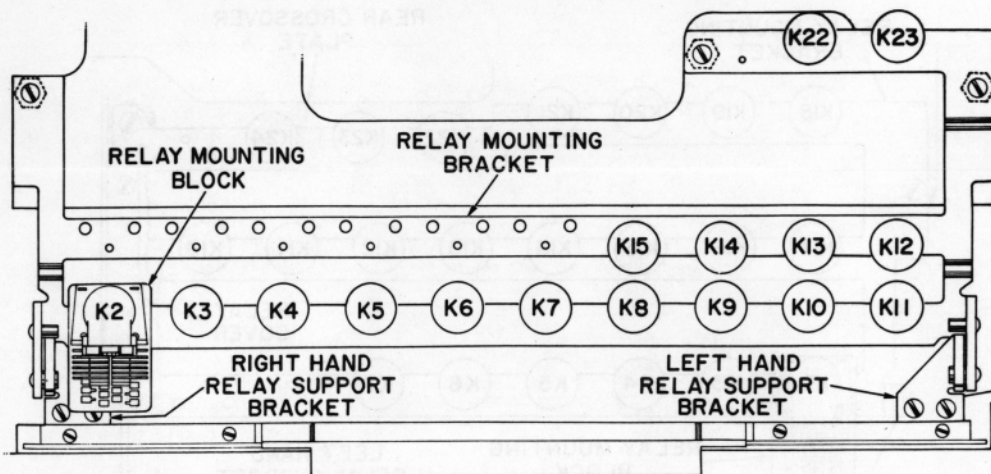


Figure 45.

Relay Mounting Bracket (2300) Series Machines (Figure 45). The relay mounting bracket extends across the rear top part of the writing machine. Pivot studs on the inner sides of the left hand and right hand rear ends of the relay mounting bracket fit into slots in left hand and right hand relay support brackets. Each relay support bracket mounts by two screws to the base casting. The front part of the relay mounting bracket is secured by three screws to the top parts of hexagonal studs.

Located on the relay mounting bracket are relays K1 through K15, K22 and K23. Each relay plugs into and is secured by a screw to a relay mounting block. Each relay mounting block is secured by a Phillips screw to the relay mounting bracket.

Friden 2200/2300 SERIES MACHINES

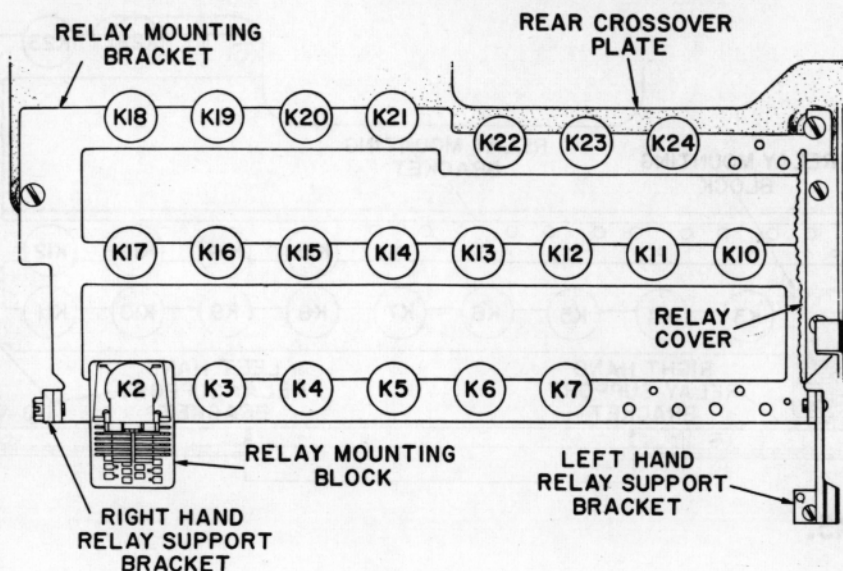


Figure 46.

Relay Mounting Bracket (2200 Series Machines) (Figure 46). The relay mounting bracket is located adjacent to the right hand side of the program patchboard assembly. The rear left hand part of the relay mounting bracket fits onto a pivot stud on the front end of a left hand relay support bracket. The relay support mounts by a screw to the left hand side of the base casting. The rear right hand part of the relay mounting bracket is mounted by a shouldered pivot to a right hand relay support bracket. The right hand relay support bracket mounts by two screws to the rear right hand side of the base casting. The left hand and right hand front parts of the relay mounting bracket are secured by two screws to vertical extensions on the rear crossover plate.

Located on the relay mounting bracket are relays K2 through K7 and K10 through K24. Each relay plugs into and is secured by a screw to a relay mounting block. Each relay mounting block is secured by a Phillips screw to the relay mounting bracket. A relay cover is mounted over the relays. It is secured by means of the same screws that mount the right hand side of the receptacle board assembly and the front right hand part of the relay mounting bracket.

Friden 2200/2300 SERIES MACHINES

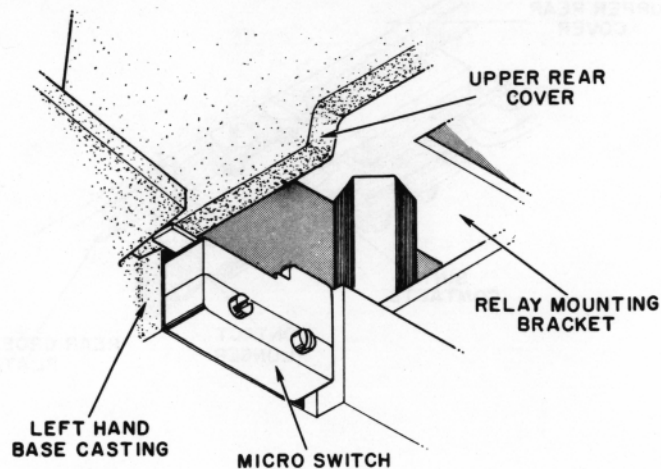


Figure 47.

Interlock (SINT) Contacts (2300 Series Machines) (Figure 47). The interlock SINT contacts are the contacts of a micro switch. The micro switch is screwed to the inner left hand side of the base casting, below the left hand front part of the relay mounting bracket. The SINT contacts operate when the upper rear cover is lifted from the writing machine. When the SINT contacts operate, they cause the keylock relay to de-energize - locking the keyboard on the writing machine.

Friden 2200/2300 SERIES MACHINES

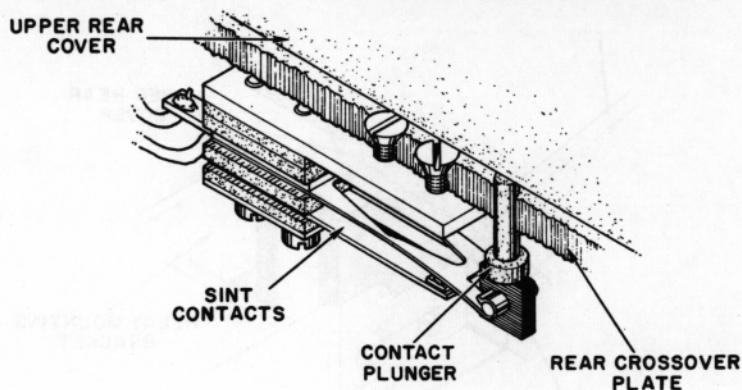


Figure 48.

Interlock (SINT) Contacts (2200 Series Machines) (Figure 48). The interlock SINT contacts are mounted by means of a contact mounting plate to the right hand bottom part of the rear crossover plate. The SINT contacts are operated by means of a contact plunger. The contact plunger extends from the contacts and passes through a hole in the rear crossover plate. The SINT contacts operate when the upper rear cover is lifted from the writing machine. When the SINT contacts operate, they cause the keylock relay to energize - locking the keyboard on the writing machine.

Friden 2200/2300 SERIES MACHINES

THE TAPE & EDGE CARD READER

Friden 2500/3300 SERIES MACHINES

THE TAPE & EDGE CARD READER

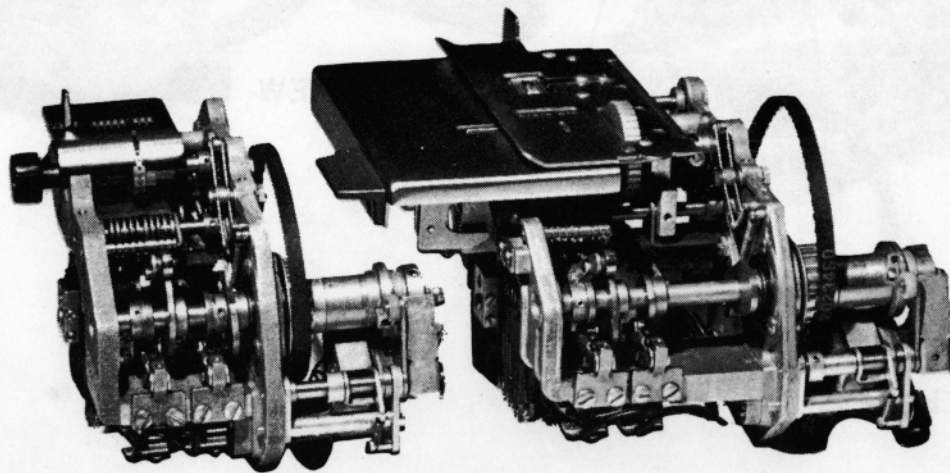
Friden 2200/2300 SERIES MACHINES

PURPOSE AND USE

The reader is a device for translating information recorded as coded holes in a punched tape or in edge cards into groups of electrical pulses. The individual pulses within each group are related to each other in a way which preserves the identity of the code, because each group of pulses maintains a direct relationship to the configuration of the generating code.

The reader is a pin-sensing mechanism which operates electrical contacts in a manner correlating with the system by which the coded holes were punched. Code configuration controls contact operation because contact operation is the result of sensing pins entering the code holes. The presence of different codes in the tape or the edge cards results in the activation of different sensing pins and therefore results in the operation of different contacts. The operation of contacts by the sensing pins results in the generation of pulses having the required relationships to the code holes.

The sensing pins operate together, and therefore the reader contacts are operated simultaneously. Because all of the reader contacts are operated at the same time and because the contact operation depends on code configuration, the immediate result of sensing a code is the simultaneous emission of a group of related pulses.



TAPE READER

TAPE/EDGE CARD READER

Figure 1.

There are two interchangeable reader models; the tape reader which has facilities for reading tape only, and the tape/edge card reader which has facilities for reading tape or edge cards (Figure 1).

Friden 2200/2300 SERIES MACHINES

PHYSICAL DESCRIPTION

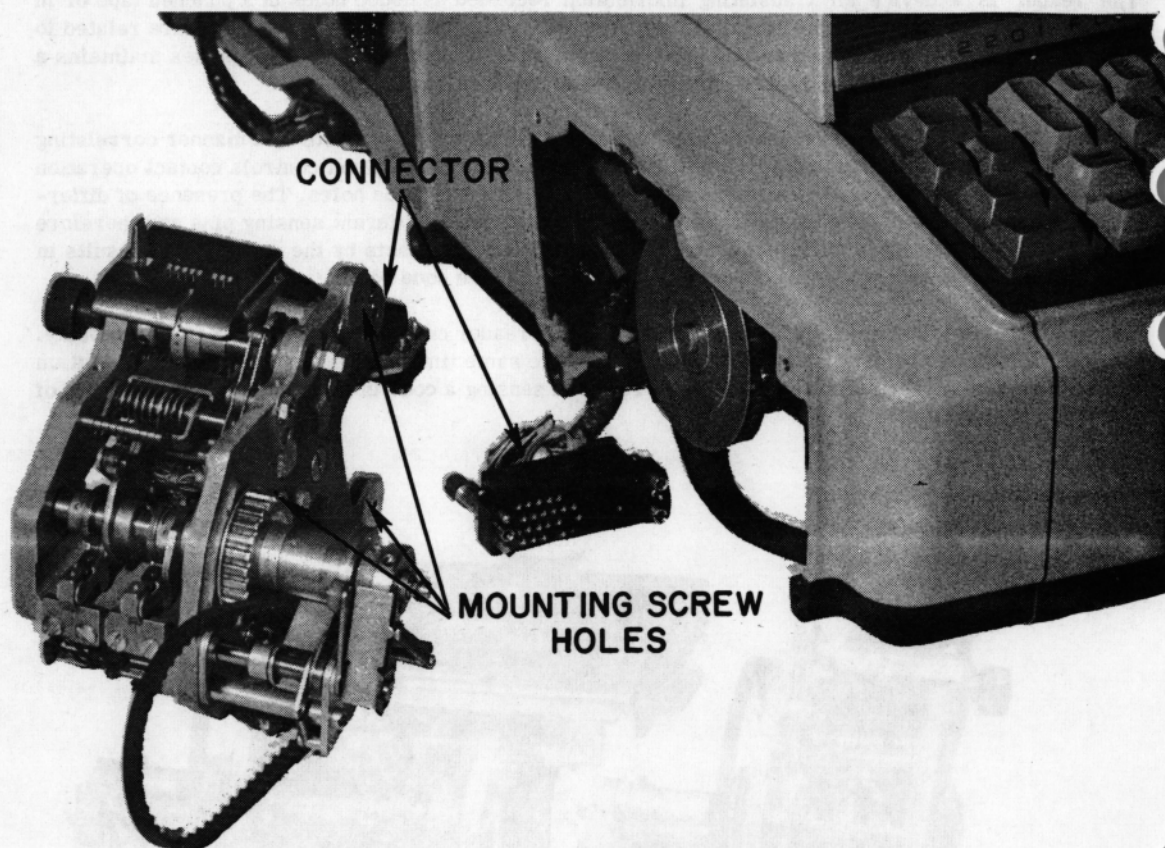


Figure 2.

General. The reader is located on the left front hand side of the Flexowriter (Figure 2). It is shock mounted to the left hand side base casting of the writing machine by three screws. Mechanical connection to the writing machine is by a cog belt engaging the clutch pulley and the left hand power roll pulley assembly. Electrical connection between the reader and the writing machine is by mating the male 50 position Amphenol connector mounted on the rear of the reader with the female 50 position Amphenol connector which is connected to the main cable of the Flexowriter.

Friden 2200/2300 SERIES MACHINES

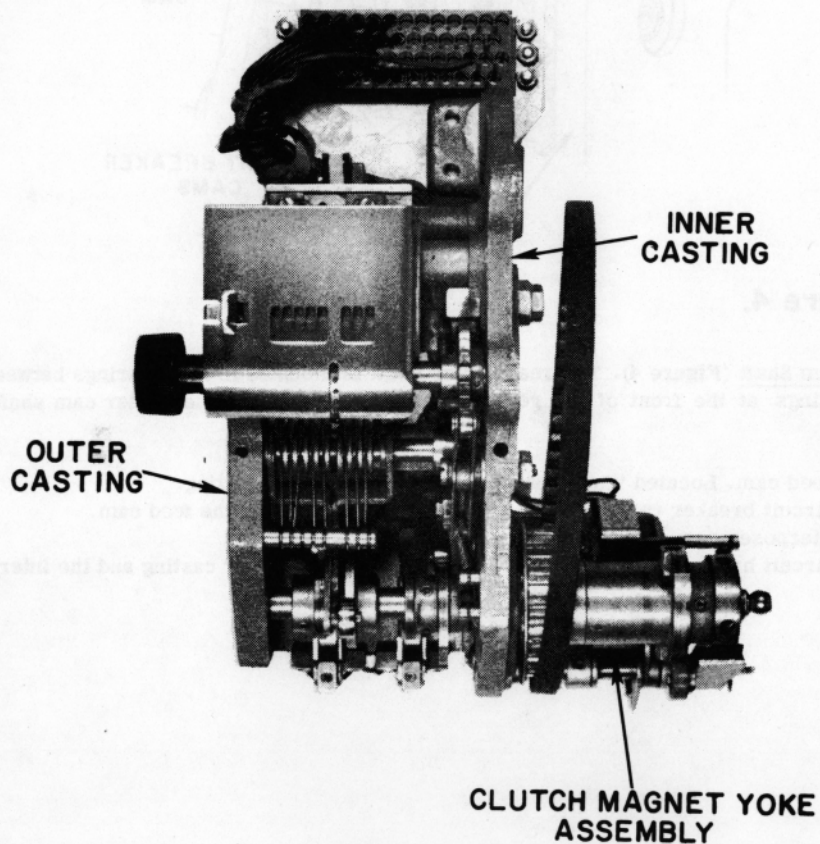


Figure 3.

The reader is a self-contained unit constructed on two castings, the inner casting and the outer casting. All reader components with the exception of the reader clutch and the clutch magnet yoke assembly, are mounted on the inner casting or between the inner casting and the outer casting (Figure 3).

Friden 2200/2300 SERIES MACHINES

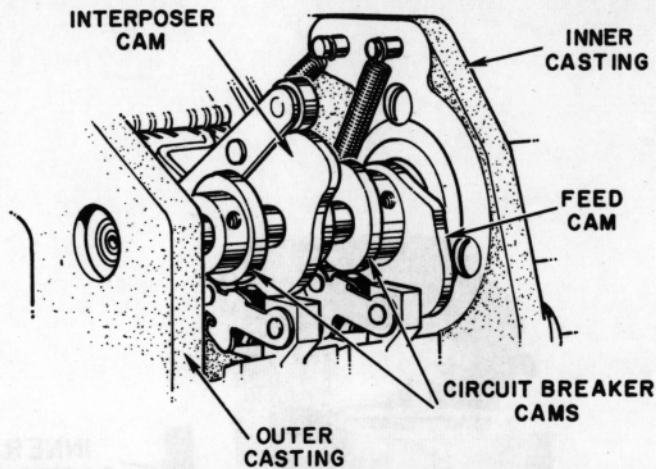


Figure 4.

Reader Cam Shaft (Figure 4). The reader cam shaft is mounted in ball bearings between the inner and outer castings at the front of the reader assembly. Mounted on the reader cam shaft are four cams as follows:

1. Feed cam. Located immediately adjacent to the inner casting.
2. Circuit breaker cam. Located immediately to the left of the feed cam.
3. Interposer cam. Centrally located on the shaft.
4. Circuit breaker cam. Centrally located between the outer casting and the interposer cam.

Friden 2200/2300 SERIES MACHINES

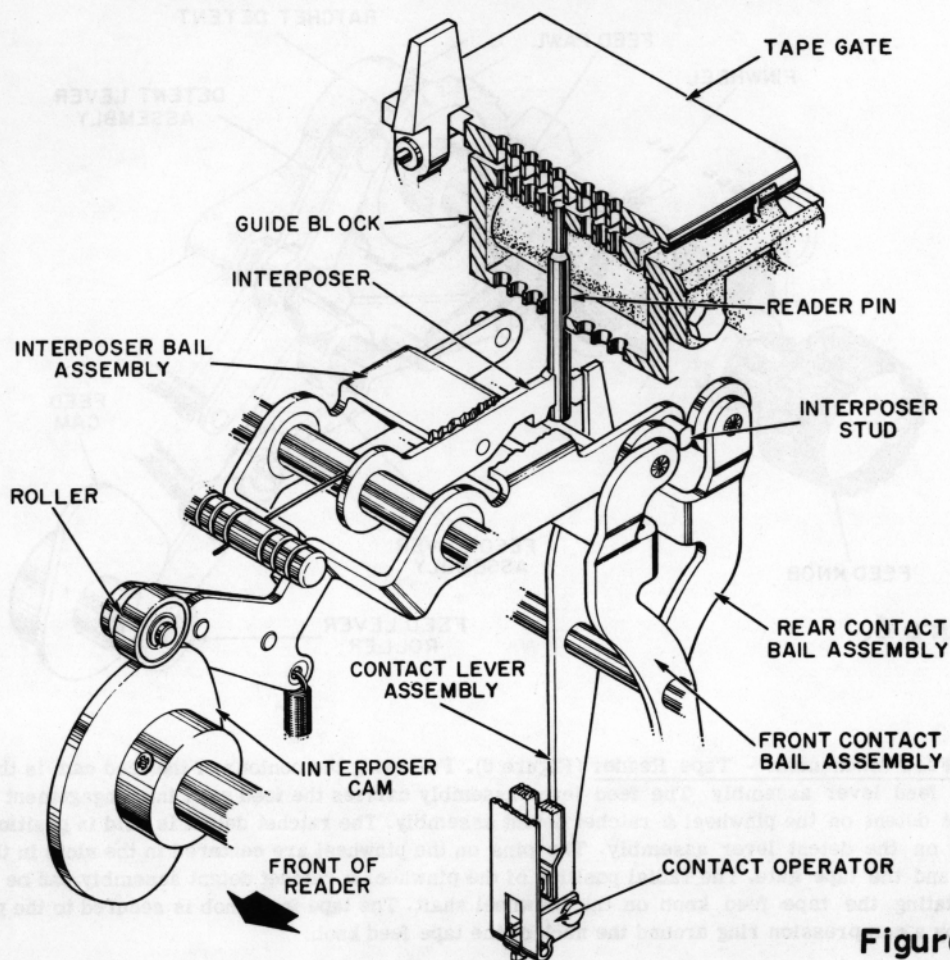


Figure 5.

Contact Operating Mechanism. Riding on the interposer cam is a roller (Figure 5). The roller is part of the interposer bail assembly. The interposer bail assembly operates the interposers, which are the means by which the reader pins are moved upward through the guide block. Immediately above the guide block is the tape gate. The tape gate is mounted on the guide block by means of a hinge.

From each end of the interposer bail assembly projects an interposer stud. When the interposer bail is operated, the interposer stud is forced between the rollers on the front and rear contact bail assemblies. Contact operators on the ends of the contact lever assemblies operate the reader contacts.

Friden 2200/2300 SERIES MACHINES

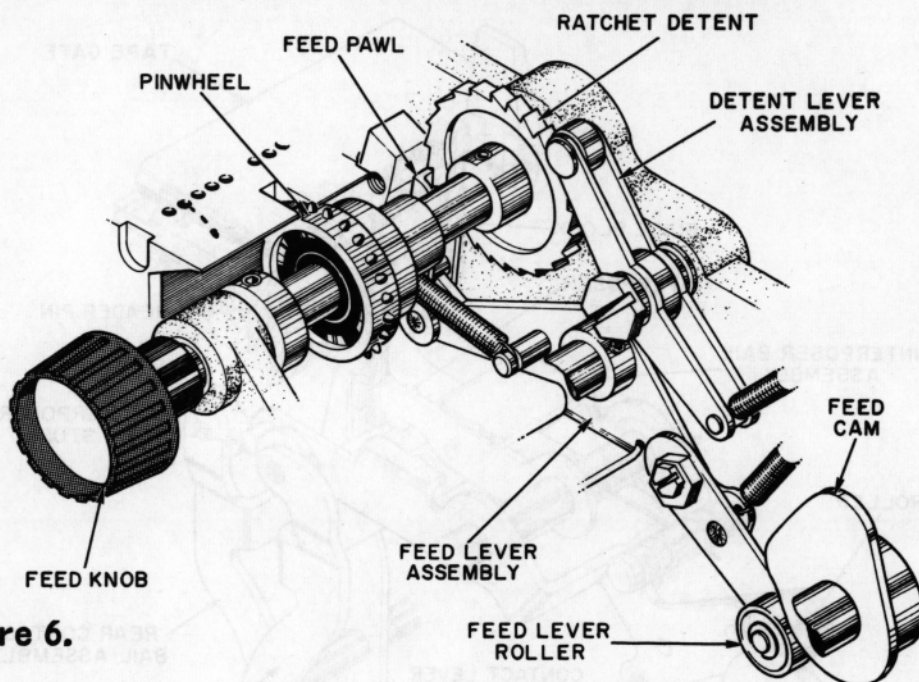


Figure 6.

Tape Feed Mechanism - Tape Reader (Figure 6). Following the contour of the feed cam is the roller on the feed lever assembly. The feed lever assembly carries the feed pawl into engagement with the ratchet detent on the pinwheel & ratchet detent assembly. The ratchet detent is held in position by the roller on the detent lever assembly. The pins on the pinwheel are centered in the slots in the guide block and the tape gate. The radial position of the pinwheel & ratchet detent assembly can be changed by rotating the tape feed knob on the pinwheel shaft. The tape feed knob is secured to the pinwheel shaft by a compression ring around the neck of the tape feed knob.

Friden 2200/2300 SERIES MACHINES

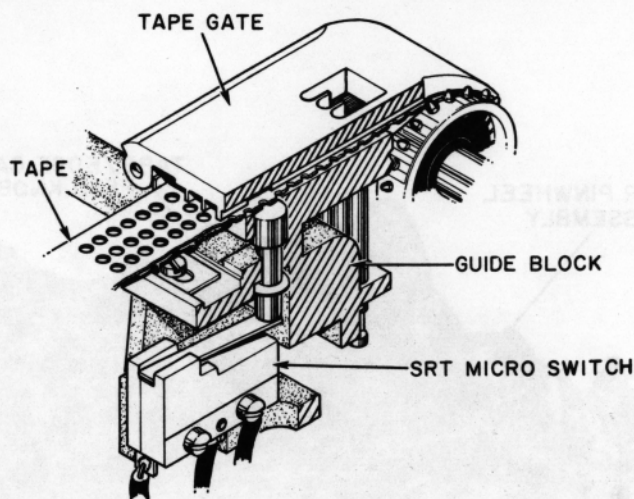


Figure 7.

Reader Tape (SRT) Micro Switch (Figure 7). The reader tape (SRT) micro switch is screw-mounted to the rear of the reader guide block. The SRT micro switch is operated when tape is in the reader and the tape gate is down and latched.

Friden 2200/2300 SERIES MACHINES

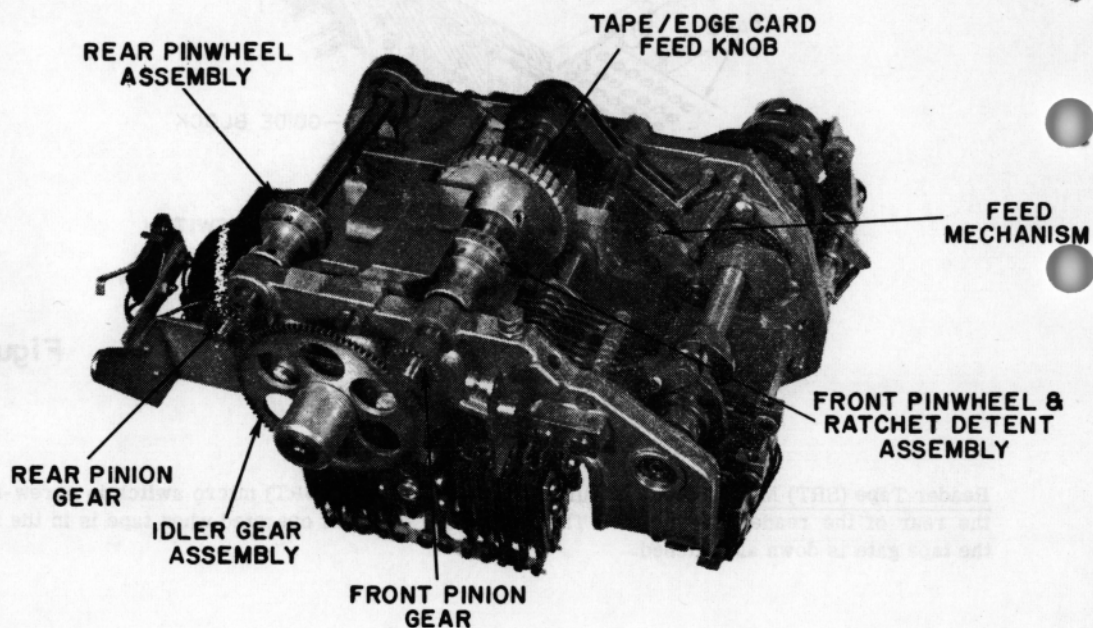


Figure 8.

Tape And Edge Card Feed Mechanism-Tape/Edge Card Reader (Figure 8). The roller on the feed lever assembly follows the contour of the feed cam. The feed lever assembly carries the feed pawl into engagement with the ratchet detent on the front pinwheel and ratchet detent assembly. The ratchet detent is held in position by the roller on the detent lever assembly. The pins on the pinwheel are centered in the slot in the guide block. Setscrew on the front pinwheel shaft is the front pinwheel gear. The front pinwheel gear is in mesh with the idler gear assembly. The idler gear is mounted by means of a plate which is screwed to the outer casting. Also in mesh with the idler gear assembly is the rear pinwheel gear setscrew to the shaft of the rear pinwheel assembly.

The front and rear pinwheels are aligned front to rear. The preperforated feed holes in the edge cards fit over the front and rear pinwheels.

The radial position of the front and rear pinwheels can be changed by rotating the card feed knob. The card feed knob is setscrew to the shaft of the front pinwheel & ratchet detent assembly.

Friden 2200/2300 SERIES MACHINES

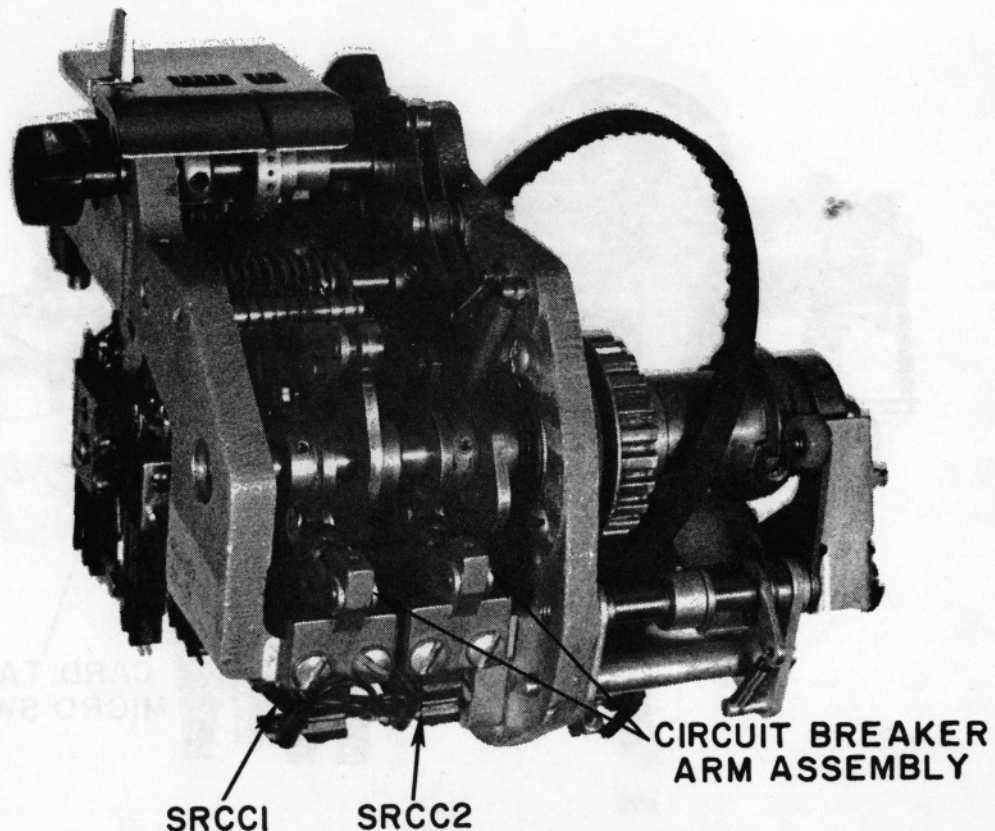


Figure 9.

Circuit Breaker Contact Assemblies (SRCC1 and SRCC2) (Figure 9). The circuit breaker contact assemblies (SRCC1 and SRCC2) are screw-mounted beneath the front part of the outer casting. The circuit breaker contact assemblies are positioned on the outer casting as follows:

1. Circuit breaker contact assembly SRCC1. Positioned near the outer side of the reader.
2. Circuit breaker contact assembly SRCC2. Positioned near the inner side of the reader.

Directly above each circuit breaker contact assembly is a circuit breaker arm assembly. Each circuit breaker arm assembly mounts by two screws to the front edge of the outer casting. Two contact plungers pass through the bottom of the outer casting between the circuit breaker arm assemblies and the circuit breaker contact assemblies. The rollers on the circuit breaker arm assemblies follow the contours of the circuit breaker cams. The flat springs on the circuit breaker arms move the contact plungers downward, operating the circuit breaker contacts.

Friden 2200/2300 SERIES MACHINES

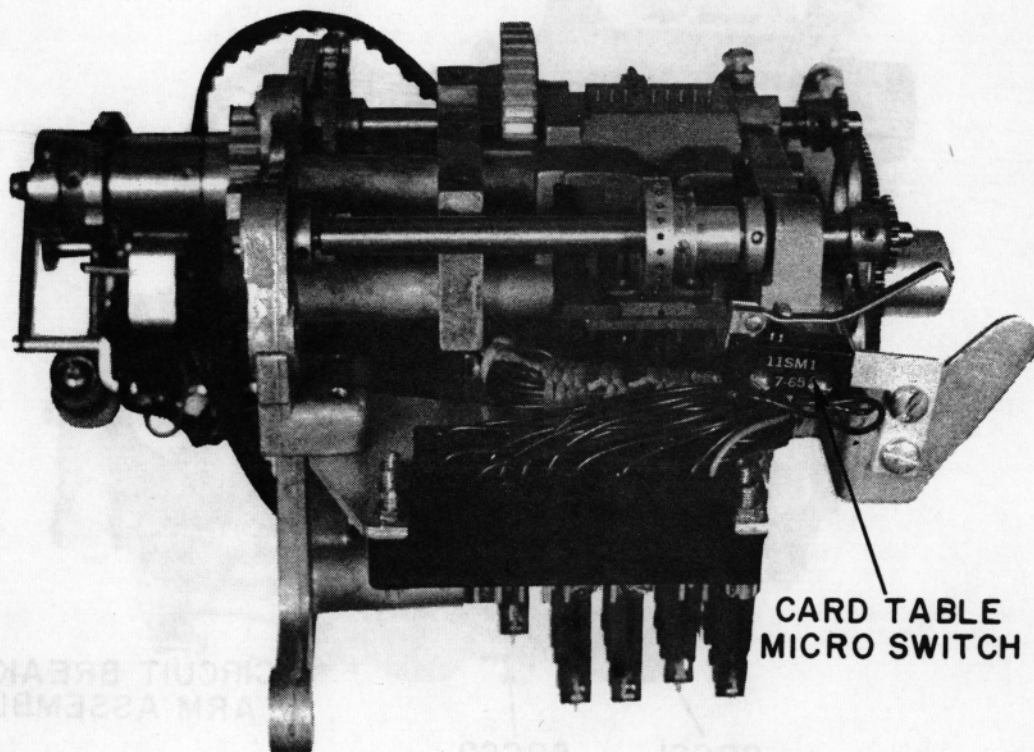


Figure 10

Card Table Micro Switch - Tape/Edge Card Reader (Figure 10). The card table micro switch is mounted on a micro switch bracket by two screws and two nuts. The micro switch bracket is mounted by two screws to a card stop actuator. The card stop actuator, in turn, is mounted by two screws to the rear edge of the outer casting. The card table micro switch is operated when the card table is in its lowered position.

Friden 2200/2300 SERIES MACHINES

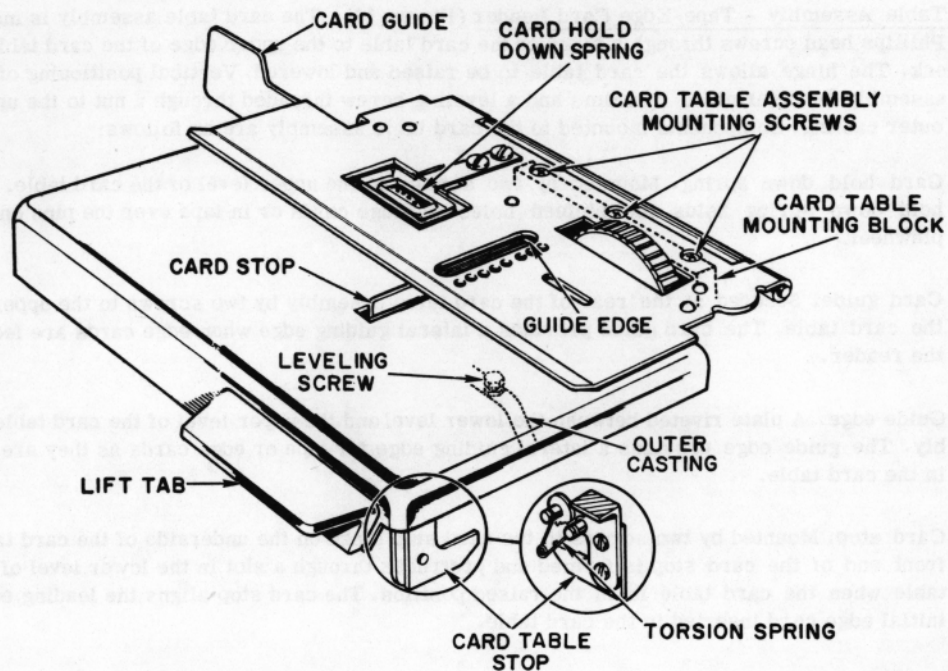


Figure 11.

Friden 2200/2300 SERIES MACHINES

Card Table Assembly - Tape/Edge Card Reader (Figure 11). The card table assembly is mounted by three Phillips head screws through a hinge on the card table to the upper edge of the card table mounting block. The hinge allows the card table to be raised and lowered. Vertical positioning of the card table assembly is determined by shims and a leveling screw threaded through a nut to the upper edge of the outer casting. Components mounted to the card table assembly are as follows:

1. Card hold down spring. Mounted by two screws to the upper level of the card table. The card hold down spring holds the pinfeed holes in edge cards or in tape over the pins on the rear pinwheel.
2. Card guide. Secured at the rear of the card table assembly by two screws to the upper level of the card table. The card guide provides a lateral guiding edge when edge cards are fed through the reader.
3. Guide edge. A plate riveted between the lower level and the upper level of the card table assembly. The guide edge provides a lateral guiding edge for tape or edge cards as they are inserted in the card table.
4. Card stop. Mounted by two screws to the card stop hinge on the underside of the card table. The front end of the card stop is formed and protrudes through a slot in the lower level of the card table when the card table is in the raised position. The card stop aligns the leading edge of an initial edge card inserted in the card table.
5. Card table stop. Screw-mounted to a spring bracket welded to the underside of the card table. The card table stop limits the raised position of the card table.
6. Lift tab. Secured by two Phillips head screws to the left hand side of the card table. Used for raising and lowering the card table. The card table assembly is locked in its lowered or its raised position by the tension of a torsion spring. The torsion spring is anchored on the spring bracket and the card table stop bracket at the front of the card table assembly.

Friden 2200/2300 SERIES MACHINES

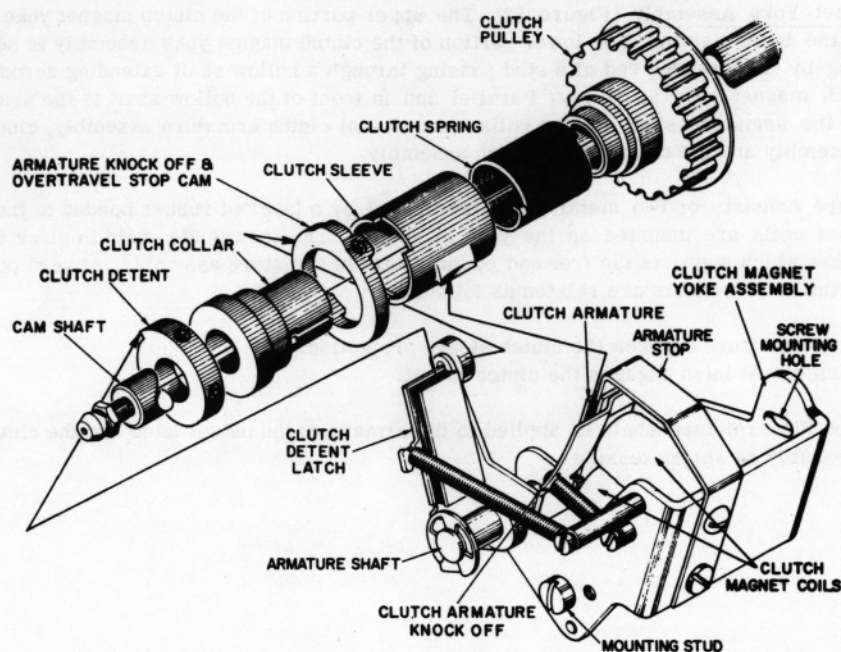


Figure 12.

Clutch Assembly (Figure 12). The clutch assembly controls the operation of the reader by controlling the transmission of mechanical power between the clutch pulley and the reader cam shaft. Control of power transmission is affected by friction between the clutch spring and the hub of the clutch pulley.

The clutch assembly includes the clutch detent, the clutch collar, the knock off & overtravel cam, the clutch sleeve, the clutch spring and the clutch pulley. One end of the spirally-wound clutch spring overlaps the hub of the clutch pulley; the other end overlaps the clutch collar.

The clutch detent and the clutch collar are setscrewed to the power shaft. The knock off & overtravel cam is setscrewed to the clutch collar.

The clutch spring is closely wound of rectangular wire. The close tolerance to which the inside diameter of the clutch spring is held insures a secure grip on both the clutch pulley hub and the clutch collar. One end of the spring has a right angle bend which, by fitting into a slot in the clutch collar, anchors the clutch spring to the clutch collar. The opposite end of the clutch spring works against a square stud on the inside surface of the clutch sleeve.

Friden 2200/2300 SERIES MACHINES

Clutch Magnet Yoke Assembly (Figure 12). The upper portion of the clutch magnet yoke assembly is screwed to the inner casting. The lower portion of the clutch magnet yoke assembly is secured to the inner casting by the threaded end of a stud passing through a hollow shaft extending across the bottom of the clutch magnet yoke assembly. Parallel and in front of the hollow shaft is the armature shaft. Mounted on the armature shaft are the collar (not shown) clutch armature assembly, clutch armature knock off assembly and the clutch detent latch assembly.

The armature consists of two metal plates separated by a layer of rubber bonded to the plates. The clutch magnet coils are mounted on the yoke by screws. The screws also hold in place the armature stop, a bracket which supports the free end of the released armature assembly. At zero position of the clutch, the clutch components are related as follows:

1. The clutch armature engages the clutch sleeve projection.
2. The clutch detent latch engages the clutch detent.

Torque about the armature shaft is applied to the armature, the detent latch and the clutch armature knock off assembly by spring tension.

Friden 2200/2300 SERIES MACHINES

THE TRANSLATOR

Friden 5500/5300 SERIES MACHINES

THE TRANSLATOR

Friden 2200/2300 SERIES MACHINES

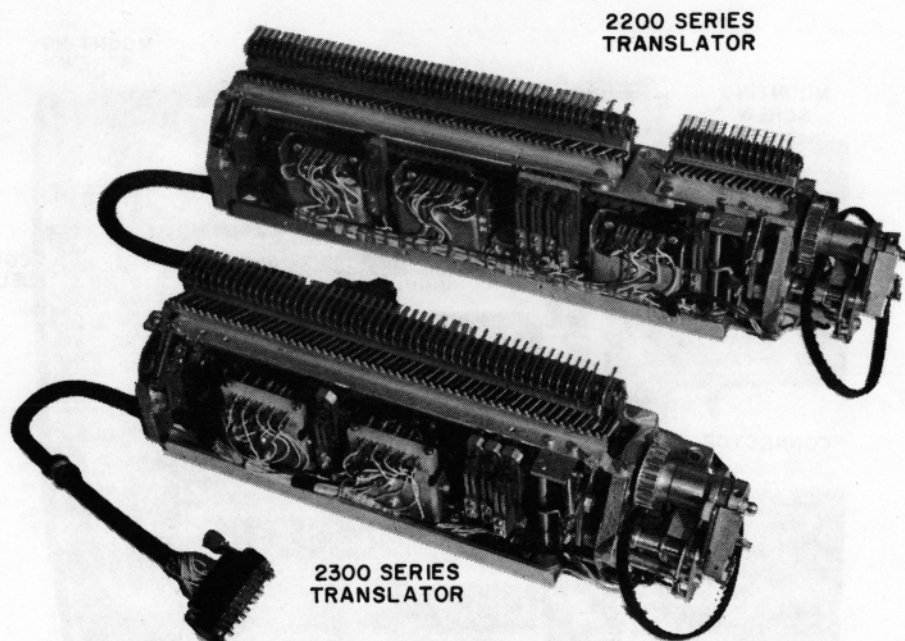


Figure 1.

PURPOSE AND USE

The translator (Figure 1) is a device for interpreting information recorded as coded holes in punched tape or in punched edge cards. Electrical pulses representative of coded holes in tape or in edge cards are received from the reader. The translator converts these into mechanical operations which result in the operation of keylevers in the writing machine.

Friden 2200/2300 SERIES MACHINES

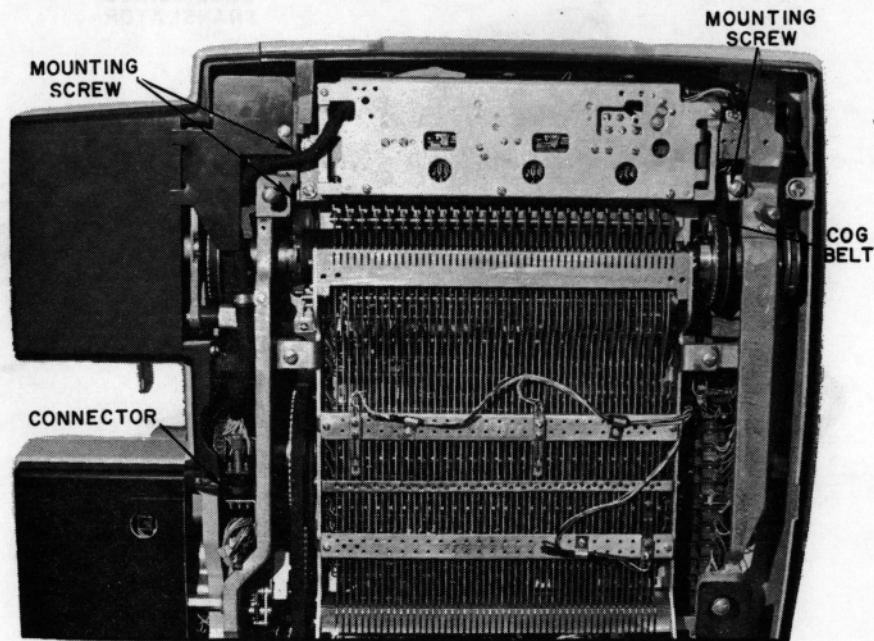


Figure 2.

Physical Description

General. The translator is located under the extreme front of the Flexowriter (Figure 2). It is mounted to the writing machine by two screws to the left hand base casting and one screw to the right hand base casting. Mechanical connection to the writing machine is by a cog belt engaging the translator clutch pulley and the right hand power roll pulley. Electrical connection is by mating the male 34 position Amphenol connector on the end of the translator cable with the female 34 position Amphenol connector which is connected to the main cable of the Flexowriter.

The translator is a self-contained unit. With the exception of the translator clutch, all the components of the translator are mounted on the bottom plate or within the confines of the translator casting. The bottom plate is secured by two dowels and five screws to the bottom edges of the translator casting. (On the 2200 series translator the bottom plate is secured by two dowels and six screws to the bottom edges of the translator casting.)

Friden 2200/2300 SERIES MACHINES

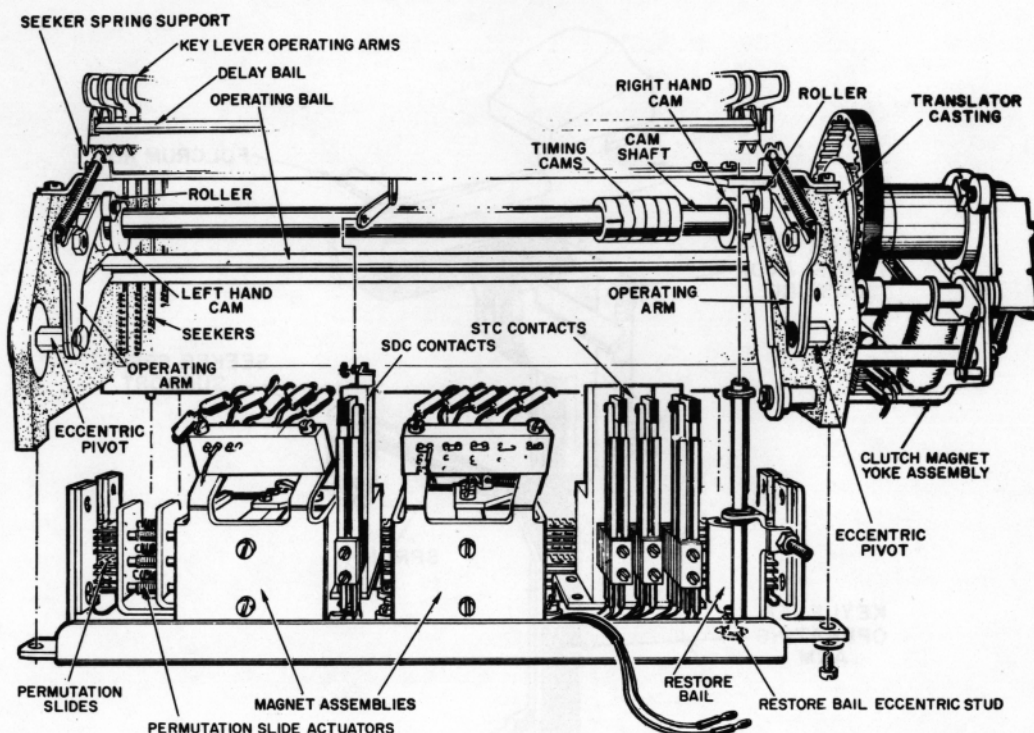


Figure 3.

Cam Shaft (Figure 3). The translator cam shaft is mounted in ball bearings between the left hand end and the right hand end of the translator casting. Mounted on the translator cam shaft are eight cams as follows:

1. Right hand cam. Located near the right hand end of the translator casting.
2. Six timing cams. Grouped a short distance to the left of the right hand cam. (There are eight timing cams on the cam shaft of the 2200 series translator).
3. Left hand cam. Located near the left hand end of the translator casting.

Operating Bail (Figure 3). Following the contours of the left hand and right hand cams are the rollers on the operating arm assemblies. The operating arm assemblies are secured to the ends of the operating bail by two eccentric screws and two nuts. The operating arms and each end of the operating bail are mounted to eccentric pivots. The eccentric pivots are secured by two screws through the left hand and right hand ends of the translator casting. The operating bail operates under the tension of two springs anchored to the operating arms and to a seeker spring support. The seeker spring support is secured by two screws to the top front edges of the translator casting. (The 2200 series translator has a seeker spring support and an auxiliary seeker spring support. The seeker spring support is mounted by a screw to the left top front edge of the translator casting. Its right end is mounted by a screw through a spacer to a spring support bracket. The left end of the auxiliary seeker spring support is mounted by a screw through a spacer to the spring support bracket. The right hand end of the auxiliary seeker spring support is mounted by a screw through a spacer to the right top edge of the translator casting.)

Friden 2200/2300 SERIES MACHINES

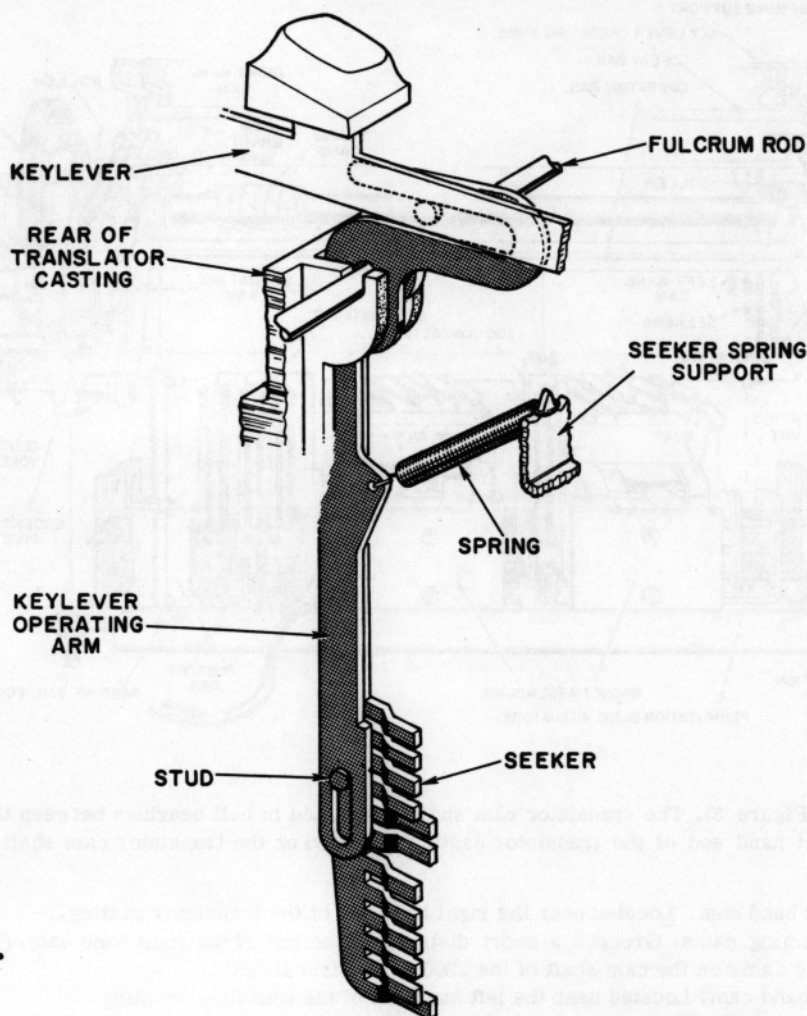


Figure 4.

Seekers & Keylever Operating Arms (Figure 3 & Figure 4). The seekers and the keylever operating arms are located in slots in the rear of the translator casting. There are 51 seekers and 51 keylever operating arms. They are retained by a fulcrum rod passing through the upper rear of the translator casting and through the upper ends of the seekers and the keylever operating arms. A stud projects from the left side of each seeker. The studs are contained in slots in the lower ends of the keylever operating arms. The seekers are coded by means of bent tabs on their lower ends. Operation of an individual seeker determines the operation of its keylever operating arm. The keylever operating arms are under the tension of springs anchored to the keylever operating arms and to the seeker spring support.

Friden 2200/2300 SERIES MACHINES

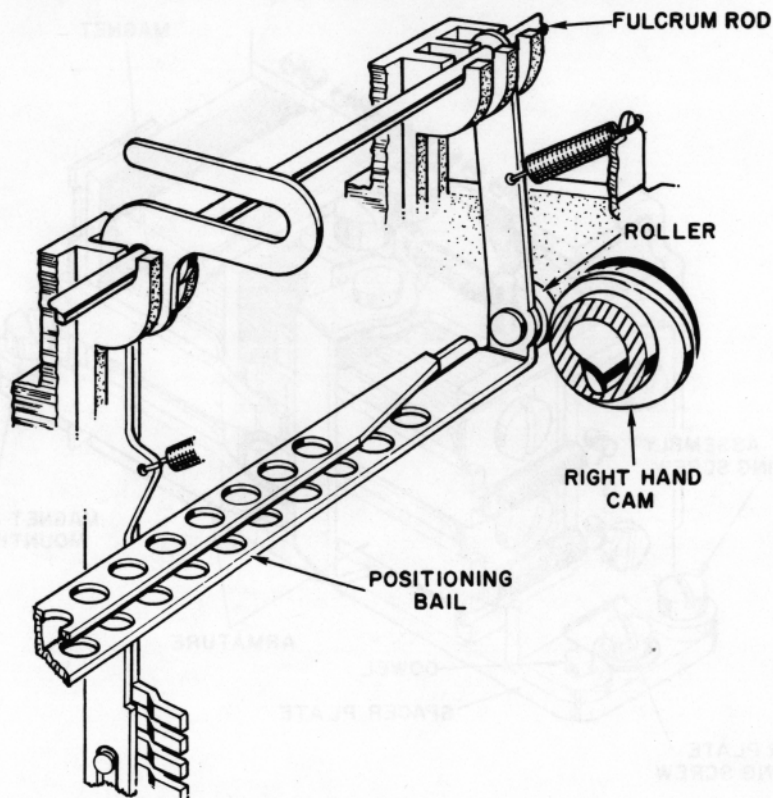


Figure 5.

Positioning Ball Assembly (Figure 5). Behind the translator cam shaft and in front of the seekers and the keylever operating arms is the positioning ball assembly. The upper ends of the positioning ball assembly are mounted on the fulcrum rod passing through the rear of the translator casting. On each lower end of the positioning bail assembly is a roller. The rollers ride on the left hand and right hand cams. The positioning bail is the means by which the keylever operating arms and the seekers are restored.

Friden 2200/2300 SERIES MACHINES

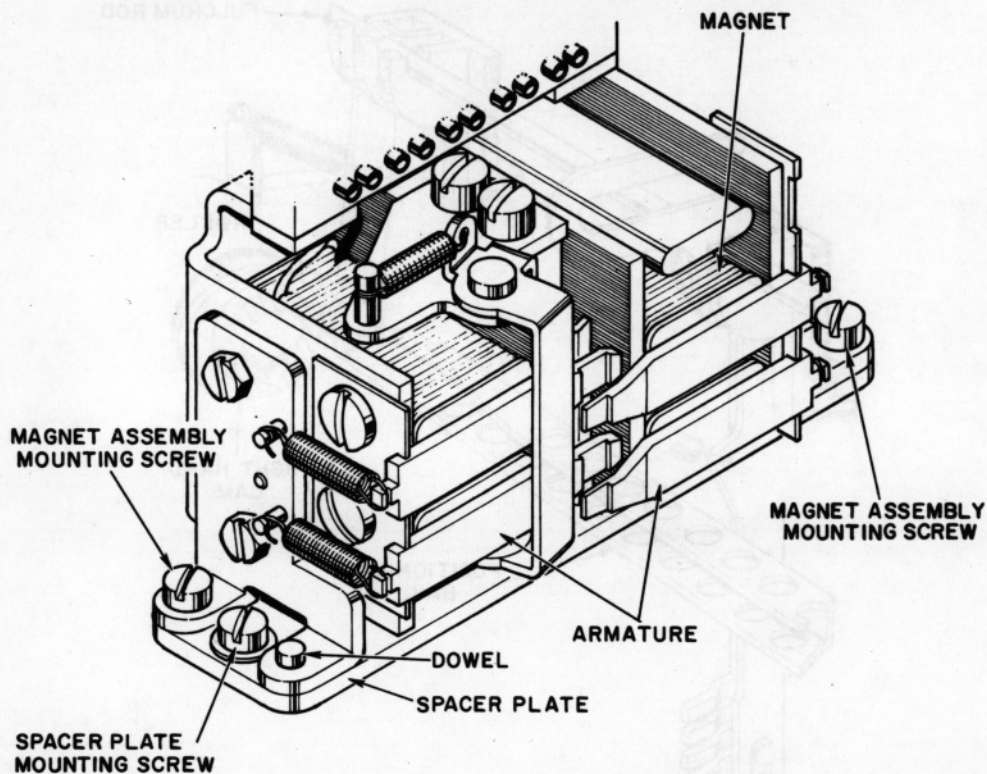


Figure 6.

Translator Magnet Assemblies (Figure 3 & Figure 6). There are two magnet assemblies in the 2300 series translator. (The 2200 series translator contains three magnet assemblies.) The magnet assemblies are located at the front part of the translator. Each translator magnet assembly is mounted by two dowels and two screws to the bottom plate. The vertical positions of the magnet assemblies are determined by spacer plates. Each spacer plate is mounted by two screws to the bottom plate. The translator magnet assemblies contain the individual translator magnets. Each translator magnet is mounted and numbered in the indicated position relative to the others as shown in Figure 6.

Immediately adjacent to each magnet is its associated armature. The armatures are mounted to the translator magnet assemblies by spring tension.

Friden 2200/2300 SERIES MACHINES

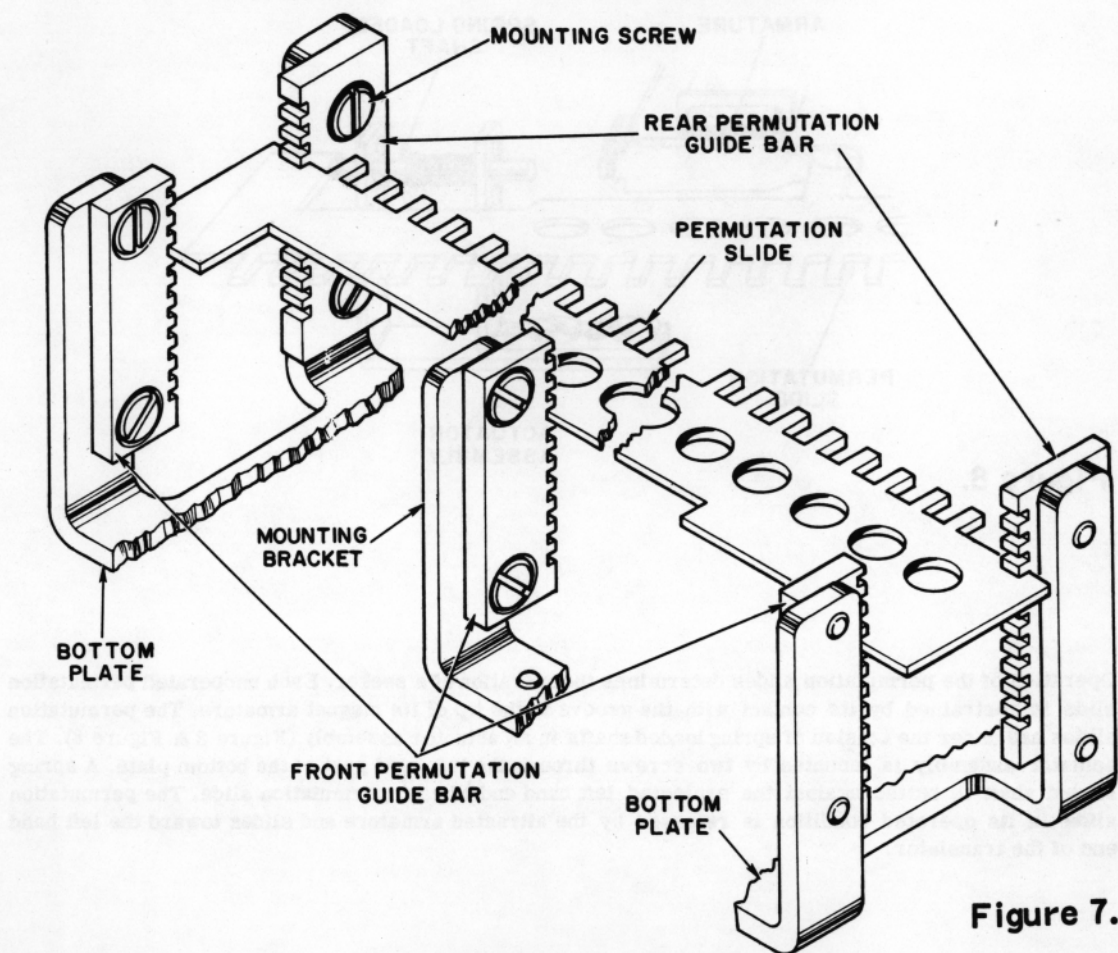


Figure 7.

Permutation Slides (Figure 3 & Figure 7). There are eight permutation slides in the 2300 series translator. (The 2200 series translator contains eleven permutation slides.) They extend across the length of the bottom plate behind the translator magnet assemblies. They are mounted in slots between two rear permutation guide bars and three front permutation guide bars. The rear permutation guide bars and two of the front permutation guide bars are mounted by eight screws to the bent extensions on each end of the bottom plate. The third front permutation guide bar is centrally spaced and mounted by two screws to a bracket on the bottom plate. (Because of the length of the permutation slides in the 2200 series translator, a fourth front permutation guide bar is used. It is spaced equidistant to the other front permutation guide bars. It is mounted by two screws to a bracket on the bottom plate.)

Friden 2200/2300 SERIES MACHINES

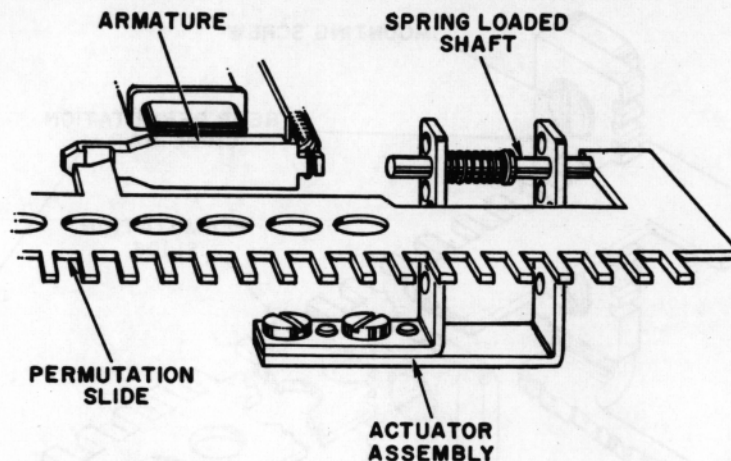


Figure 8.

Operation of the permutation slides determines the operation of a seeker. Each unoperated permutation slide is restrained by its contact with the groove in the tip of its magnet armature. The permutation slides are under the tension of spring loaded shafts in an actuator assembly (Figure 3 & Figure 8). The actuator assembly is mounted by two screws through the left hand part of the bottom plate. A spring loaded shaft is butted against the projected left hand end of each permutation slide. The permutation slide in its operated condition is released by the attracted armature and slides toward the left hand end of the translator.

Friden 2200/2300 SERIES MACHINES

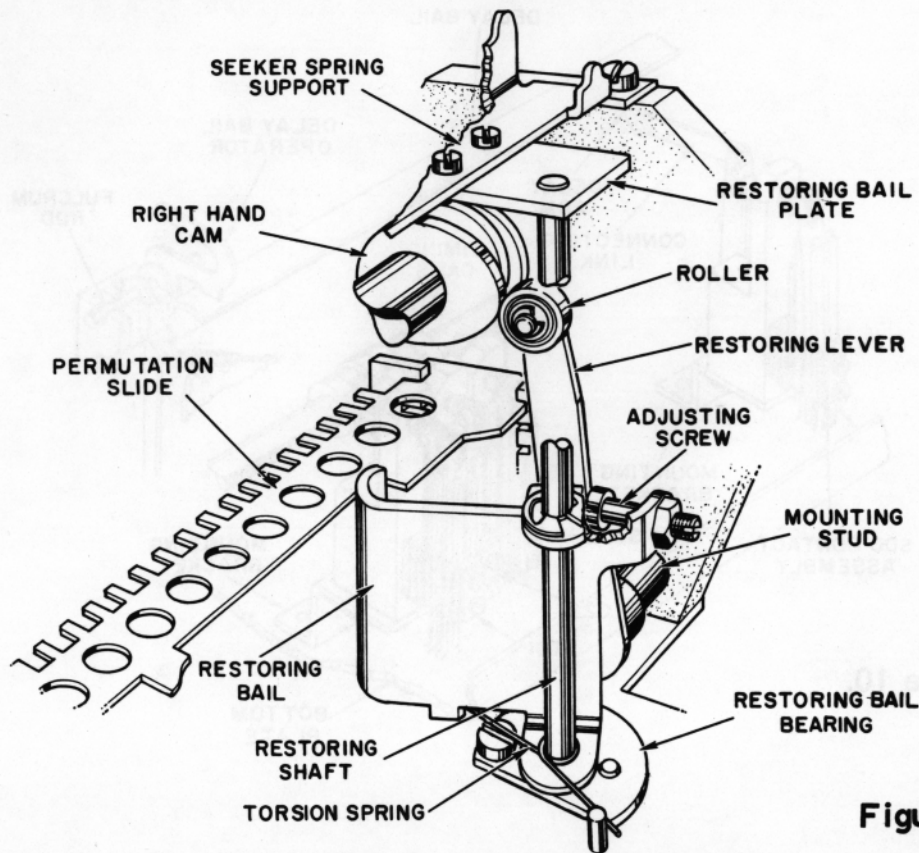


Figure 9.

Permutation Restoring Mechanism (Figure 3 & Figure 9). Following the contours of the right hand cam is the roller on the restoring lever. The restoring lever is mounted on a stud projecting from the inner surface on the right hand end of the translator casting. Adjacent to the restoring lever is a restoring shaft. The lower end of the shaft fits into a restoring bail bearing. The bearing is mounted by two screws through the bottom plate. The upper end of the shaft fits into a hole in a restoring bail plate. The plate is mounted by two screws through the seeker spring support. Mounted on the restoring shaft is a restoring bail. The rear edge of the bail is formed. It is vertically positioned parallel to the projected front edges on the right hand ends of the permutation slides. A projection on the front edge of the restoring bail contains an adjusting screw fastened by a nut. The head of the screw is butted against the front edge of the restoring lever. When the restoring lever is operated, it causes the restoring bail to rotate clockwise, restoring operated permutation slides to the right hand side of the translator. The restoring bail itself is restored by means of a torsion spring on the lower end of the restoring shaft.

Friden 2200/2300 SERIES MACHINES

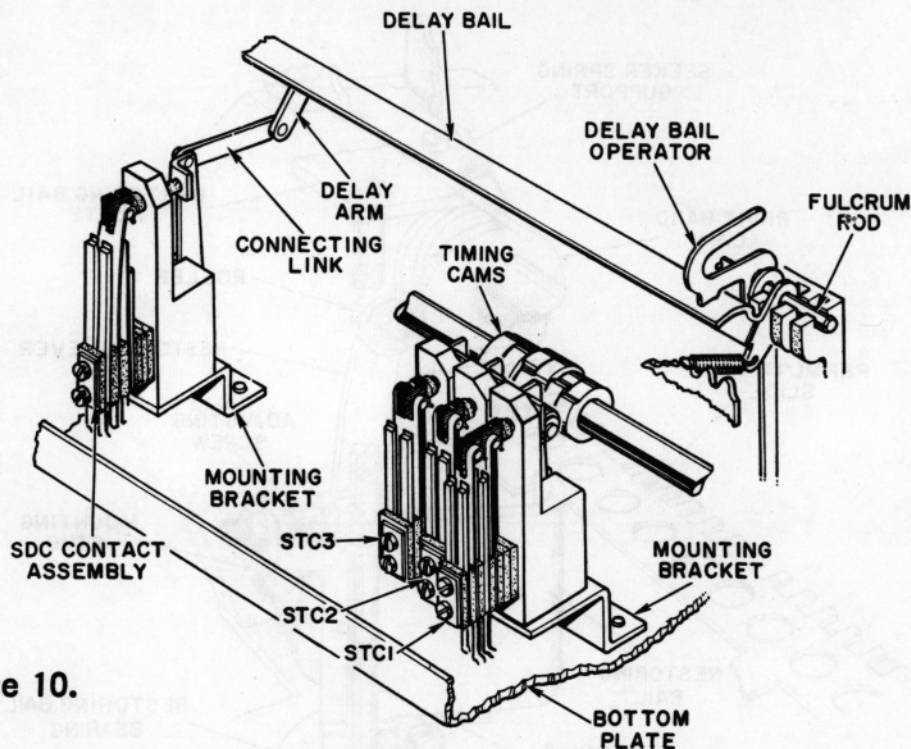


Figure 10.

Translator Timing Contact Assemblies (STC1, STC2 and STC3) - 2300 Series Translator (Figure 3 & Figure 10). The translator timing contact assemblies (STC1, STC2 and STC3) are located on the front right hand end of the translator. The STC1, STC2 and STC3 timing contact assemblies are mounted by six screws to a bracket on the bottom plate of the translator. Each timing contact assembly consists of a mounting block to which contacts are screwed, a contact operating arm secured by a roll pin through the mounting block, and a contact plunger. The timing contact assemblies are positioned on the bracket as follows:

1. Timing contact assembly STC1. Positioned on the extreme right hand end of the bracket.
2. Timing contact assembly STC2. Butted against the left hand side of the STC1 mounting block.
3. Timing contact assembly STC3. Butted against the left hand side of the STC2 mounting block.

Each of the rollers on the contact arms follows the contours of two timing cams simultaneously. The upper ends of the operating arms move the contact plungers forward, operating the timing contacts.

Friden 2200/2300 SERIES MACHINES

Translator Timing Contact Assemblies (STC1, STC2, STC3 and STC4) - 2200 Series Translator (Figure 3 & Figure 10). The translator timing contact assemblies (STC1, STC2, STC3 and STC4) are located right hand of center on the front of the translator. The STC1, STC2, STC3 and STC4 timing contact assemblies are mounted by eight screws to a bracket on the bottom plate of the translator. Each timing contact assembly consists of a mounting block to which contacts are screwed, a contact operating arm secured by a roll pin through the mounting block, and a contact plunger. The timing contact assemblies are positioned on the bracket as follows:

1. Timing contact assembly STC1. Positioned on the extreme right hand end of the bracket.
2. Timing contact assembly STC2. Butted against the left hand side of the STC1 mounting block.
3. Timing contact assembly STC3. Butted against the left hand side of the STC2 mounting block.
4. Timing contact assembly STC4. Butted against the left hand side of the STC3 mounting block.

The rollers on the STC1, STC2, STC3 and STC4 timing contact assemblies follow the contours of two timing cams simultaneously. The upper ends of the operating arms move the contact plungers forward, operating the timing contacts.

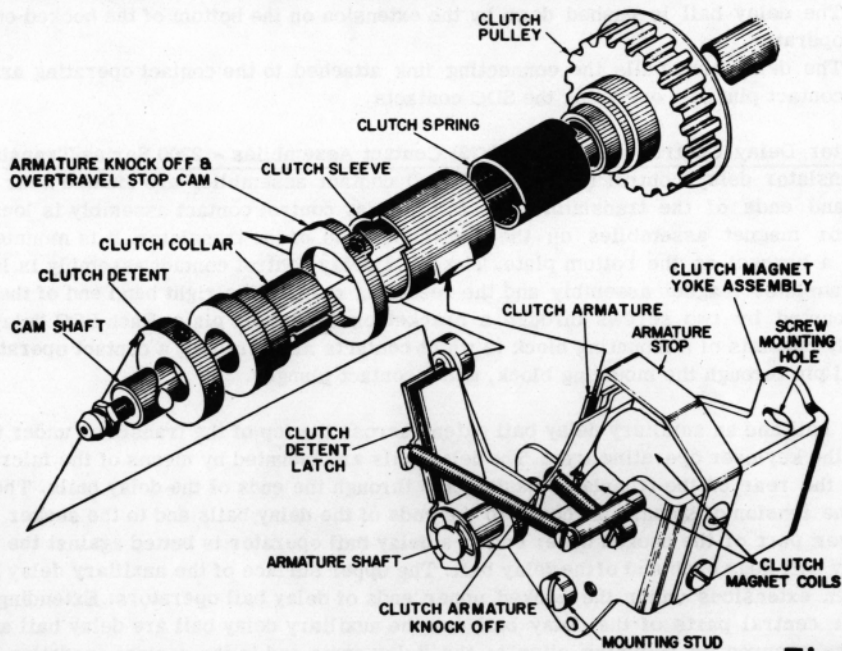


Figure 11.

Friden 2200/2300 SERIES MACHINES

Translator Delay Control (SDC) Contact Assembly - 2300 Series Translators (Figure 3 & Figure 10)
The translator delay control (SDC) contact assembly is located between the translator magnet assemblies. The SDC delay control contact assembly is mounted by two screws through a bracket on the bottom plate of the translator. The SDC delay control contact assembly consists of a mounting block to which contacts are screwed, a contact operating arm secured by a roll pin through the mounting block, and a contact plunger.

A delay bail extends across the top of the translator under the hooked upper ends of the keylever operating arms. The delay bail is mounted by means of the fulcrum rod passing through the rear of the translator casting and through each end of the delay bail. The delay bail is under the tension of springs anchored to each end of the delay bail and to the seeker spring support. Near each end of the casting the lower part of the hooked upper end of a delay bail operator is butted against the upper surface of the delay bail. Extending downward from the rear central part of the delay bail is the delay arm. A connecting link is secured by retaining clips to the delay arm and to the contact operating arm of the SDC delay control contact assembly. The SDC contact assembly is operated as follows:

1. Either one of the two delay bail operators butted against the delay bail is pulled down.
2. The delay bail is pushed down by the extension on the bottom of the hooked end of a delay bail operator.
3. The delay arm pulls the connecting link attached to the contact operating arm away from the contact plunger, operating the SDC contacts.

Translator Delay Control (SDC1 and SDC2) Contact Assemblies - 2200 Series Translator (Figure 10).
The translator delay control (SDC1 and SDC2) contact assemblies are located near the left hand and right hand ends of the translator. The SDC2 delay control contact assembly is located between two translator magnet assemblies on the left hand side of the translator. It is mounted by two screws through a bracket on the bottom plate. The SDC1 delay control contact assembly is located between a third translator magnet assembly and the restoring shaft on the right hand end of the translator. It is also mounted by two screws through a bracket on the bottom plate. Each SDC delay control contact assembly consists of a mounting block to which contacts are screwed, a contact operating arm secured by a roll pin through the mounting block, and a contact plunger.

A delay bail and an auxiliary delay bail extend across the top of the translator under the hooked upper ends of the keylever operating arms. The delay bails are mounted by means of the fulcrum rods passing through the rear of the translator casting and through the ends of the delay bails. The delay bails are under the tension of springs anchored to the ends of the delay bails and to the seeker spring supports. The lower part of the hooked upper end of a delay bail operator is butted against the upper surface of the delay bail near each end of the delay bail. The upper surface of the auxiliary delay bail is contacted by eleven extensions under the hooked upper ends of delay bail operators. Extending downward from the rear central parts of the delay bail and the auxiliary delay bail are delay bail arms. Connecting links are secured by retaining clips to the delay arms and to the contact operating arms of the SDC delay control contact assemblies. The SDC1 and the SDC2 contact assemblies are individually operated as follows:

1. A delay bail operator butted against the delay bail or against the auxiliary delay bail, is pulled down.
2. The delay bail or the auxiliary delay bail is pushed down by the extension on the bottom of the hooked end of a delay bail operator.
3. A delay arm pulls the connecting link attached to its associated contact operating arm away from its contact plunger, operating the SDC1 contacts or the SDC2 contacts.

Friden 2200/2300 SERIES MACHINES

Clutch Assembly (Figure 11). The clutch assembly controls the operation of the translator by controlling the transmission of mechanical power between the clutch pulley and the translator cam shaft. Control of power transmission is affected by friction between the clutch spring and the hub of the clutch pulley.

The clutch assembly includes the clutch detent, the clutch collar, the knock off & overtravel cam, the clutch sleeve, the clutch spring and the clutch pulley. One end of the spirally-wound clutch spring overlaps the hub of the clutch pulley; the other end overlaps the clutch collar.

The clutch detent and the clutch collar are setscrewed to the translator cam shaft. The knock off & overtravel cam is setscrewed to the clutch collar.

The clutch spring is closely wound of rectangular wire. The close tolerance to which the inside diameter of the clutch spring is held insures a secure grip on both the clutch pulley hub and the clutch collar. One end of the spring has a right angle bend which, by fitting into a slot in the clutch collar, anchors the clutch spring to the clutch collar. The opposite end of the clutch spring works against a square stud on the inside surface of the clutch sleeve.

Clutch Magnet Yoke Assembly (Figure 11). The upper portion of the clutch magnet yoke assembly is screwed to the right hand end of the translator casting. The lower portion of the clutch magnet yoke assembly is secured to the right hand end of the translator casting by the threaded end of a mounting stud passing through a hollow shaft extending across the bottom of the clutch magnet yoke assembly. Parallel and in front of the hollow shaft is the armature shaft. Mounted on the armature shaft are the collar (not shown) clutch armature assembly, clutch armature knock off assembly and the clutch detent latch assembly.

The armature consists of two metal plates separated by a layer of rubber bonded to the plates. The clutch magnet coils are mounted on the yoke by screws. The same screws also hold in place the armature stop, a bracket which supports the free end of the released armature assembly. At zero position of the clutch, clutch components are related as follows:

1. The clutch armature engages the clutch sleeve projection.
2. The clutch detent latch engages the clutch detent.

Torque about the armature shaft is applied to the armature, the detent latch and the clutch armature knock off assembly by spring tension.

THE SELECTOR

Friden 2200/2300 SERIES MACHINES

PURPOSE AND USE

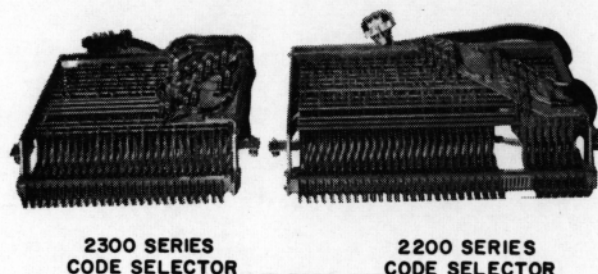


Figure 1.

The code selector (Figure 1) is a device for converting the mechanical operation of cam assemblies into coded electrical pulses. Each group of pulses is sent to the punch where each pulse causes a code hole to be punched in tape or in edge cards.

PHYSICAL DESCRIPTION

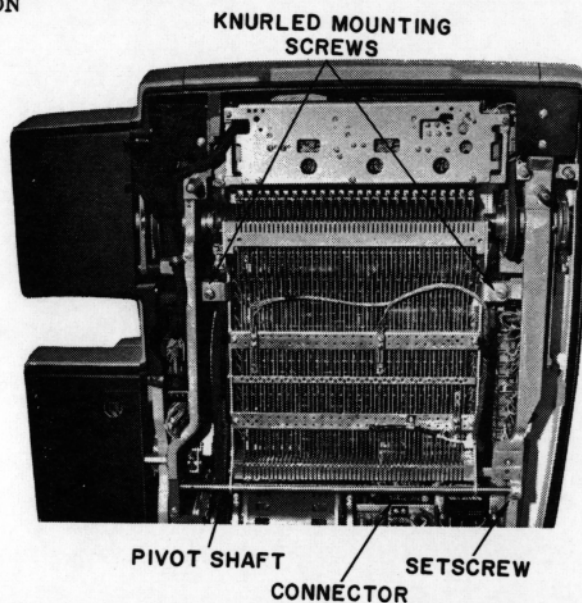


Figure 2.

General. The code selector is centrally located under the writing machine (Figure 2). It is mounted by means of a pivot shaft passing through holes in the rear of a left hand end plate and a right hand end plate. Each end of the shaft extends beyond the end plates into holes in the left hand and the right hand sides of the base casting. The right hand end of the shaft is secured by a setscrew through the bottom of the right hand base casting. The front of the code selector is removably mounted by two knurled screws passing through bent extensions on the end plates into the left hand and right hand sides of the base casting. Electrical connection between the code selector and the writing machine is by mating the male 75 position Amphenol connector on the end of the code selector cable with the female 75 position

Friden 2200/2300 SERIES MACHINES

Amphenol connector which is connected to the main cable of the Flexowriter. (On 2200 series machines electrical connection between the code selector and the writing machine is by mating the male 104 position Amphenol connector on the end of the code selector cable with the female 104 position Amphenol connector which is connected to the main cable of the Flexowriter.)

The code selector is constructed as a completely self-contained unit. The parts of the code selector are assembled between the left hand end plate and the right hand end plate.

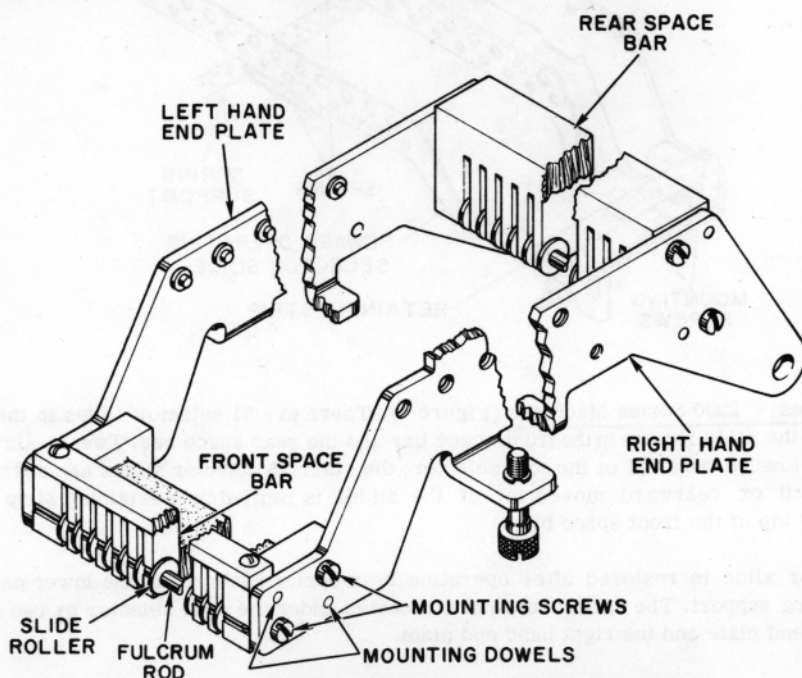


Figure 3.

Front Space Bar Assembly (Figure 3). The front space bar assembly is located on the extreme front of the code selector. It is mounted by two dowels and two screws through the left hand end plate and the right hand end plate. There are 51 vertical slots in the front space bar. Each slot contains a slide roller. (On 2200 series machines there are 72 vertical slots in the front space bar. Sixty five slots contain slide rollers.) The slide rollers are retained by a fulcrum rod passing through the front space bar and the slide rollers.

Rear Space Bar Assembly (Figure 3). The same as the front space bar assembly, but located at the rear of the code selector.

Friden 2200/2300 SERIES MACHINES

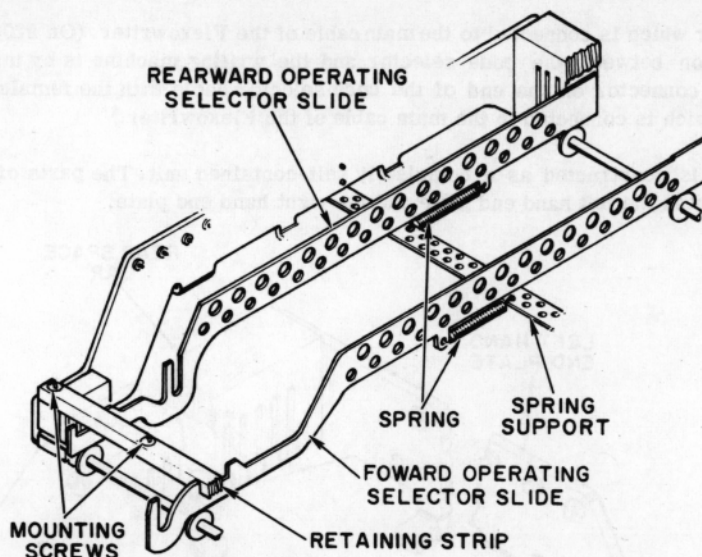


Figure 4.

Selector Slides - 2300 Series Machines (Figure 4). There are 51 selector slides in the code selector. They ride on the slide rollers in the front space bar and the rear space bar. Twenty-six selector slides are operated toward the front of the code selector; the other 25 selector slides are operated toward the rear. Forward or rearward movement of the slides is limited by a retaining strip mounted by six screws to the top of the front space bar.

Each selector slide is restored after operation by a spring anchored to the lower part of each slide and to a spring support. The spring support is mounted under the code selector by two screws through the left hand end plate and the right hand end plate.

Selector Slides - 2200 Series Machines (Figure 4). There are 65 selector slides arranged in two groups in the code selector. They ride on slide rollers in the front space bar and the rear space bar. Thirty-three of the selector slides are operated toward the front of the code selector; the remaining 32 selector slides are operated toward the rear. Forward or rearward movement of the slides is limited by a retaining strip mounted by eight screws to the front space bar.

Each selector slide is restored after operation by a spring anchored to the lower part of each slide and to a spring support. The spring support is mounted under the code selector by two screws through the left hand end plate and the right hand end plate.

Friden 2200/2300 SERIES MACHINES

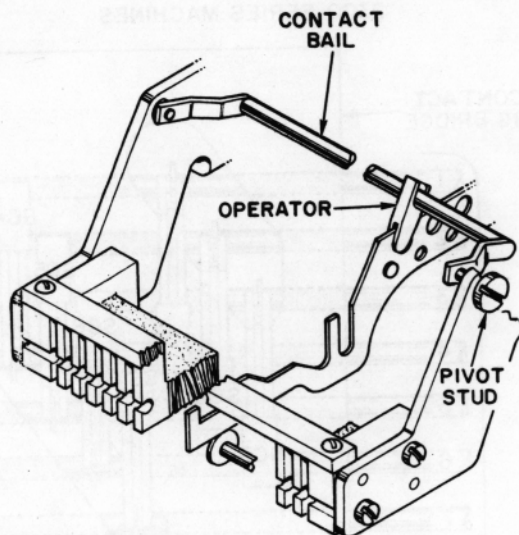


Figure 5.

Contact Bails (Figure 5). The contact bails extend across the top of the code selector. They are mounted by means of pivot studs projecting from the left hand end plate and the right hand end plate. The contact bails are further supported by operators. Each operator has a bifurcated end in which the contact bails rest; the other ends fit into holes in the selector slides.

Friden 2200/2300 SERIES MACHINES

2300 SERIES MACHINES

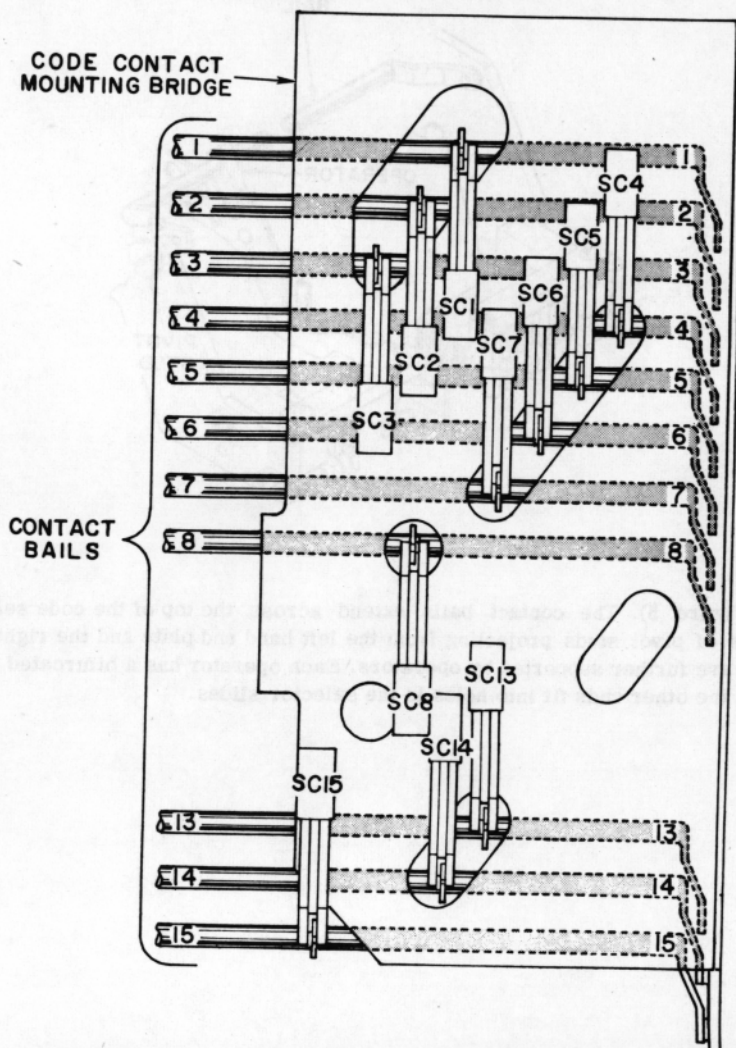


Figure 6.

Code Contact (SC) Mounting Bridge - 2300 Series Machines (Figure 6). The code contact (SC) mounting bridge is located over the contact bails on the top right hand side of the code selector. The rear of the bridge is mounted by a dowel and two screws through spacers to the rear space bar assembly. The front of the bridge is secured by a dowel and two screws through a bent extension on the right hand end plate. Selector code contacts SC1 through SC8, auxiliary contacts SC9 through SC11 and common contacts SC13 through SC15 are screw-mounted on the bridge. The contact operators extend through holes in the bridge to the contact bails. The contacts are operated when selected contact bails are lifted by a selector slide.

Friden 2200/2300 SERIES MACHINES

2200 SERIES MACHINES

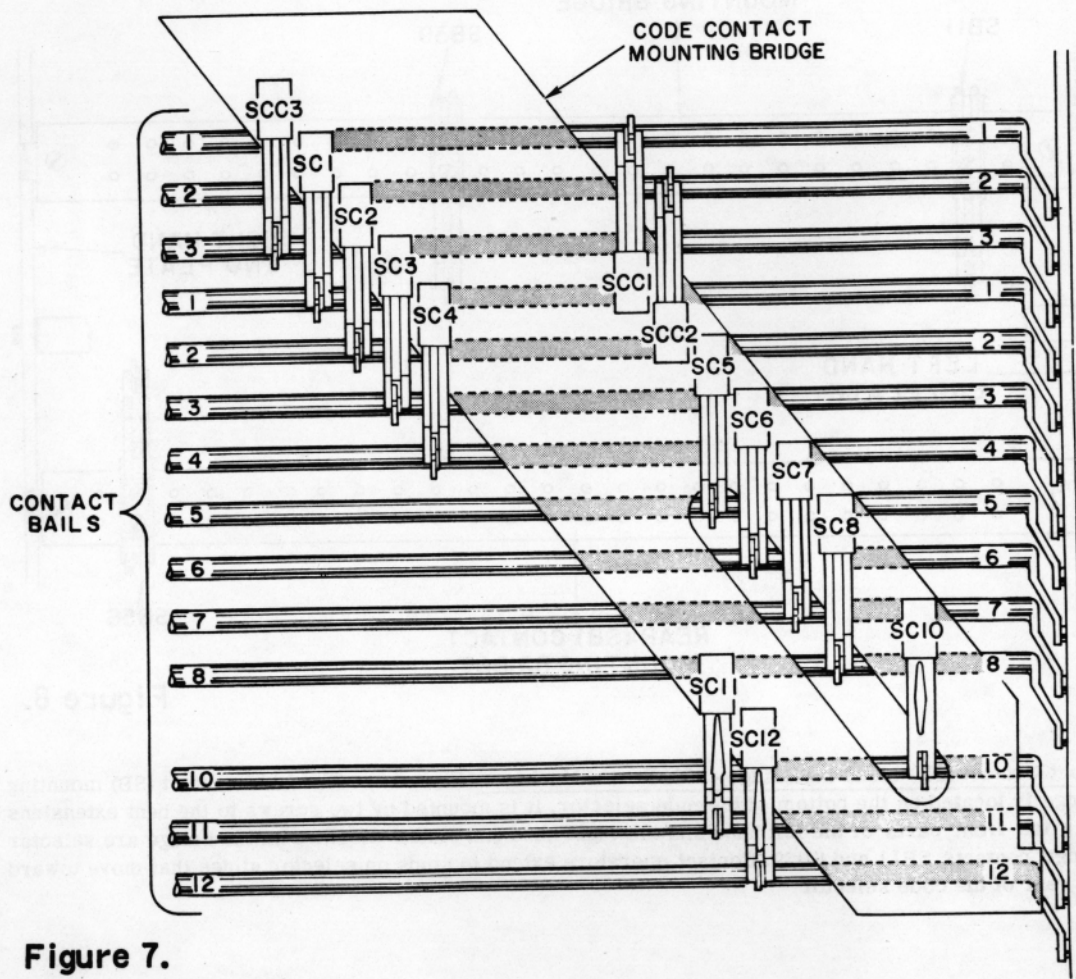


Figure 7.

Code Contact (SC) Mounting Bridge - 2200 Series Machines (Figure 7). The code contact (SC) mounting bridge is diagonally located over the contact bails on the top right hand side of the code selector. The rear of the bridge is mounted by a dowel and two screws through a spacer to the rear space bar assembly. The front of the bridge is secured by a dowel and two screws through a bent extension on the right hand end plate. Selector code contacts SC1 through SC8, SC10 through SC12 and selector common contacts SCC1, SCC2, and SCC3 are screw-mounted on the bridge. The contact operators extend downward at the left hand and right hand edges of the bridge to the contact bails. Contact operators also extend through a slot in the bridge to the contact bails. The contacts are operated when selected contact bails are lifted by a selector slide.

Friden 2200/2300 SERIES MACHINES

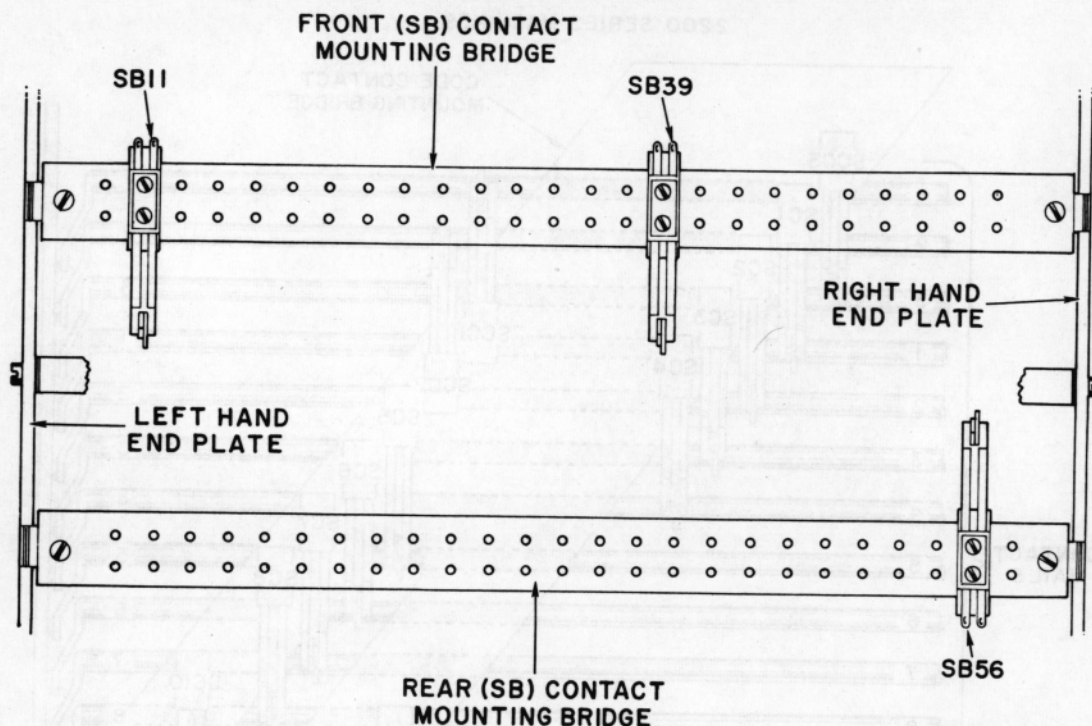


Figure 8.

Front Contact (SB) Mounting Bridge - 2300 Series Machines (Figure 8). The front contact (SB) mounting bridge is located on the bottom of the code selector. It is mounted by two screws to the bent extensions near the front parts of the left hand and the right hand end plates. Mounted on the bridge are selector bridge contacts SB11 and SB39. Contact operators extend to studs on selector slides that move toward the rear of the code selector.

Friden 2200/2300 SERIES MACHINES

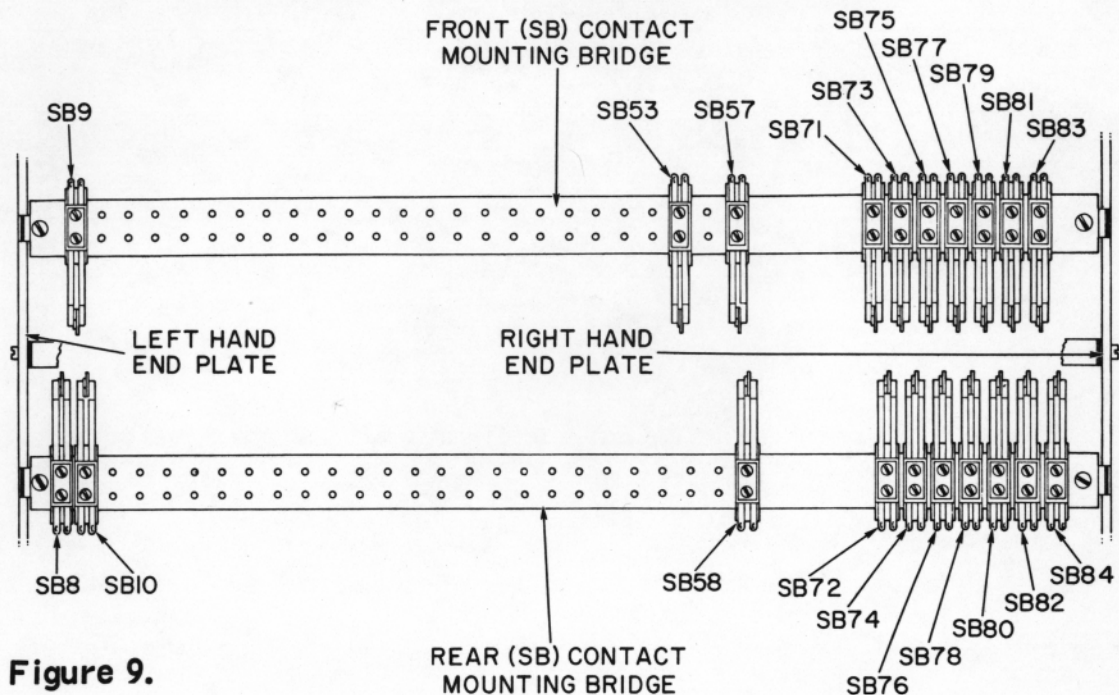


Figure 9.

Front Contact (SB) Mounting Bridge - 2200 Series Machines (Figure 9). The same as the 2300 series front contact mounting bridge except the selector bridge contacts differ. Mounted on the 2200 series front contact bridge are selector bridge contacts SB9, SB53, SB57, SB71, SB73, SB75, SB77, SB79, SB81 and SB83.

Rear Contact (SB) Mounting Bridge - 2300 Series Machines (Figure 8). The rear contact (SB) mounting bridge is located on the bottom of the code selector. It is mounted by two screws to the bent extensions near the rear parts of the left hand and the right hand end plates. Mounted on the rear bridge are selector bridge contacts SB56. A contact operator extends to a stud on a selector slide that operates toward the front of the code selector.

Rear Contact (SB) Mounting Bridge - 2200 Series Machines (Figure 9). The same as the 2300 series front contact mounting bridge except the selector bridge contacts differ. Mounted on the 2200 series rear contact bridge are selector bridge contacts SB8, SB10, SB58, SB72, SB74, SB76, SB78, SB80, SB82 and SB84.

Figure 9. 2500/2300 Series Machines



The 2500/2300 Series Machine is a high-speed, high-precision machine designed for the production of high-quality, high-precision parts. It is capable of producing parts with a tolerance of ± 0.0005 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches.

The 2500/2300 Series Machine is a high-speed, high-precision machine designed for the production of high-quality, high-precision parts. It is capable of producing parts with a tolerance of ± 0.0005 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches.

The 2500/2300 Series Machine is a high-speed, high-precision machine designed for the production of high-quality, high-precision parts. It is capable of producing parts with a tolerance of ± 0.0005 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-speed production, with a maximum production rate of 1000 parts per hour. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches. The machine is designed for high-precision production, with a maximum precision of ± 0.0005 inches. It is capable of producing parts with a maximum length of 100 inches and a maximum diameter of 10 inches.

Friden 2200/2300 SERIES MACHINES

THE TAPE & EDGE CARD PUNCH

Figure 1

Two models of the punch are available. The tape punch (Figure 1) punch and performs on perforated tape and the edge card punch which has facilities for punching holes in edge cards.

PHYSICAL DESCRIPTION



Figure 2

Friden 2200/2300 SERIES MACHINES

PURPOSE AND USE

The punch manufactures coded tapes or edge cards. It is an electromagnetically controlled perforating mechanism. It punches coded holes in a tape or in edge cards. The configuration of the holes punched is determined by the electrical pulses received by the punch from the selector. The punch transforms groups of coded electrical pulses received from the code selector into codes in tape or in edge cards.

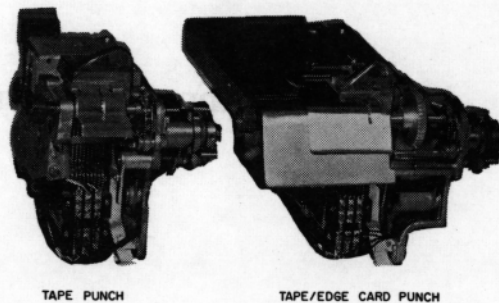


Figure 1.

Two models of the punch are available; the tape punch (Figure 1) which has facilities for perforating tape only, and the tape/edge card punch which has facilities for perforating tape or edge cards.

PHYSICAL DESCRIPTION

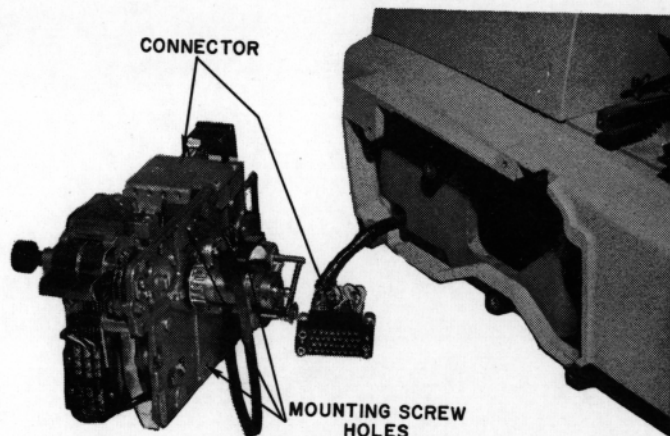


Figure 2.

Friden 2200/2300 SERIES MACHINES

General - The punch is located on the rear left hand side of the Flexowriter (Figure 2). It is shock-mounted to the left hand side of the base casting of the writing machine by three screws. Mechanical connection to the writing machine is by a cog engaging the clutch pulley and the jack shaft pulley. Electrical connection between the tape punch and the writing machine is by mating the male 34 position Amphenol connector mounted on the rear of the tape punch with the female 34 position Amphenol connector which is connected to the main cable of the Flexowriter.

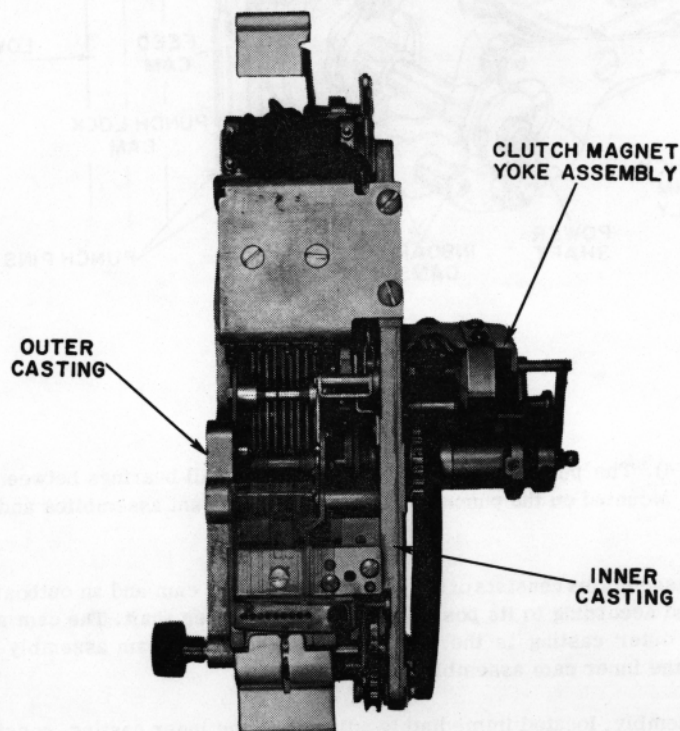


Figure 3.

The punch is a self-contained unit constructed on two castings, the inner casting and the outer casting. All the punch components with the exception of the punch clutch and the clutch magnet yoke assembly are mounted on the inner casting or between the inner casting and the outer casting (Figure 3).

Friden 2200/2300 SERIES MACHINES

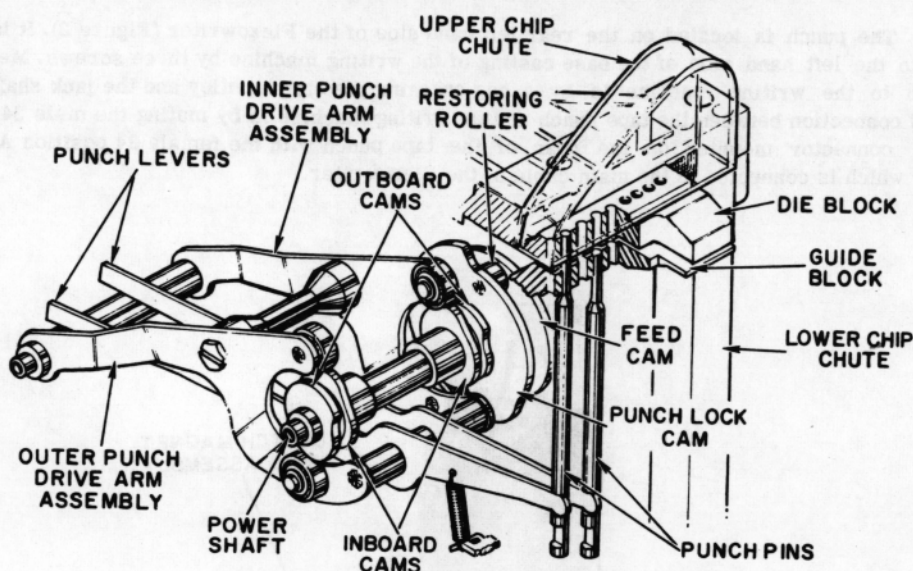


Figure 4.

Power Shaft (Figure 4). The punch power shaft is mounted in ball bearings between the inner casting and the outer casting. Mounted on the punch power shaft are two cam assemblies and one cam & roller assembly.

Each of the two cam assemblies consists of two cams - an inboard cam and an outboard cam. Each cam assembly is designated according to its position on the punch power shaft. The cam assembly immediately adjacent to the outer casting is the outer cam assembly. The cam assembly located slightly to the right of center is the inner cam assembly.

The cam & roller assembly, located immediately adjacent to the inner casting, consists of two cams - the feed cam and the punch lock cam. The restoring roller is mounted between the feed cam and the punch lock cam.

Arm Lever Assembly (Figure 4). Riding the cams on both the inner and outer cam assemblies are two pair of rollers. Each pair of rollers is a part of a punch drive arm assembly. The upper rollers follow the contour of the inboard cams; the lower rollers follow the contour of the outboard cams. There are two punch drive arm assemblies, inner and outer. Between the punch drive arm assemblies are the punch levers. The punch drive arm assemblies together with the punch levers, shafts and rollers comprise the punch arm lever assembly. The punch arm lever assembly is the mechanism by which the motion of the punch pins is controlled.

Perforating Mechanism (Figure 4). Mounted on the front end of each of the eight punch levers is a punch pin. The end of each punch lever fits into a slot near the butt of the punch pin. The punch pins

Friden 2200/2300 SERIES MACHINES

extend upward through the punch guide block and into the punch die block. Mounted by one screw to the punch die block is the transparent plastic upper chip chute. The upper chip chute protects the punch pins and guides the chat (paper slugs) into the lower chip chute. The chad is conducted out of the punch assembly by the lower chip chute.

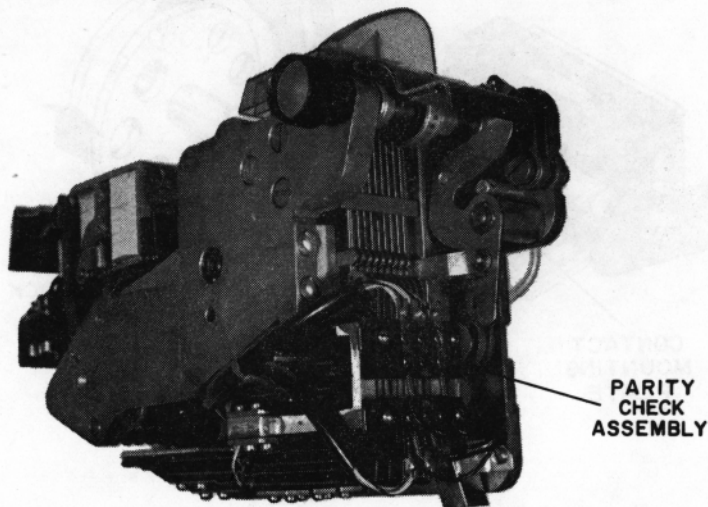


Figure 5.

Parity Check Assembly (Figure 5) The parity check assembly is mounted by two screws through the inner casting. It is located at the front of the punch immediately under the punch pins. The parity check contact operators are connected to the punch pins by means of slots in the extreme butt ends of the punch pins.

Friden 2200/2300 SERIES MACHINES

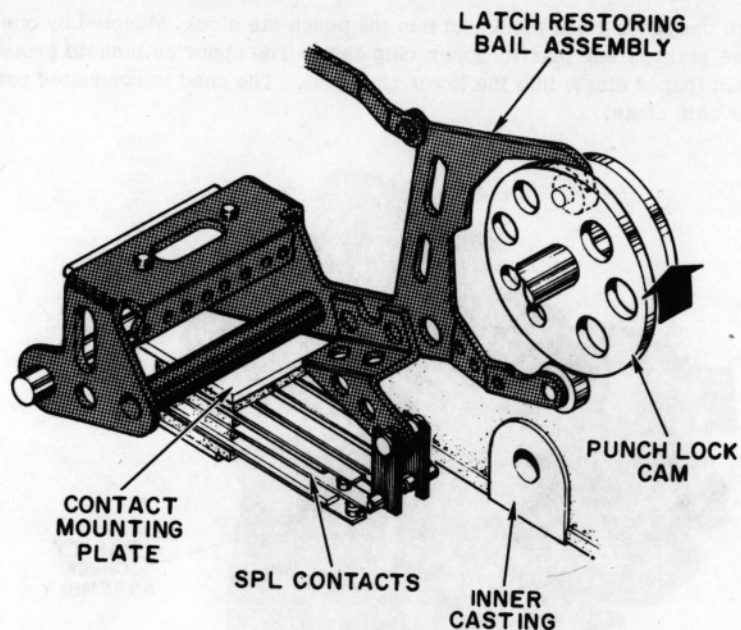


Figure 6.

Punch Lock (SPL) Contacts (Figure 6). The roller on the latch restoring bail assembly follows the contour of the punch lock cam. The lower part of the latch restoring bail assembly carries the contact operators of the punch lock (SPL) contacts. The punch lock (SPL) contacts are screwed to the contact mounting plate. The contact mounting plate is mounted by three screws to the recessed lower rear edge of the inner casting.

Friden 2200/2300 SERIES MACHINES

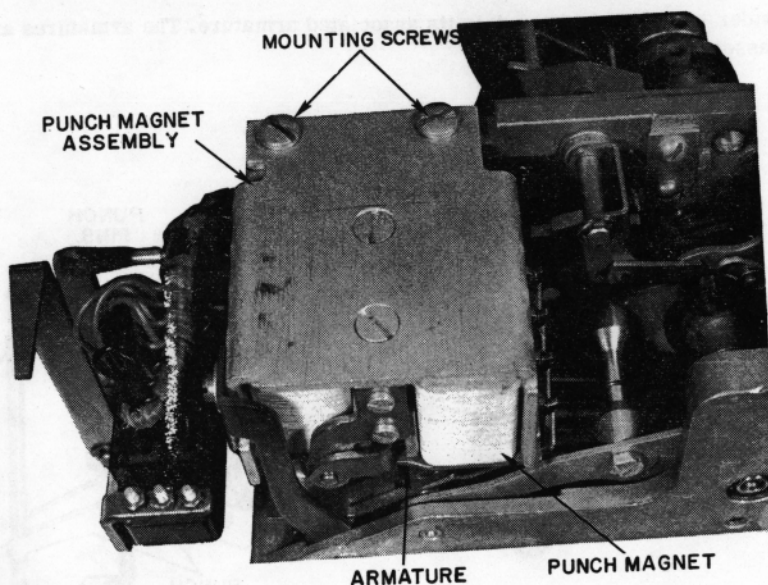


Figure 7A.

Punch Magnet Assembly (Figure 7A). The punch magnet assembly mounts by two screws to the upper rear edge of the inner casting. Its vertical position is determined by shims. The punch magnet assembly contains the individual punch magnets. Each punch magnet is mounted in the indicated position relative to the others and numbered according to the punch pin it causes to be operated as shown in Figure 7B.

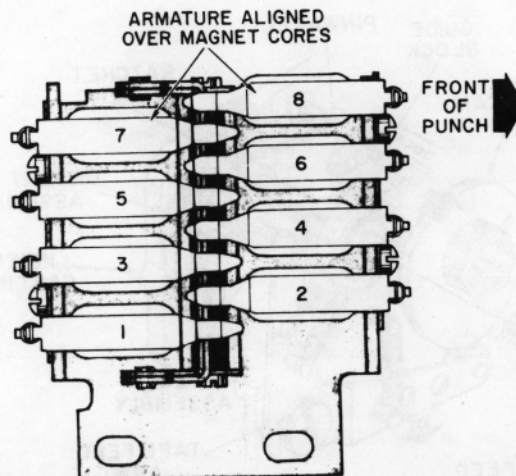


Figure 7B.

Friden 2200/2300 SERIES MACHINES

Immediately under each punch magnet is its associated armature. The armatures are mounted to the punch magnet assembly by spring tension.

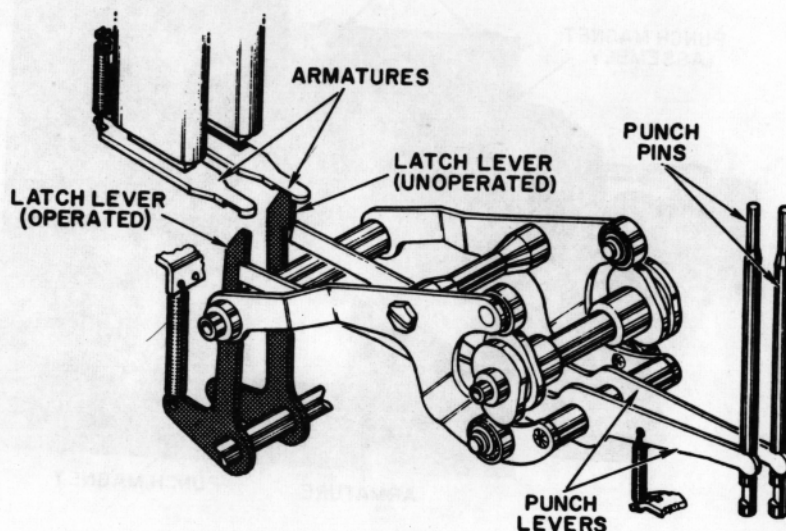


Figure 8.

Latch Levers (Figure 8). Operation of the latch levers determines which punch pins will operate. Each unoperated latch lever is restrained by its contact with the groove in the tip of its magnet armature. The latch lever in its operated condition is released by the attracted armature, is pivoted in a clockwise direction on its shaft and is latched over the extreme rear tip of the punch lever.

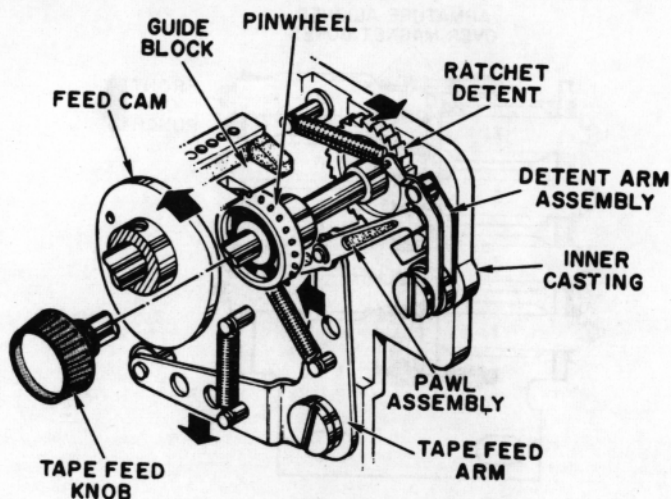


Figure 9.

Friden 2200/2300 SERIES MACHINES

Tape Feed Mechanism - Tape Punch (Figure 9). The tape feed mechanism is located at the extreme upper front of the tape punch assembly. Tape feed is controlled by interaction of the roller on the tape feed arm & pawl assembly and the feed cam on the cam & roller assembly. The pawl on the tape feed arm & pawl assembly engages the ratchet detent on the pinwheel & ratchet detent assembly. The ratchet detent is held in position by the roller of the detent arm assembly. The pins on the pinwheel are centered in the slots in the guide block and in the tape feed pressure arm assembly.

The radial position of the pinwheel & ratchet detent assembly can be changed by rotating the tape feed knob. The knob is secured to the pinwheel shaft by means of a compression ring around the neck of the tape feed knob.

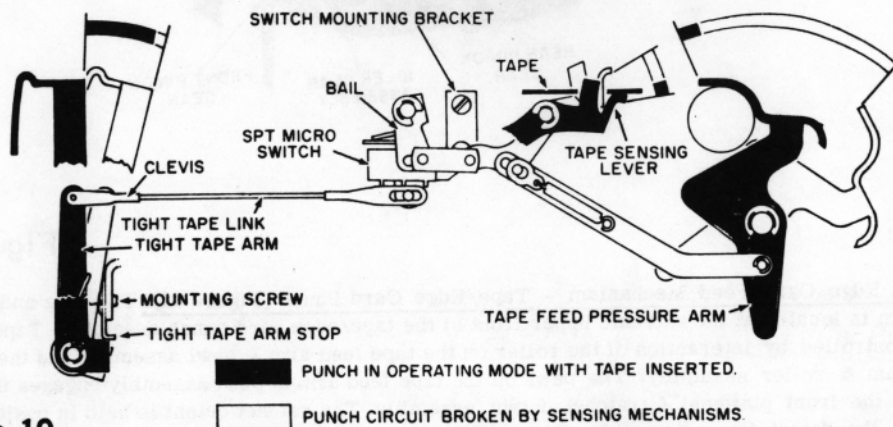


Figure 10.

Tight Tape (SPT) Micro Switch (Figure 10). The tight tape (SPT) micro switch is mounted by a bracket which is screwed to the inner casting. The SPT micro switch operates in the event of tight tape, tape run out (tape sensing lever) or lowering of the tape feed pressure arm. Because each of them is linked to the SPT micro switch, operation of the tight tape arm, the tight tape sensing lever or the tape feed pressure arm causes the operation of the SPT micro switch.

Friden 2200/2300 SERIES MACHINES

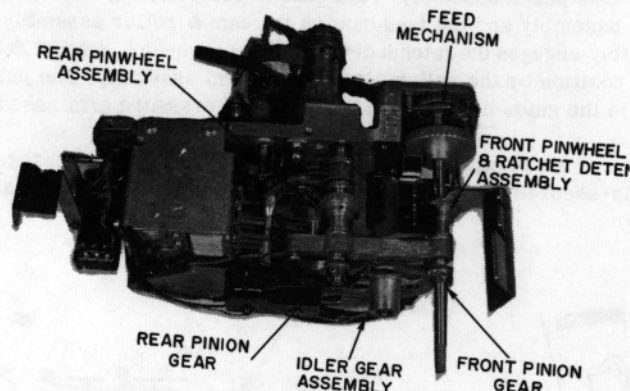


Figure 11.

Tape and Edge Card Feed Mechanism - Tape/Edge Card Punch (Figure 11). The tape and card feed mechanism is located at the extreme upper front of the tape/edge card punch assembly. Tape and card feed is controlled by interaction of the roller on the tape feed arm & pawl assembly and the feed cam on the cam & roller assembly. The pawl on the tape feed arm & pawl assembly engages the ratchet detent on the front pinwheel & ratchet detent assembly. The ratchet detent is held in position by the roller on the detent lever assembly. The pins on the pinwheel are centered in the slots in the guide block and in the tape feed pressure arm assembly. Setscrew on the front pinwheel shaft is the front pinwheel gear. The front pinwheel gear is in mesh with the idler gear assembly. The idler gear is mounted by means of a plate which is screwed to the outer casting. Also in mesh with the idler gear assembly is the rear pinwheel gear setscrew to the shaft of the rear pinwheel assembly.

The front and rear pinwheels are aligned front to rear. The perforated feed holes in the edge cards fit over the front and rear pinwheels.

The radial position of the front and rear pinwheels can be changed by rotating the card feed knob. The card feed knob is secured to the shaft of the front pinwheel & ratchet detent assembly. The radial position of the front and rear pinwheels can also be changed by rotating the tape feed knob. The knob is secured to the shaft of the front pinwheel & ratchet detent by means of a compression ring around the neck of the tape feed knob.

Friden 2200/2300 SERIES MACHINES

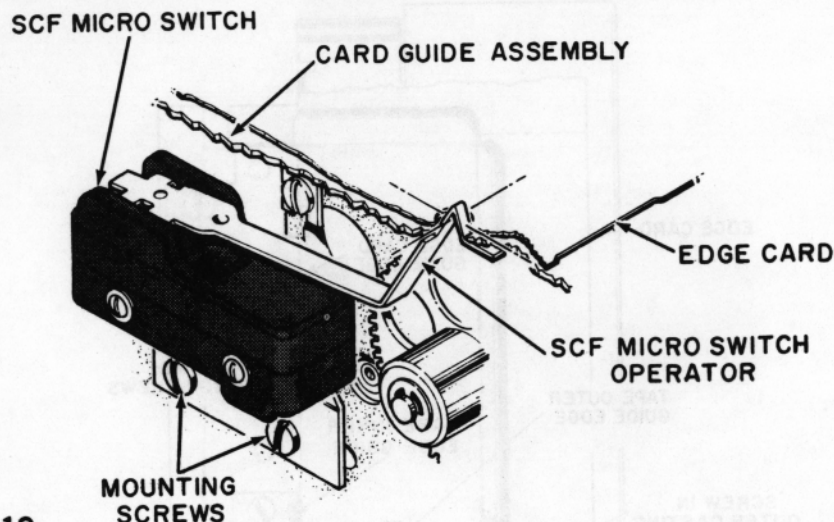


Figure 12.

Card Feed (SCF) Micro Switch - Tape/Edge Card Punch (Figure 12). The card feed (SCF) micro switch is mounted by means of a bracket which is screwed to the outer casting. The tip of the micro switch operating arm is formed and extends upward protruding through a hole in the surface of the card guide assembly. The SCF micro switch is operated until the micro switch hole in the edge cards pass over the protruding tip of the micro switch operating arm.

Friden 2200/2300 SERIES MACHINES

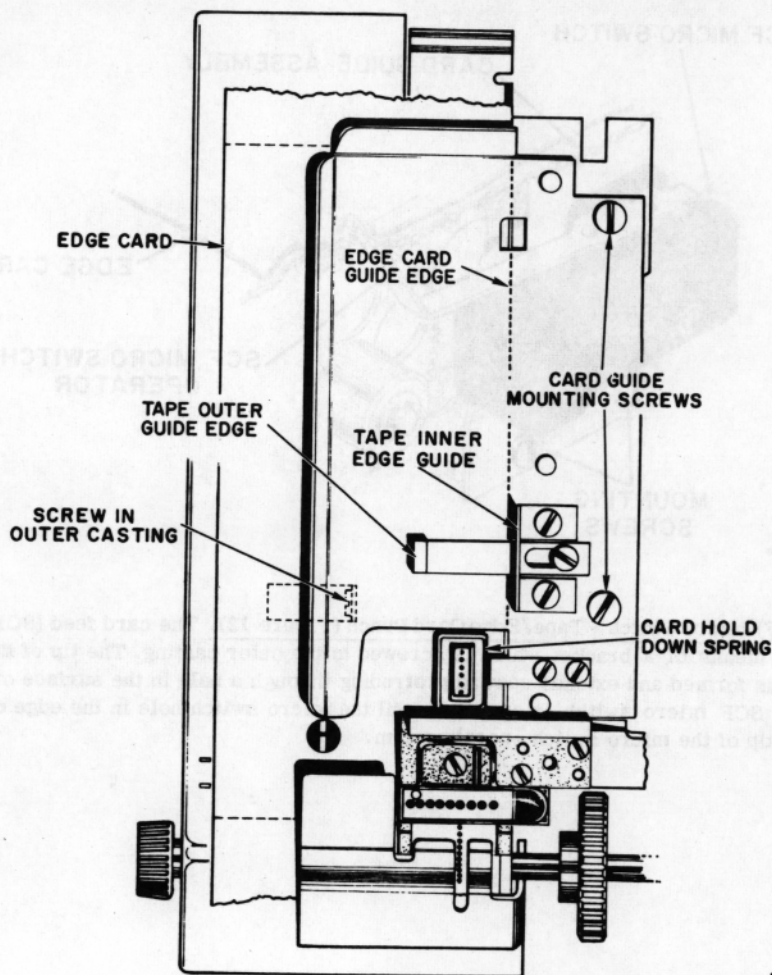


Figure 13.

Card Guide Assembly - Tape/Edge Card Punch (Figure 13). The card guide assembly mounts by two screws to the upper edge of the inner casting. Its vertical position is determined by shims and by a screw threaded into the outer casting. Screw-mounted on the upper level of the card guide assembly are the tape inner edge guide, the tape outer edge guide and the card hold down spring.

When tape is used in the tape/edge card punch, it is guided to the punching station by means of the inner and the outer tape edge guides. When edge cards are used, they are guided to the punching station by the guiding edge of a plate riveted between the lower level and the upper level of the card guide assembly. The card hold down spring holds the pinfeed holes in the edge cards over the pins on the rear pinwheel.

Friden 2200/2300 SERIES MACHINES

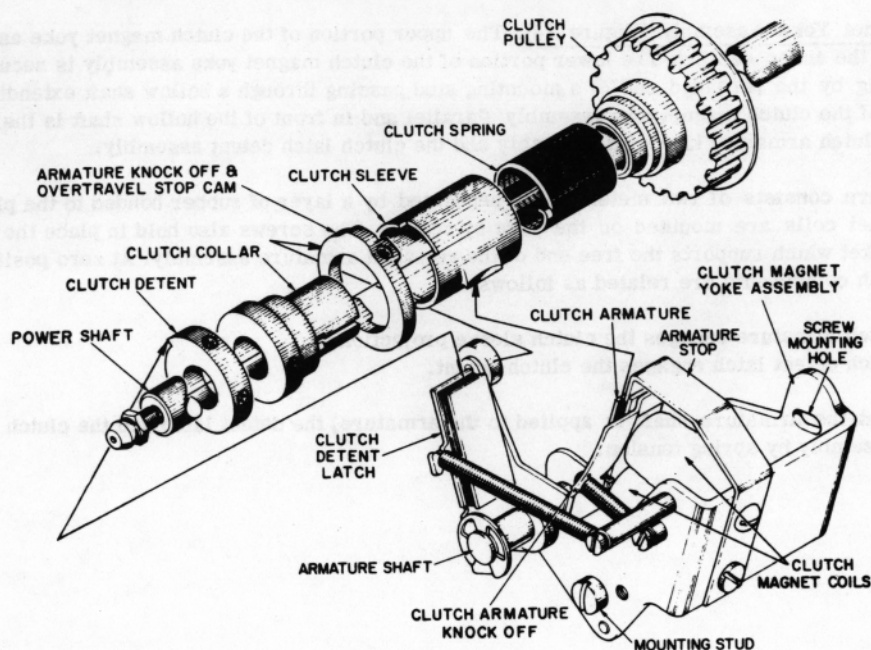


Figure 14.

Clutch Assembly (Figure 14). The clutch assembly controls the operation of the punch by controlling the transmission of mechanical power between the clutch pulley and the punch power shaft. Control of power transmission is effected by friction between the clutch spring and the hub of the clutch pulley.

The clutch assembly includes the clutch detent, the clutch collar, the knock off & overtravel cam, the clutch sleeve, the clutch spring and the clutch pulley. One end of the spirally-wound clutch spring overlaps the hub of the clutch pulley; the other end overlaps the clutch collar.

The clutch detent and the clutch collar are setscrewed to the power shaft. The knock off & overtravel cam is setscrewed to the clutch collar.

The clutch spring is closely wound of rectangular wire. The close tolerance to which the inside diameter of the clutch spring is held insures a secure grip on both the clutch pulley hub and the clutch collar. One end of the spring has a right angle bend which, by fitting into a slot in the clutch collar, anchors the clutch spring to the clutch collar. The opposite end of the clutch spring works against a square stud on the inside surface of the clutch sleeve.

Friden 2200/2300 SERIES MACHINES

Clutch Magnet Yoke Assembly (Figure 14). The upper portion of the clutch magnet yoke assembly is screwed to the inner casting. The lower portion of the clutch magnet yoke assembly is secured to the inner casting by the threaded end of a mounting stud passing through a hollow shaft extending across the bottom of the clutch magnet yoke assembly. Parallel and in front of the hollow shaft is the armature assembly, clutch armature knock off assembly and the clutch latch detent assembly.

The armature consists of two metal plates separated by a layer of rubber bonded to the plates. The clutch magnet coils are mounted on the yoke by screws. The screws also hold in place the armature stop, a bracket which supports the free end of the released armature assembly. At zero position of the clutch, clutch components are related as follows:

1. The clutch armature engages the clutch sleeve projection.
2. The clutch detent latch engages the clutch detent.

Torque about the armature shaft is applied to the armature, the detent latch and the clutch armature knock off assembly by spring tension.

Friden 2200/2300 SERIES MACHINES

INTRODUCTION

This section contains detailed explanations of all assemblies within the FLEXOWRITER Automatic Writing Machine. All explanations are supported by illustrations to aid both the experienced service technician and those technicians learning the Flexowriter for the first time.

The assemblies are presented in the order in which they are operated during normal machine operation. Many assemblies indirectly affect machine operation; for example, platen indexing, impression control, ribbon feed, and so forth. These assemblies are presented in a logical manner which does not disrupt the continuity of machine operation.

Included in each explanation is the function of the assembly, as well as its operation. Many assemblies perform more than one function. In such cases, the operations are explained in the order in which they occur. For example, many assemblies perform a latching and unlatching operation; the latching operation is always explained first. Or, many assemblies perform a mechanical action, and, at the same time, open or close an electrical circuit. In these instances, the mechanical actions are explained first.

The nomenclatures used in this section are as they appear in the 2200/2300 Series Parts Manual.

Philbin 2200/2300 SERIES MACHINES

INTRODUCTION

This section contains detailed explanations of all assemblies which the PHILBIN 2200/2300 SERIES MACHINES perform. All explanations are explained by illustrations as well as the expected service technician and those technicians learning the Philbin for the first time.

The assemblies are presented in the order in which they are operated during normal machine operation. Many assemblies indirectly affect machine operation, for example, when internal, inspection control, ribbon feed, and so forth. These assemblies are presented in a logical manner, which does not disrupt the continuity of machine operation.

Included in each explanation is the function of the assembly, as well as its operation. Many assemblies perform more than one function. In such cases, the operation is explained in the order in which they occur. For example, many assemblies perform a function and maintain operation, the latching operation is always explained first. Or, many assemblies perform a mechanical function, and, at the same time, open or close an electrical circuit. In these instances, the mechanical action is explained first.

The nomenclatures used in this section are as they appear in the 2200/2300 Series Parts Manual.

Friden 2200/2300 SERIES MACHINES

POWER DRIVE MECHANISM

The function of the power drive mechanism is to supply all the mechanical power required to operate the FLEXOWRITER automatic writing machine (Figure 1).

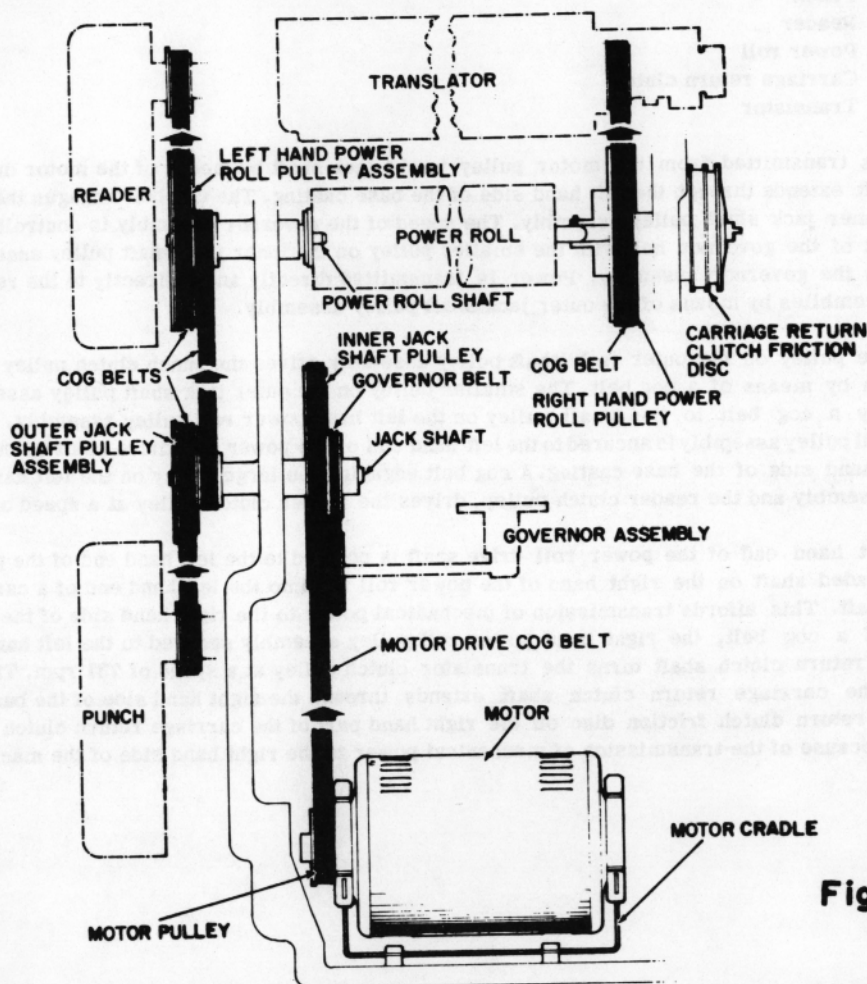


Figure 1.

Electrical power to the motor is controlled by the power switch located on the right hand side of the keyboard. The motor has no brushes or internal contacts, is not self-starting, and is grounded to the machine by a conductor. With power applied to the motor, the starting relay energizes the starting coil in the motor. When proper operating speed is attained, the main motor winding controls the output speed and the starting coil is de-energized.

Friden 2200/2300 SERIES MACHINES

The power drive mechanism transmits power to the various assemblies in the FLEXOWRITER automatic writing machine by means of cog belts and pulleys.

The following assemblies are operated by the power drive mechanism:

1. Tab governor
2. Punch
3. Reader
4. Power roll
5. Carriage return clutch
6. Translator

Power is transmitted from the motor pulley to the jack shaft by means of the motor drive belt. The jack shaft extends through the left hand side of the base casting. The cog belt engages the large pulley on the inner jack shaft pulley assembly. The speed of the governor assembly is controlled by the engagement of the governor belt with the smaller pulley on the inner jack shaft pulley assembly and the pulley on the governor assembly. Power is transmitted directly and indirectly to the remaining machine assemblies by means of the outer jack shaft pulley assembly.

The large pulley on the outer jack shaft pulley assembly drives the punch clutch pulley at a speed of 1044 rpm by means of a cog belt. The smaller pulley on the outer jack shaft pulley assembly is connected by a cog belt to the small pulley on the left hand power roll pulley assembly. The left hand power roll pulley assembly is secured to the left hand end of the power roll drive shaft extending through the left hand side of the base casting. A cog belt engaging the large pulley on the left hand power roll pulley assembly and the reader clutch pulley, drives the reader clutch pulley at a speed of 731 rpm.

The right hand end of the power roll drive shaft is coupled to the left hand end of the power roll. A spring loaded shaft on the right hand of the power roll fits into the left hand end of a carriage return clutch shaft. This affords transmission of mechanical power to the right hand side of the machine. By means of a cog belt, the right hand power roll pulley assembly secured to the left hand part of the carriage return clutch shaft turns the translator clutch pulley at a speed of 731 rpm. The right hand end of the carriage return clutch shaft extends through the right hand side of the base casting. A carriage return clutch friction disc on the right hand part of the carriage return clutch shaft is also rotated because of the transmission of mechanical power to the right hand side of the machine.

Friden 2200/2300 SERIES MACHINES

KEYLEVERS

Some of the keylevers in the writing machine keyboard are used to initiate typebar actions which result in the printing of characters; others are used to initiate various machine operations. Manually, the keylevers are operated by depressing their corresponding keybuttons. They are automatically operated by keylever operating arms located in the translator. The upper ends of the keylever operating arms are positioned over the studs on the right hand sides of the keylevers. In either case, the keylevers do not directly cause printing. A keylever releases its associated cam assembly which is rotated by the power roll to cause printing or a machine function. Once a cam is released the keylever function ceases; therefore, typing quality and subsequent machine functions are independent of operator touch.

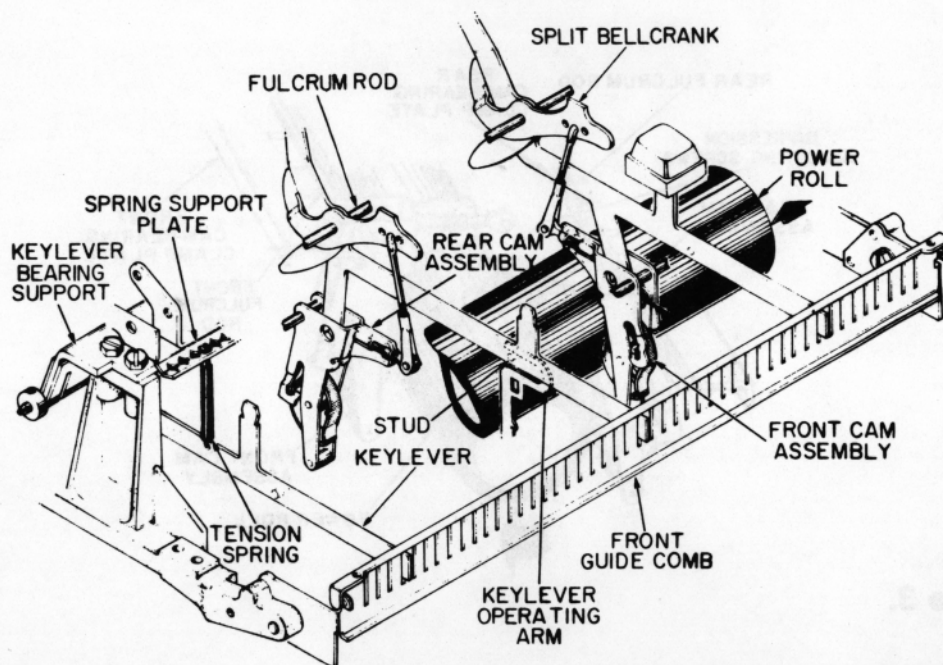


Figure 2.

The keylevers are mounted on the fulcrum rod which is held by the keylever bearing support in the power frame. This is the pivot point for keylevers and split bellcranks. The keylevers are held in position against the top of the front guide comb by tension springs anchored to the spring support plate by spring adjusting screws. When depressed, they are guided by the slots in the front guide comb.

Friden 2200/2300 SERIES MACHINES

An extension of the keylevers extends downward through the power frame to engage the cam release levers in the cam assemblies. Since all keylevers pivot at the rear, these lower extensions move in an arc downward and to the rear.

The keylevers have four basic configurations which correspond to the four rows of keybuttons on the keyboard. The two rear rows of keybuttons operate keylevers connected to the rear cam assemblies; the two front rows operate keylevers connected to the front cam assemblies (Figure 2).

CAM ASSEMBLIES AND TYPING TRAIN MECHANISM

The cam assemblies are divided into two groups, the front cam assemblies and the rear cam assemblies, as shown in Figure 3.

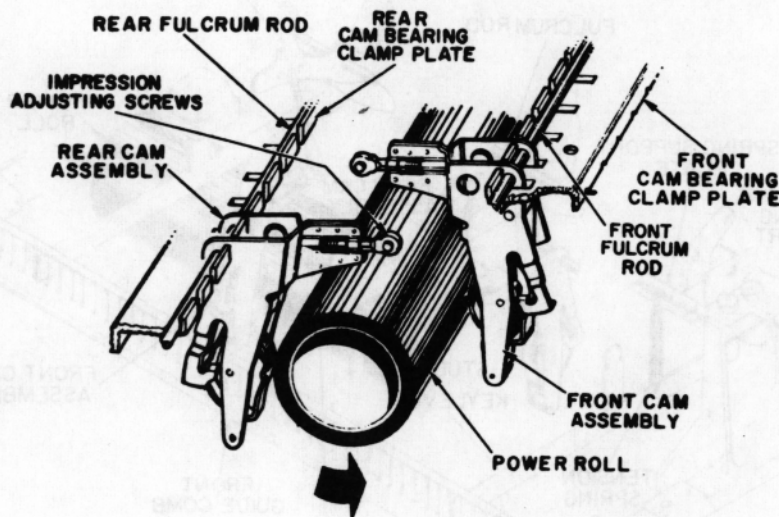


Figure 3.

The cam assemblies transform the operator's touch or the movement of a trip lever by the translator into a uniform force to operate a typebar. When released, the cam assemblies initiate and terminate an automatic operation of the machine. They also initiate an operation of the code selector to open or close various electrical circuits in the machine.

Friden 2200/2300 SERIES MACHINES

The five types of cams required for the writing machine are shown in Figure 4.

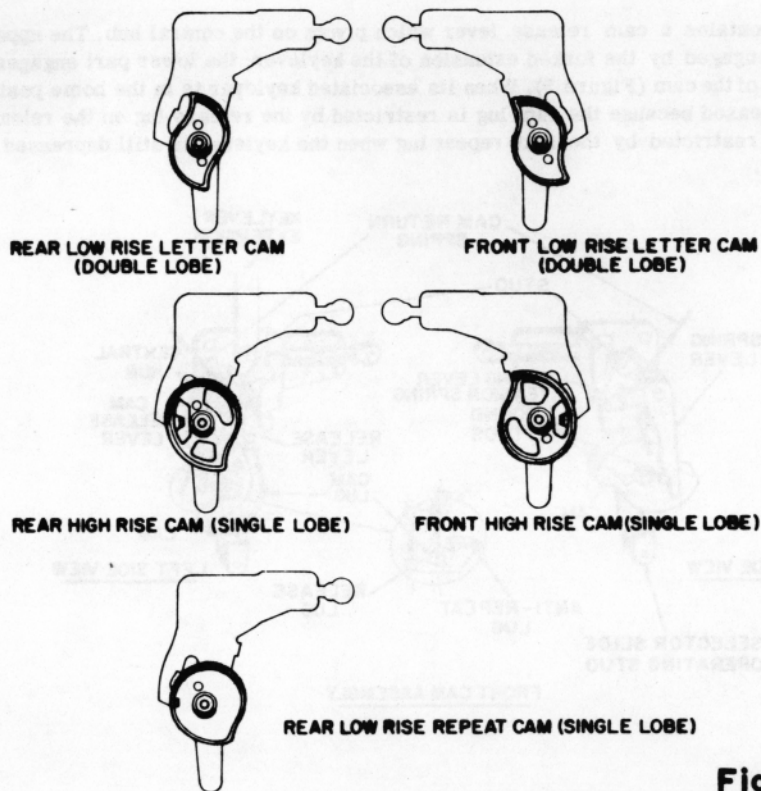


Figure 4.

<u>TYPE</u>	<u>FUNCTION</u>	<u>WHEN REQUIRED</u>
1. Rear Low-Rise Letter Cam	Printing	For normal operating time.
2. Front Low-Rise Letter Cam	Printing, spacing, segment support shifting	For normal operating time.
3. Rear High-Rise Cam	Tab latching and back spacing	For longer operating time and greater leverage.
4. Front High-Rise Cam	Carriage return latching	For longer operating time and greater leverage.

Friden 2200/2300 SERIES MACHINES

<u>TYPE</u>	<u>FUNCTION</u>	<u>WHEN REQUIRED</u>
5. Rear Low-Rise Repeat Cam	Carriage return and tab unlatching	For longer operating time.

Each cam assembly contains a cam release lever which pivots on the central hub. The upper part of the release lever is engaged by the forked extension of the keylever; the lower part engages the cam lug on the left hand side of the cam (Figure 5). When its associated keylever is in the home position (up), the cam cannot be released because the cam lug is restricted by the release lug on the release lever. The cam lug is also restricted by the anti-repeat lug when the keylever is still depressed after the cam has been released.

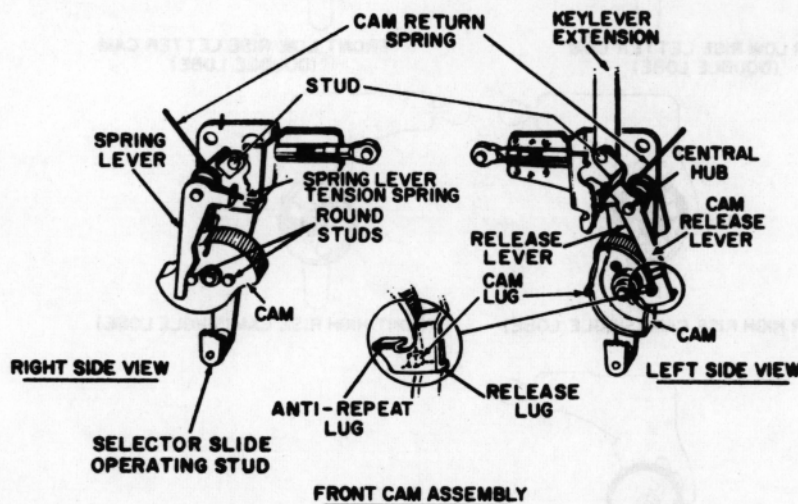


Figure 5.

The cam assembly operates when the cam is rotated by the power roll. The spring lever provides the tension necessary to allow the cam to be rotated. The spring lever also provides the tension required to hold the cam engaged with the lugs on the cam release lever. The spring lever provides the proper tension by applying pressure against the round studs on the right hand side of the cam.

Friden 2200/2300 SERIES MACHINES

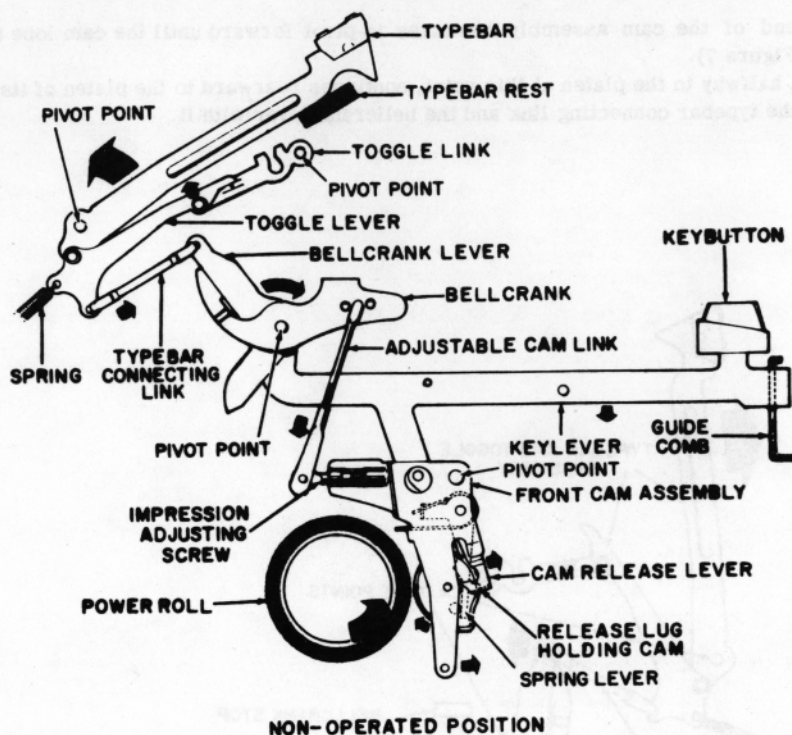


Figure 6.

The front and rear cams are released in the same manner; only the direction of movement is different (Figure 6). A front cam assembly operates as follows:

1. The keylever extension moves the stud on the upper part of the cam release lever to the rear.
2. The release lug on the lower part of the cam release lever pivots forward, away from the lug on the cam.
3. Spring lever pressure is applied to the lower stud on the cam and the bottom of the cam pivots to the rear until its serrated surface is against the power roll.
4. The power roll rotates the cam, causing the bottom of the cam assembly to pivot forward.
5. When the cam lever is pivoted forward, the adjustable cam link is pulled downward to rotate the bellcrank on its pivot point.
6. When the bellcrank pivots it pushes the bellcrank lever forward, which in turn pulls the typebar connecting link forward.
7. The force applied to the toggle lever unlocks the toggle and pulls the bottom of the typebar forward, thereby pivoting the top of the typebar up and to the rear.

Friden 2200/2300 SERIES MACHINES

8. The lower end of the cam assembly continues to pivot forward until the cam lobe is against the power roll (Figure 7).
9. The typebar, halfway to the platen at this point, continues rearward to the platen of its own momentum pulling the typebar connecting link and the bellcrank lever with it.

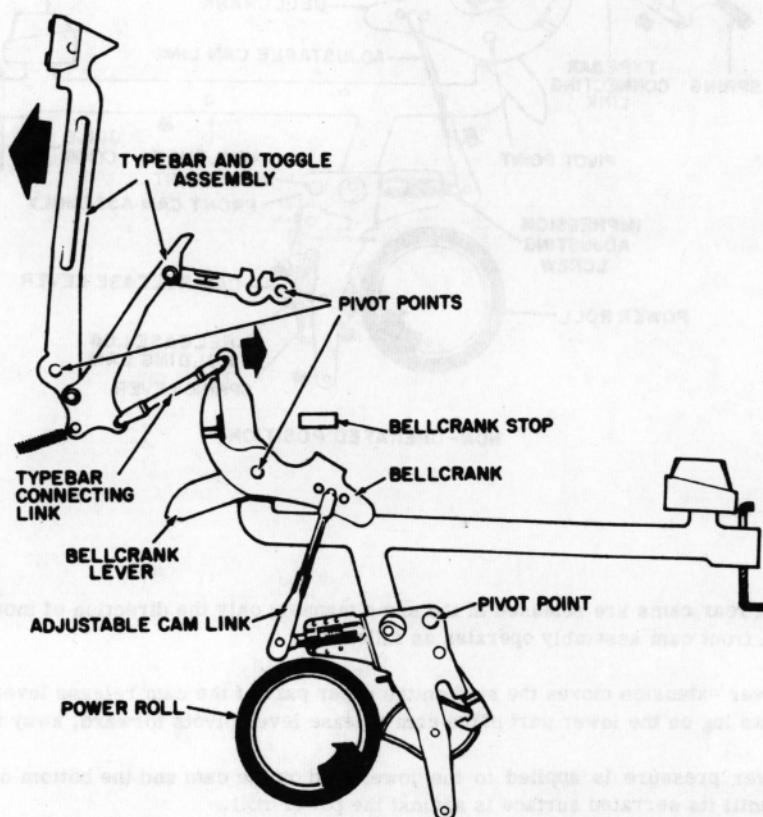


Figure 7.

Friden 2200/2300 SERIES MACHINES

Further cam rotation returns the cam assembly, the adjustable cam link, and the bellcrank to the home position against the bellcrank stop plate (Figure 8). As the cam lobe rotates away from the power roll, spring tension assists in restoring the cam. With the cam in home position, the cam return spring returns the lower end of the cam assembly toward the power roll. If the keylever is still depressed, the anti-repeat lug blocks the cam lug, holding it in the anti-repeat position. This insures one cam operation for each keylever depression.

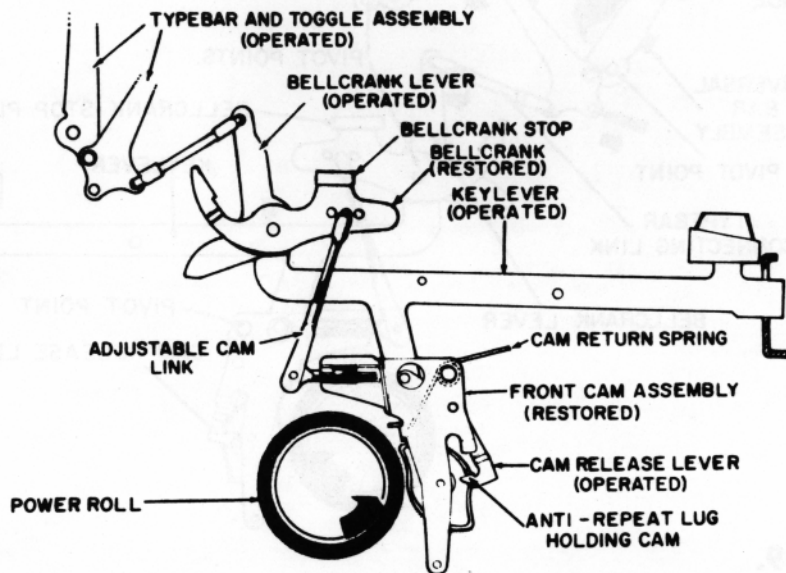


Figure 8.

The cam release is restored when the keylever is released, thereby disengaging the anti-repeat lug from the cam lug. At this time, the release lug blocks the cam as it is rotated by the spring lever to home position.

The entire typing train is actuated by the operation of a cam assembly. However, the bellcrank, the adjustable cam link, and the cam assembly return independently of the bellcrank lever, the typebar connecting link, and the typebar and toggle assembly.

The speed of the machine requires that a cam assembly be returned as soon as possible after being actuated. This is necessary so that a character can be typed consecutively. After the typebar strikes the platen, the typebar connecting link and the bellcrank lever are immediately returned to home position. As the typing train returns, the bellcrank is stopped by the bellcrank stop plate and the typebar is stopped by the typebar rest (Figure 9).

Friden 2200/2300 SERIES MACHINES

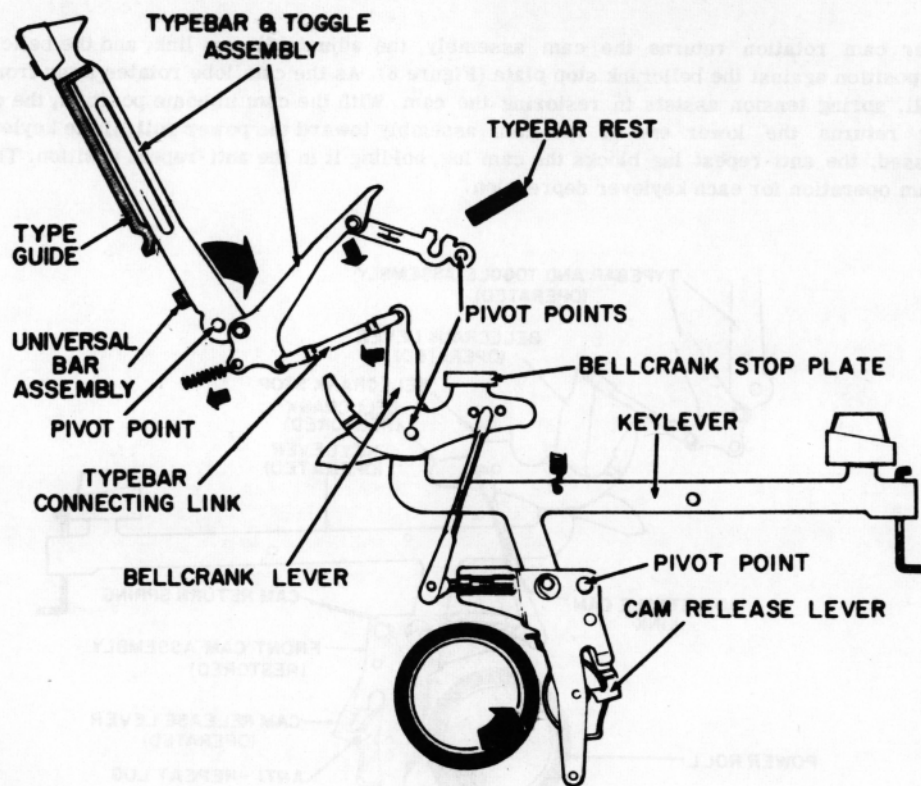


Figure 9.

Friden 2200/2300 SERIES MACHINES

BELLCRANK LEVER AND BELLCRANK

The bellcrank levers are specifically designed for each keylever position and are not interchangeable. The bellcranks operate the bellcrank levers which are co-ordinated with the curvature of the segment support casting; that is, they become progressively higher toward the outer ends of the segment support casting (Figure 10).

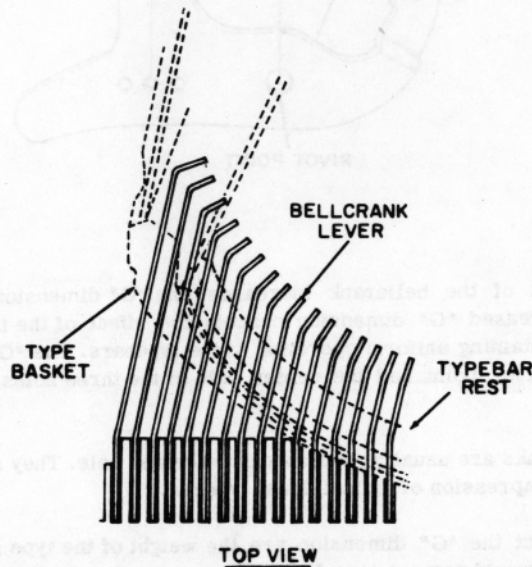


Figure 10.

Friden 2200/2300 SERIES MACHINES

This progressively increases the distance the typebars must travel and the velocity required to operate them properly. The differences in the height of the bellcrank levers are compensated for by the design of the bellcranks for each position. This is accomplished by varying the "G" dimension of each bellcrank (Figure 11).

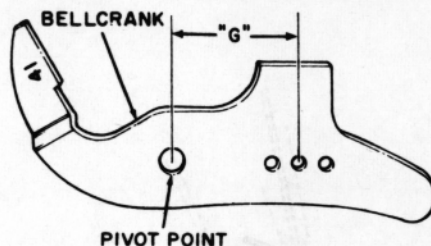


Figure 11.

Generally, as the height of the bellcrank increases, the "G" dimension of the bellcrank increases proportionately. The increased "G" dimension cancels the effect of the increased height of the bellcrank lever, thereby maintaining uniform operation of the typebars. The "G" dimension is the distance between the bellcrank pivot point and the center hole of the three holes provided for the adjustable cam link.

NOTE: Adjustable cam links are usually positioned in the center hole. They may be changed to increase or decrease the impression of an individual typebar.

Other factors which affect the "G" dimension are the weight of the type slug, the type style, and the type face area. (A period would require less force than an upper case W for uniform impression.)

There are 88 different bellcranks, each having a number stamped on its left hand side. These numbers indicate the width of the "G" dimension. Bellcrank number 1 is the shortest and number 88 the longest. The odd numbered bellcranks are used in the odd numbered keylever positions; the even numbered bellcranks are used in the even numbered keylever positions.

Friden 2200/2300 SERIES MACHINES

SEGMENT SUPPORT ASSEMBLY

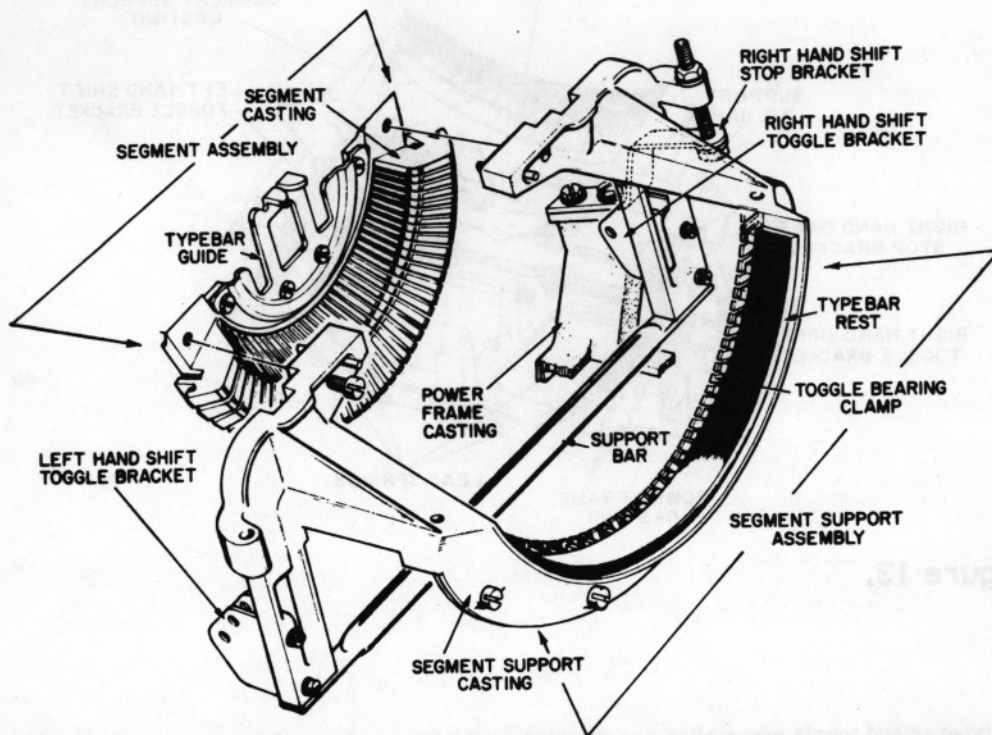


Figure 12.

The segment support assembly is the mount for the segment assembly. Together, they support the typebar and toggle assemblies. The segment support assembly is indirectly mounted to the power frame casting through shifting mechanisms which move and lock the segment support assembly in an upper or lower position. The shifting mechanisms enable either the upper or the lower character on a type slug to be printed when the typebar is actuated. The segment support assembly is also mounted to the power frame casting by four leaf springs. The leaf springs are flexible enough to permit upward and downward movement of the segment support assembly. The leaf springs are straight (no tension) when the segment support assembly is in its centralized position (mid-way between the upper and lower extreme of travel). When the segment support is moved either up or down, the leaf springs arc slightly, applying tension to the segment support assembly. This tension of the leaf springs is constantly attempting to restore the segment support assembly to the center position (Figure 12 and Figure 13).

NOTE: On single case machines the segment support assembly is locked in the lower position.

Friden 2200/2300 SERIES MACHINES

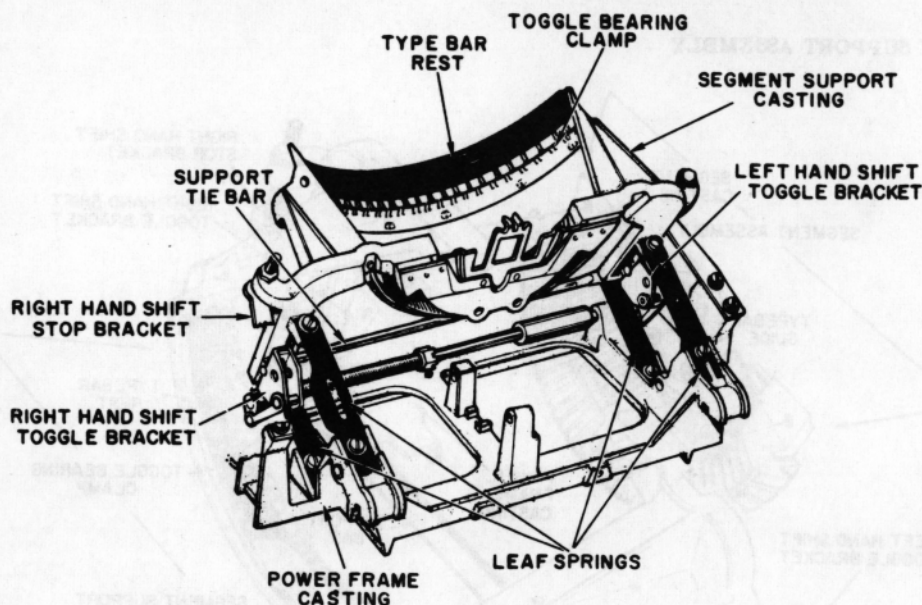


Figure 13.

The typebar and toggle assemblies are mounted on the front and rear fulcrum rods; the typebars pivot on the rear fulcrum rod and the toggle assemblies pivot on the front fulcrum rod. The typebars are individually formed and can be used in only one position of the segment casting.

All typebars are numbered on the right hand side, near the type slug. The left hand typebars, 00 through 21, are located in the left hand half of the segment casting. The tops of the left hand typebars are offset toward the left and their associated toggle assemblies are mounted on their left hand sides. The right hand typebars, 22 through 43, are located in the right hand half of the segment casting. The tops of the right hand typebars are offset toward the right and their associated toggle assemblies are mounted to their right hand sides.

The segment casting, mounted to the segment support casting, contains the fulcrum rod on which the typebars pivot. There are 16 typebar slots in the segment casting plus a slot for the blank segment link. These slots allow a minimum of typebar side play, thereby maintaining near-perfect alignment as the typebars enter the typebar guide.

The typebar guide, mounted to the segment casting, centers the typebar just before it strikes the platen. This ensures uniform printing both horizontally and vertically. The elevated ring beneath the typebar guide limits the rearward travel of the typebars. It prevents the type face from imbedding into the soft platen and maintains uniform density and impression of all characters.

Friden 2200/2300 SERIES MACHINES

SEGMENT SUPPORT SHIFTING MECHANISM

The segment support shifting mechanism is found only on double case machines. Double case machines have two characters on each type slug. For example, the typebar for the N keylever has both an upper case and lower case n on the same type slug (Figure 14). These characters do not print simultaneously. The height of the typebar in relation to the platen determines which character is printed. When the typebar is in its lower position, the upper character on the type slug strikes the platen. The printing of upper or lower case characters is accomplished by moving the typebar pivot point (fulcrum rod) up and down.

The fulcrum rod is contained within the segment casting; the segment casting is securely fastened to the segment support assembly. Therefore, the segment support assembly must move into an upper or lower position and be securely held there while printing takes place.

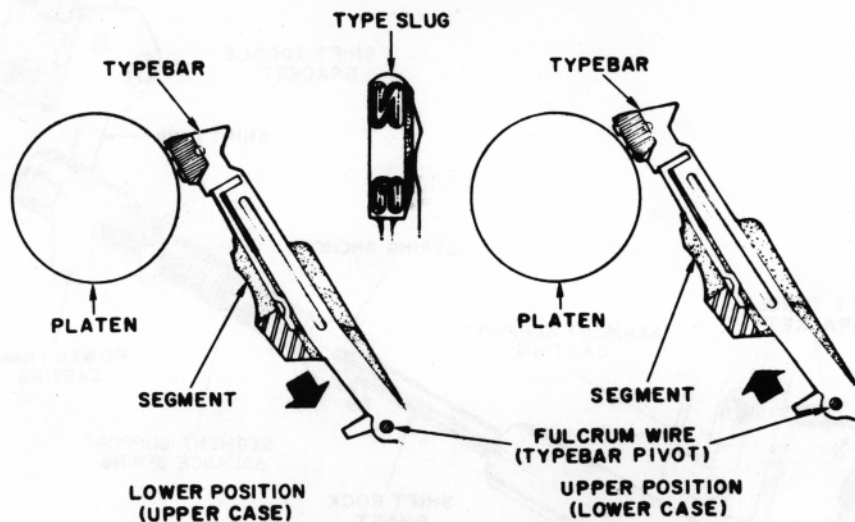


Figure 14.

Friden 2200/2300 SERIES MACHINES

The shift rock shaft assembly is comprised of the shift rock shaft, the shift rock shaft arms and the shift links (Figure 15). The shift rock shaft assembly is supported by the power frame casting and is also attached to the shift toggle bracket. The shift rock shaft assembly insures that both sides of the segment support assembly move up and down in unison.

The balance spring is tightly wound around the shift rock shaft. It is wound in such a way that it overcomes the effect of gravity on the segment support assembly. The balance spring also aids the leaf springs in keeping the segment support assembly centralized. During machine operation, the segment support assembly never remains stationary in the center position. However, the centralizing effect insures that the segment support assembly shifts up as easily as it shifts down.

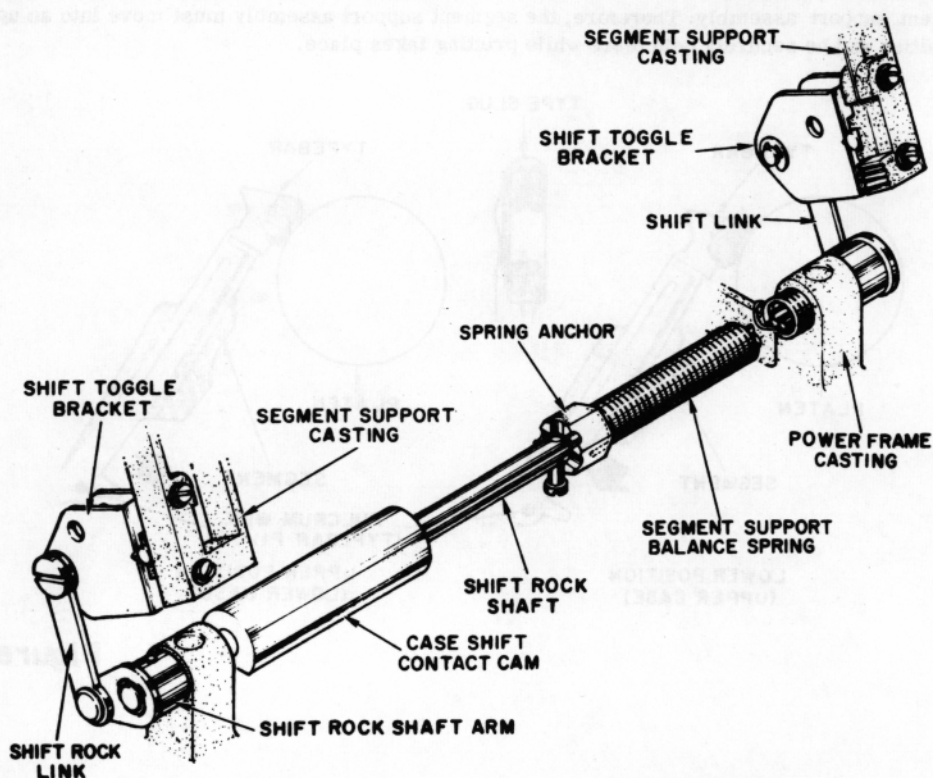


Figure 15.

Friden 2200/2300 SERIES MACHINES

The shift toggle mechanism includes the shift toggle arm and shift toggle link. Both the shift toggle arm and shift toggle link are used to hold the segment support assembly in its upper position (Figure 16). The shift toggle lever unlocks the toggle when the segment support assembly is shifted to its lower position. The ribbon lift bar bearing is a common pivot point for the shift toggle arm and shift toggle lever. The shift toggle arm is connected at point B by a stud. Finally, the shift toggle bracket, as shown in Figure 16, is mounted to the rear of the segment support casting.

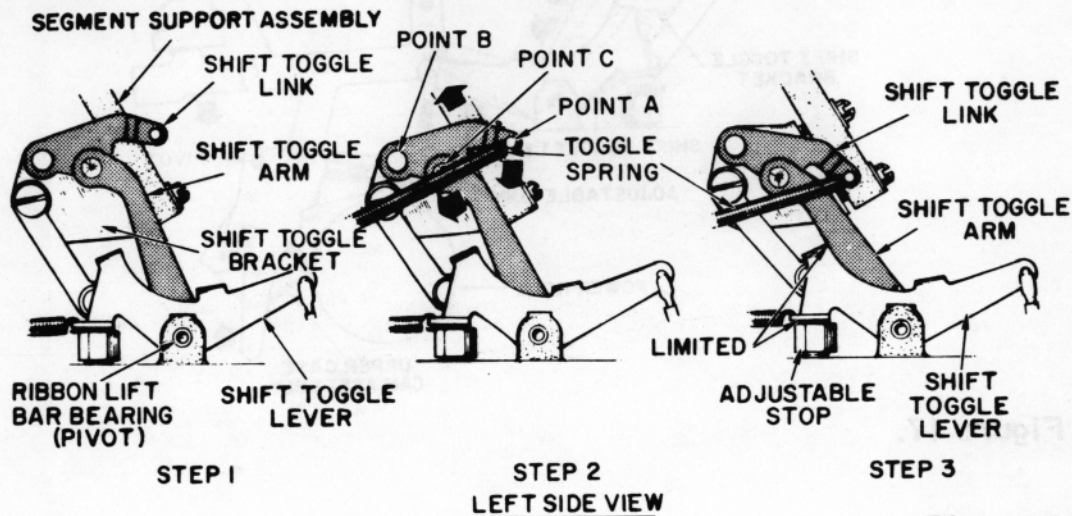


Figure 16.

Step 1 shows the position of the shift toggle mechanism when the segment support assembly is in the center position.

Step 2 shows the toggle spring connected to point A on the shift toggle link. The segment support assembly at this time, begins to move up. The force of the toggle spring pivots the shift toggle arm at point C rearward. As point C moves rearward, it forces the rear of the shift toggle link (point B) to move upward. As point B moves upward, it carries with it the shift toggle bracket and the segment support assembly.

Step 3 shows the shift toggle arm still under the tension of the toggle spring. The shift toggle arm continues rearward until it strikes the upper-right-angle bend at the rear of the shift toggle lever. The shift toggle lever is limited at this time against the adjustable stop. The limiting of the shift toggle arm halts the upward travel of the segment support assembly.

Friden 2200/2300 SERIES MACHINES

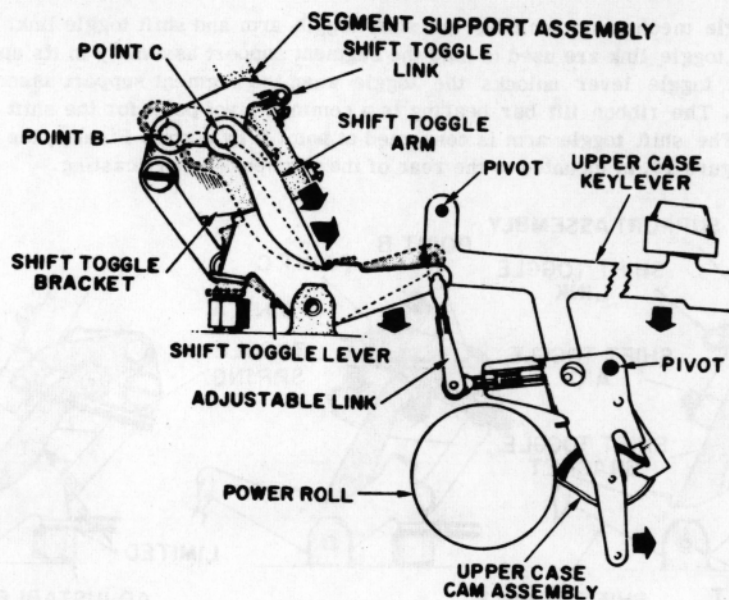


Figure 17.

With the segment support assembly in its upper position, the lower case characters on the type slug are in position to print. The segment support assembly can be shifted to its lower position by depressing either upper case keylever (Figure 17).

Friden 2200/2300 SERIES MACHINES

Depression of an upper case keylever releases the upper case cam assembly against the power roll. The rotation of the power roll pivots the cam assembly which pulls the adjustable link downward. The adjustable link then rotates the shift toggle lever. The shift toggle lever pushes the shift toggle arm forward. As point C moves forward, point B is pulled downward. Point B, being a stud which connects the shift toggle link with the shift toggle bracket, causes the segment support assembly to move downward to its center position (Figure 18).

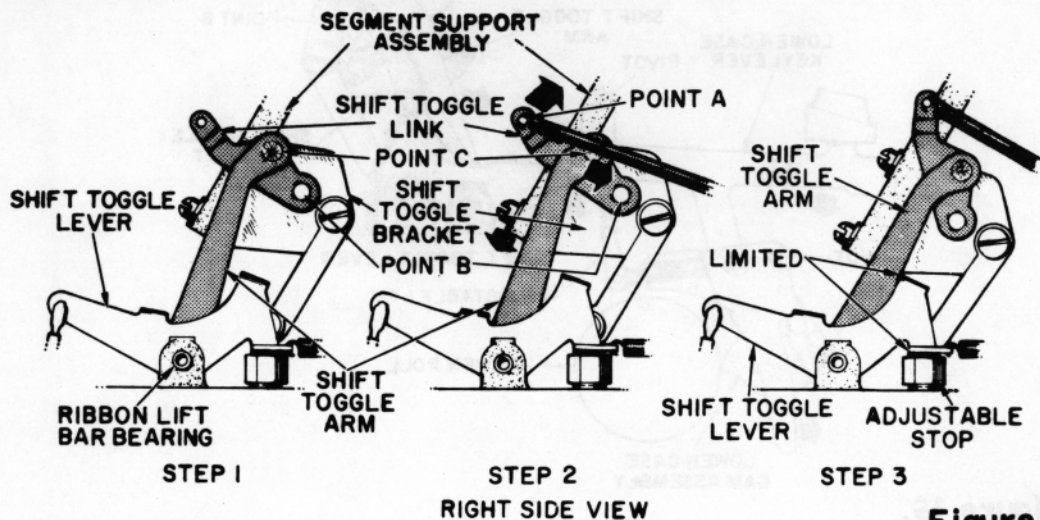


Figure 18.

The upper case cam assembly on the left hand side of the machine operates a shift toggle mechanism. The left hand shift toggle mechanism pulls the segment support assembly toward its center position. The shift toggle mechanism on the right hand side of the machine then drives the segment support assembly to its lower position. Both the left hand and the right hand shift toggle mechanisms are essentially the same, only the shift toggle links are mounted differently. The right hand shift toggle mechanism secures the segment support assembly in its lower position. The shift toggle link, however, is still attached to the shift toggle bracket (point B) and the shift toggle arm (point C). The shift toggle arm and the shift toggle lever also pivot on the ribbon lift bar bearing.

Step 1 shows the position of the right hand shift toggle mechanism when the segment support assembly is in its center position.

Step 2 shows the toggle spring connected to point A on the shift toggle link. The segment support assembly at this time, begins to move down. The force of the toggle spring pivots the shift toggle arm at point C rearward. As point C moves rearward, it forces the rear of the shift toggle link (point B) to move downward, it carries with it the shift toggle bracket and the segment support assembly.

Friden 2200/2300 SERIES MACHINES

Step 3 shows the shift toggle arm limited by the shift toggle lever and the adjustable stop. The limiting of the shift toggle arm halts the downward travel of the segment support assembly.

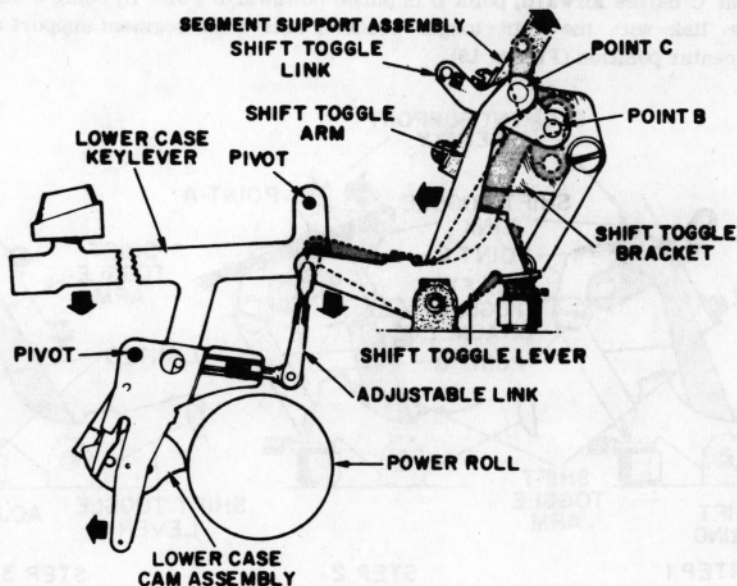


Figure 19.

The right hand shift toggle mechanism can be unlocked by the operation of the lower case cam assembly. Depression of either lower case keylever releases the lower case cam assembly against the power roll (Figure 19). The rotation of the power roll pivots the cam assembly which pulls the adjustable link downward. The adjustable link then rotates the shift toggle lever. The shift toggle lever pushes the shift toggle arm forward. As point C moves forward, point B is pulled upward. Point B moving upward causes the shift toggle bracket and the segment support assembly to rise out of its lower position. The segment support assembly moves upward to its center position. The shift toggle mechanism on the left hand side of the machine then raises the segment support assembly to its upper position as previously described.

Friden 2200/2300 SERIES MACHINES

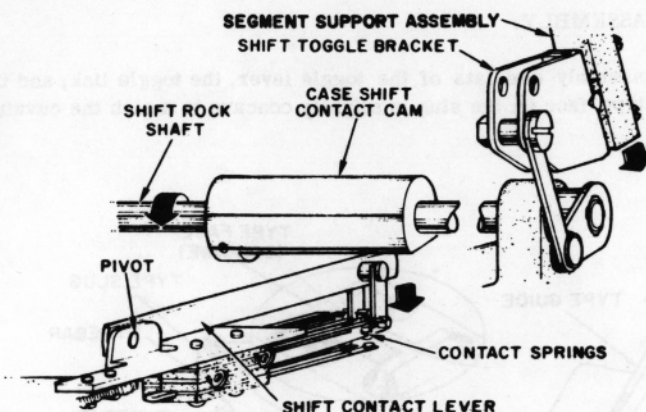


Figure 20.

Associated with the segment support assembly is a set of contacts called the case shift contacts. The condition of the contacts is determined by the position of the segment support assembly. These contacts qualify circuits in the machine when the segment support assembly is in a specific position.

The contacts are in their normal condition when the segment support assembly is in the lower case (upper) position. The contacts are in their operated condition when the segment support assembly is in the upper case (lower) position. When the segment support assembly is in its upper (lower case) position, the case shift contacts are in their normal condition (Figure 20). At this time, the shift contact lever lies flush against the flat side of the case shift contact cam.

The case shift contacts operate as the segment support assembly shifts to its lower (upper case) position. As the segment support casting and the shift toggle bracket move downward, the shift rock shaft and the case shift contact cam rotate. As the case shift contact cam rotates, it pivots the shift contact lever downward. The shift contact lever transfers the case shift contacts.

When the segment support assembly reverts to its upper (lower case) position, the contact springs restore the shift contact lever upward against the flat side of the case shift contact cam.

Friden 2200/2300 SERIES MACHINES

TYPEBAR AND TOGGLE ASSEMBLY

The typebar and toggle assembly consists of the toggle lever, the toggle link, and the typebar which holds the type slug. The type face on the slug is slightly concave to match the curvature of the platen. (Figure 21).

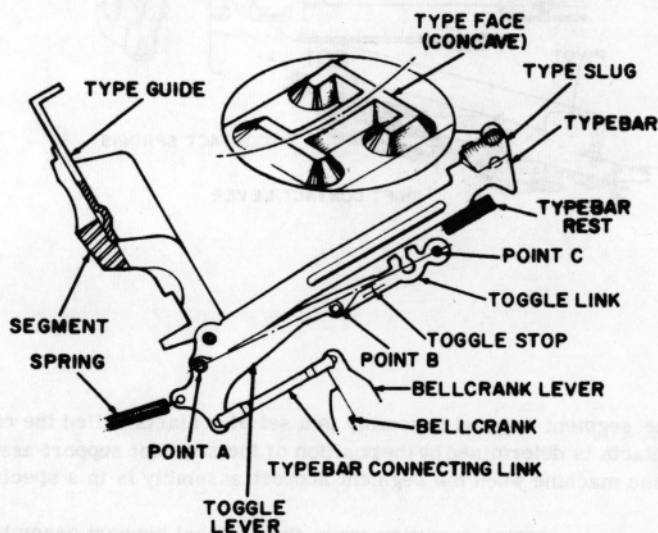


Figure 21.

Points A, B, C, and D are the pivot points at which the assembly parts rotate. Points A and B are connected by shouldered rivets which allow individual rotation. Point A connects the toggle lever to the typebar; point B connects the toggle lever to the toggle link. Points C and D are stationary pivot points. Point C is the front fulcrum rod on which the toggle link pivots; point D is the rear fulcrum rod on which the typebar pivots. When the typebar is in the home position, point B lies below points A and C, as shown by the centerline between A and C. The positioning of point B is essential to the toggle locking action.

Friden 2200/2300 SERIES MACHINES

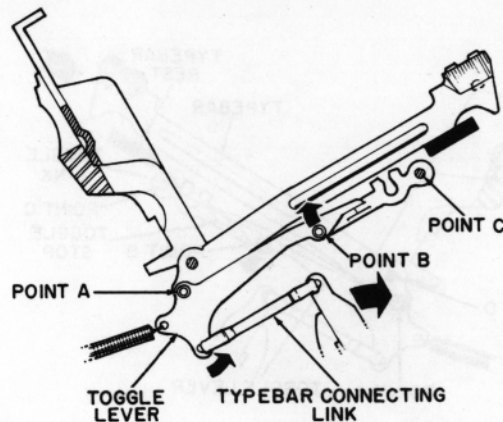


Figure 22.

During a typing operation the typebar connecting link is pulled forward, exerting pressure to the bottom of the toggle lever to try to move it forward. The toggle lever cannot pivot at point A until point B (toggle lock) moves upward. The pressure exerted by the connecting link unlocks point B, moving it upward (Figure 22).

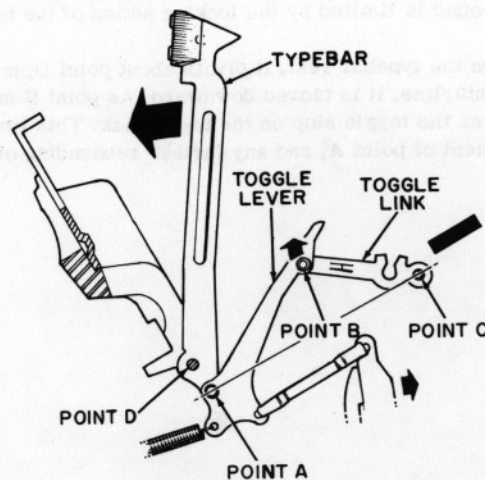


Figure 23.

As point B rises, it pivots about point C. Once point B rises above the centerline between point A and C, the toggle lever can pivot forward at point A. When the toggle lever pivots forward at point A, it causes the typebar to pivot at point D, which results in the typebar striking the platen (Figure 23).

Friden 2200/2300 SERIES MACHINES

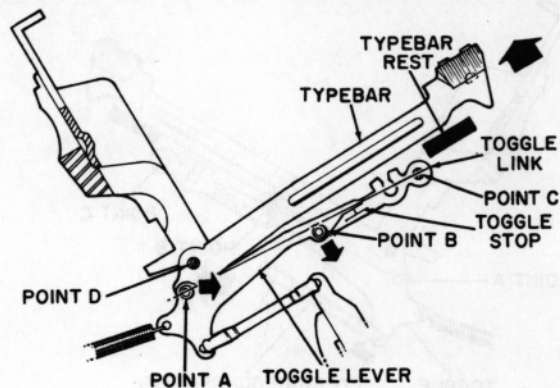


Figure 24.

After the typebar strikes the platen it must return to its home position against the typebar rest. When it strikes the typebar rest, it has a tendency to rebound toward the platen. This rebound is undesirable because the typebar may collide with an adjacent typebar actuated by the next typing operation. The tendency of the typebar to rebound is limited by the locking action of the toggle assembly (Figure 24).

As the typebar rebounds from the typebar rest, it pivots about point D, moving point A forward. Since point B is now below the centerline, it is moved downward. As point B moves downward, the forward end of the toggle lever strikes the toggle stop on the toggle link. This limits the downward movement of point B, the forward movement of point A, and any further rebounding of the typebar.

Friden 2200/2300 SERIES MACHINES

KEYLEVER INTERLOCK ASSEMBLY

The keylever interlock assembly prevents the depression of more than one keylever at a time. The assembly consists of 51 steel balls contained in a hollow rectangular bar. The bar is slotted to accommodate the keylevers (Figure 25).

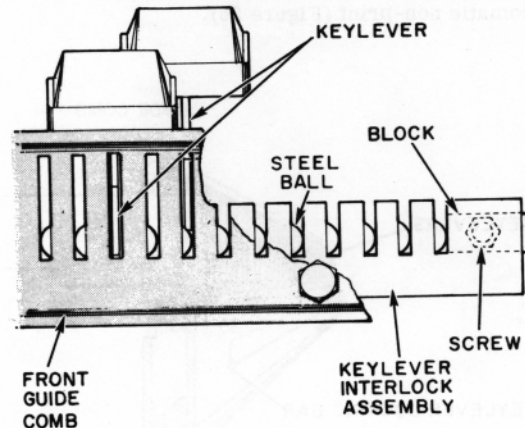


Figure 25.

When a keylever is depressed, it moves the steel balls to either side, positioning them under the remaining keylevers. The steel balls are limited at both ends of the interlock bar by spacing blocks. The total amount of unoccupied space within the interlock bar is slightly more than the width of one keylever. With most of the available space taken up by a depressed keylever, the steel balls cannot move far enough to allow another keylever to be depressed.

Any two keylevers can be depressed and released in very rapid succession. If the first keylever is held in the interlock or is restored slowly, the second keylever cannot operate or is difficult to operate. Therefore, steady, rhythmic typing is essential for fast operation of the writing machine.

Friden 2200/2300 SERIES MACHINES

KEYLEVER LOCKING MECHANISM

The keylever locking bar prevents depression of the keylevers when the machine is off. If the locking bar is not correctly positioned and several keylevers are depressed while power is off, their cam assemblies operate causing the typebars to collide at the typebar guide. The keylever locking bar also locks the keyboard, through control contacts, when a punch error occurs or during special functions such as carriage return, tab, backspace, or automatic non-print (Figure 26).

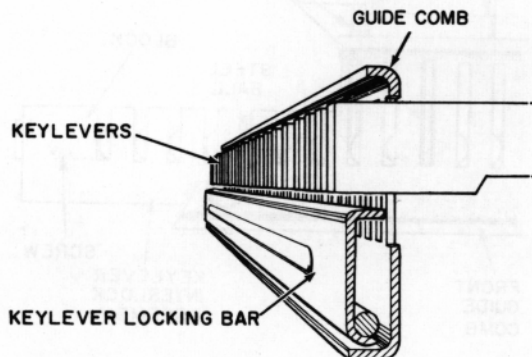


Figure 26.

The keylever locking bar is operated by the keylock relay. When the power switch is turned on the relay is energized. When the relay is energized it pulls the relay armature keylock link forward, away from the keylevers (Figure 27). When the power is turned off, the relay is de-energized and the locking bar pivots rearward, beneath the keylevers.

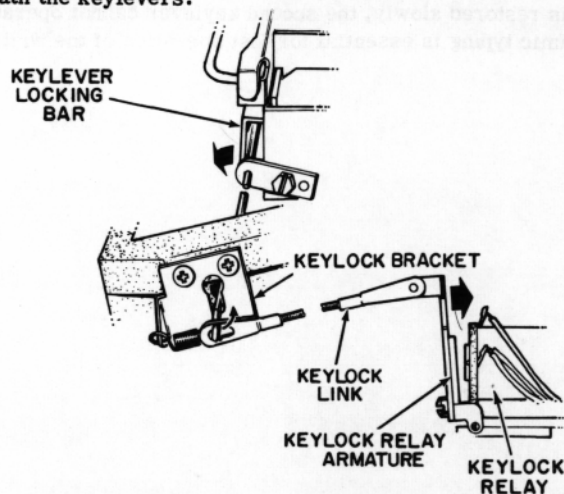


Figure 27.

Friden 2200/2300 SERIES MACHINES

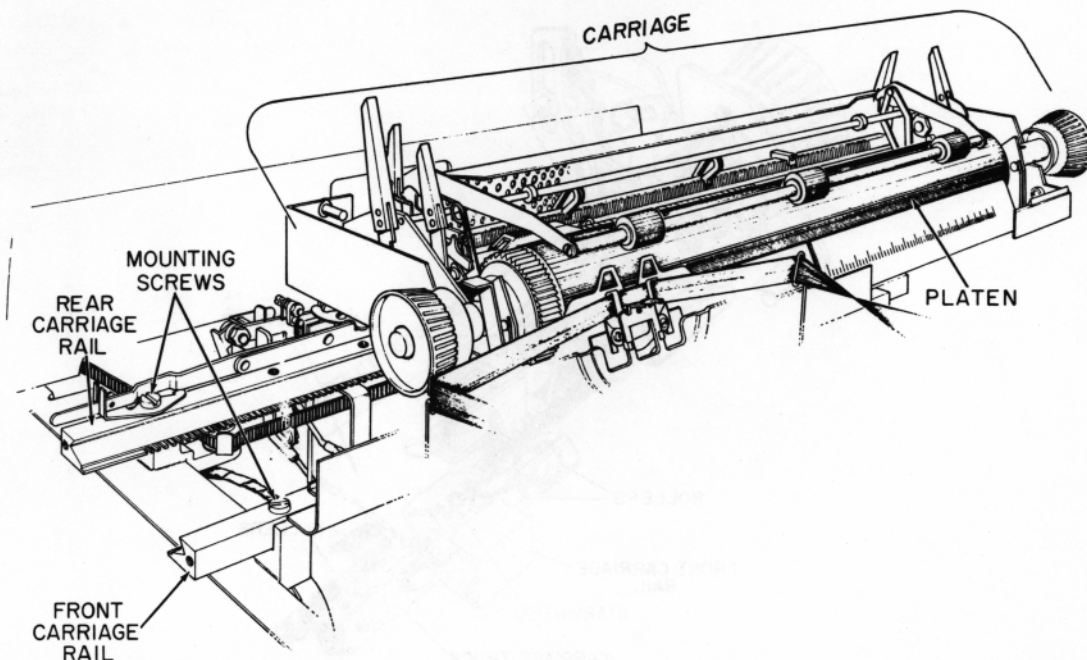


Figure 28.

CARRIAGE ASSEMBLY

The primary function of the carriage assembly is to provide a means for supporting and moving the platen assembly. Secondary functions of the carriage assembly are to control and guide the document being typed. These secondary functions are discussed in detail in succeeding sections of this manual. This section is concerned with the manner in which the carriage assembly is mounted to the front and rear carriage rails.

The carriage assembly is supported by rollers which ride on the front and rear rails. The rails are perfectly level and parallel to the front of the machine. They provide for smooth operation and control the extreme limits of carriage assembly travel (Figure 28).

Friden 2200/2300 SERIES MACHINES

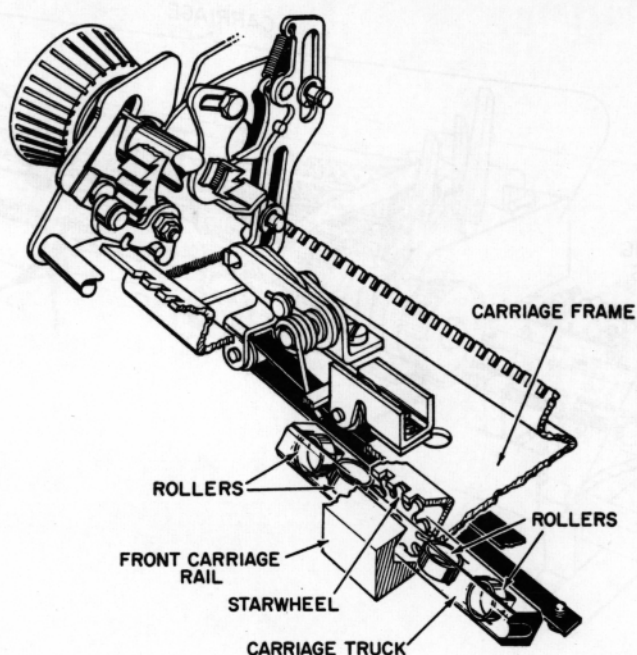


Figure 29.

The rollers which support the weight of the carriage assembly are contained in carriage trucks. Also contained within each truck is a starwheel. The starwheel engages the teeth on the carriage frame and the lower portion of the rails. The starwheel provides the means for positioning the carriage trucks beneath the carriage assembly. As the carriage frame moves right or left, it rotates the starwheel. The starwheel, being rotated, positions the trucks in relation to the carriage assembly. This provides adequate carriage assembly support in any position (Figure 29).

Friden 2200/2300 SERIES MACHINES

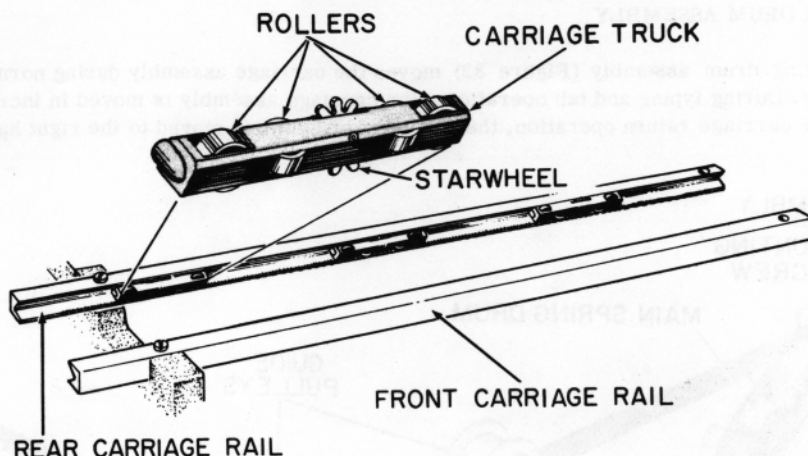


Figure 30.

With the carriage assembly centered on the machine, the carriage trucks are positioned as shown in Figure 30. Six trucks are used for a 16 inch carriage assembly; eight trucks are used for a 20 inch carriage assembly. The illustration represents a machine having a 16 inch carriage assembly; that is, three trucks on each carriage rail.

The rollers contact the "V" surfaces of the carriage frame and the rails. The weight of the carriage assembly is supported by the rollers which contact the upper surfaces of the carriage frame and the lower surfaces of the rails. The remaining rollers prevent upward movement and side play of the carriage frame. Therefore, they provide the means of maintaining uniform typing quality.

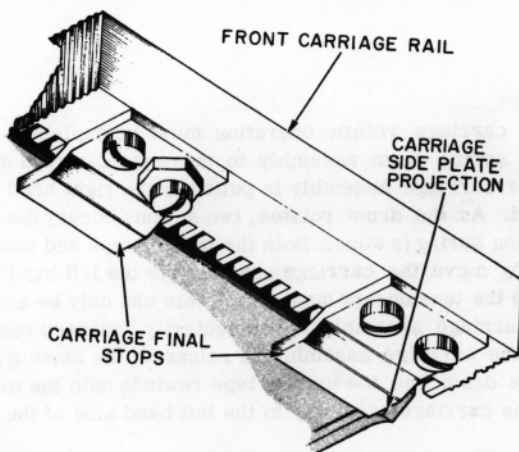


Figure 31.

The carriage final stops are fastened to the front rail. The final stops prevent the carriage from moving beyond the point of support. The final stops contact the carriage end plate projections when the carriage assembly is in the extreme right hand or extreme left hand position (Figure 31).

Friden 2200/2300 SERIES MACHINES

MAIN SPRING DRUM ASSEMBLY

The main spring drum assembly (Figure 32) moves the carriage assembly during normal typing and tab operations. During typing and tab operations, the carriage assembly is moved in increments to the left. During a carriage return operation, the carriage assembly is moved to the right hand side of the machine.

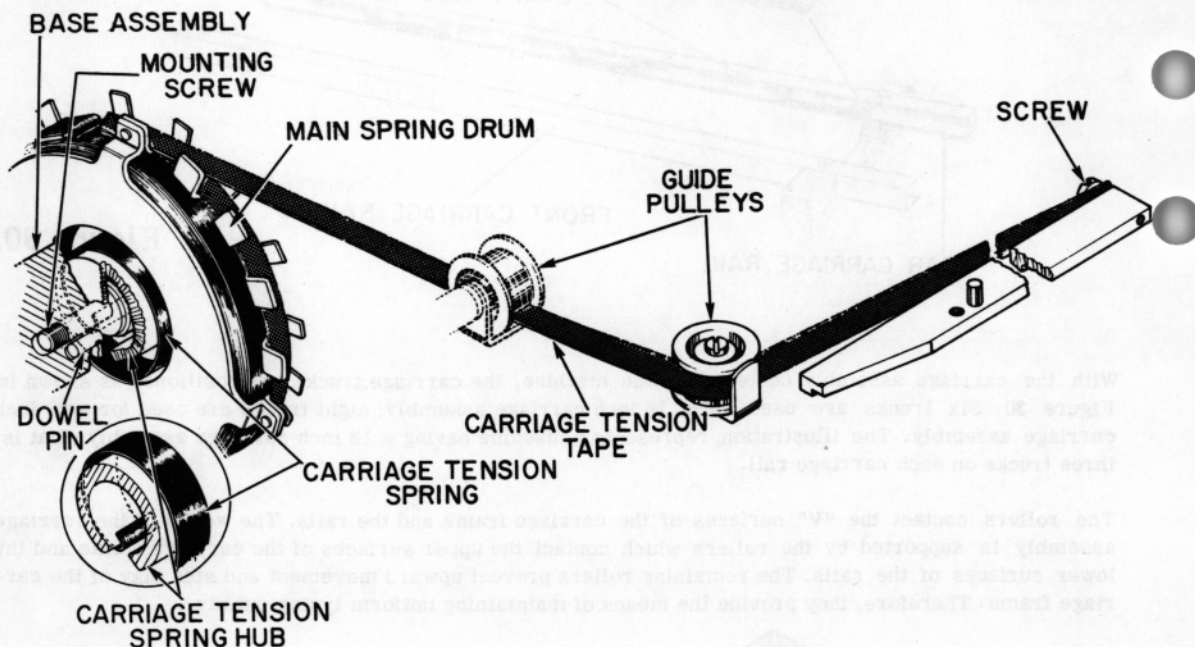


Figure 32.

For easier understanding, a carriage return operation must be explained first. A carriage return operation prepares the main spring drum assembly to move the carriage assembly to the left hand side of the machine. When the carriage assembly is pulled to the right hand side of the machine, the main spring drum is rotated. As the drum rotates, two actions occur; the carriage tension tape is unwound and the carriage tension spring is wound. Both the tension tape and tension spring are attached to the main spring drum. To move the carriage assembly to the left hand side of the machine, the tension spring must unwind and the tension tape must wind. This can only be accomplished by releasing the carriage assembly. The carriage assembly is momentarily released each time a typing or a tab operation occurs. Each time the carriage assembly is released, the tension spring is also released. The tension spring rotates the drum and the tension tape rewinds onto the drum. As the tension tape winds onto the drum, it pulls the carriage assembly to the left hand side of the machine.

Friden 2200/2300 SERIES MACHINES

After the carriage assembly moves completely to the left hand side of the machine, another carriage return operation is required. When the carriage return is initiated, the carriage return mechanism overcomes the tension remaining in the carriage tension spring. As the carriage assembly is pulled to the right hand side of the machine, the tension spring rewinds and the tension tape unwinds. The complete assembly is again prepared to move the carriage assembly to the left hand side of the machine.

One end of the carriage tension tape is attached to a tab on the main spring drum. The other end is attached to the escapement rack on the carriage frame. Tape guide pulleys provide an unobstructed path for the carriage tension tape.

One end of the carriage tension spring is attached to a tab on the main spring drum. The other end is attached to the carriage tension spring hub. The tension spring hub is held stationary by a dowel pin pressed into the inner side of the base assembly. The hub provides a solid base around which the tension spring can wind and unwind.



Friden 2200/2300 SERIES MACHINES

MONO-SPACING ESCAPEMENT ASSEMBLY

All components which control the escapement of the carriage assembly are mounted to the escapement frame casting (Figure 33).

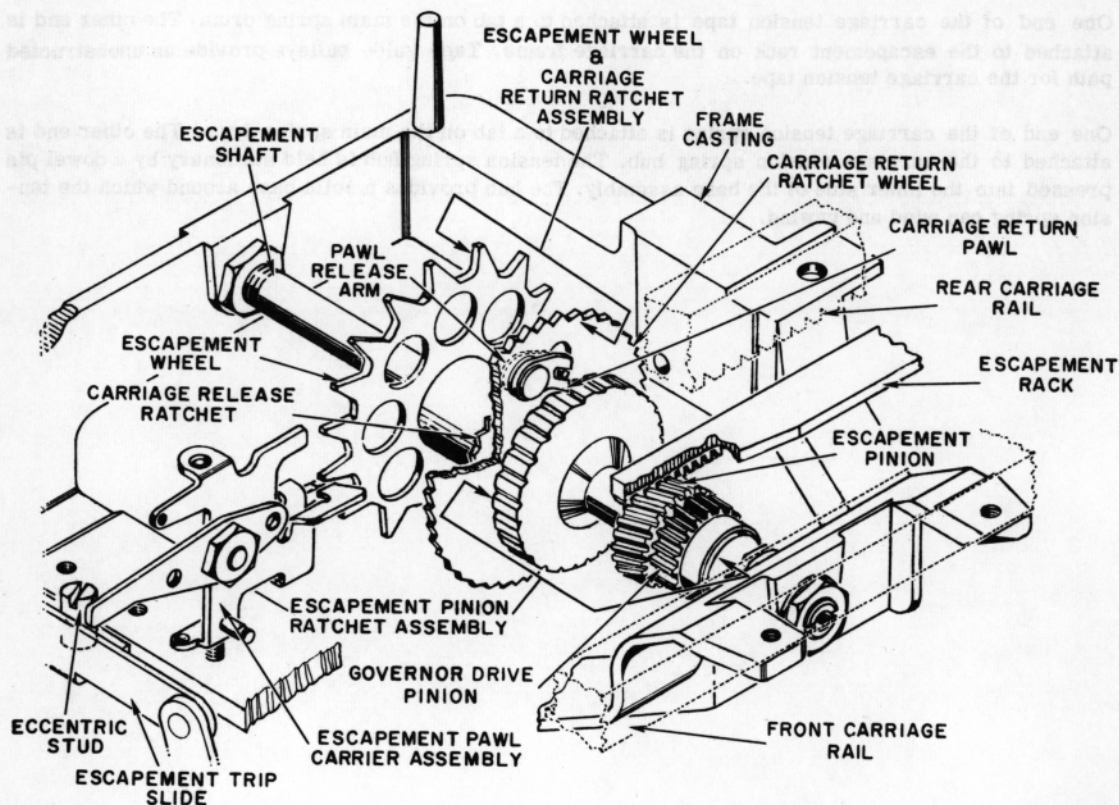


Figure 33.

Friden 2200/2300 SERIES MACHINES

The escapement shaft is connected to the escapement frame casting at the front and the rear. Mounted to the front end of the shaft is the escapement pinion & ratchet assembly. This assembly is comprised of the governor drive pinion, the escapement pinion, and the escapement ratchet. The function of the individual components is as follows:

- a. Governor drive pinion - engages the governor assembly which regulates the speed of carriage assembly movement.
- b. Escapement pinion - provides the physical contact between the escapement assembly and the and the carriage assembly. It engages the escapement rack mounted to the underside of the carriage assembly.
- c. Escapement ratchet - provides the means for momentarily releasing the escapement assembly from the carriage assembly. This momentary uncoupling is required during a tab operation or a manual carriage release.

Mounted on the rear of the escapement shaft is the escapement wheel & carriage return ratchet assembly. This assembly is comprised of the carriage return ratchet, the carriage release ratchet, the escapement wheel, and the carriage return pawl.

The escapement wheel and carriage return ratchet rotate together on a common hub. The carriage release ratchet, although mounted to the same hub, rotates independently. The carriage release ratchet rotates independently so that it can operate the carriage return pawl.

The escapement wheel is controlled by the escapement pawl carrier assembly. The escapement pawl carrier assembly is operated by the eccentric stud on the escapement trip slide whenever a typebar strikes the platen. Each tooth on the escapement wheel corresponds to one unit of carriage assembly escapement.

Friden 2200/2300 SERIES MACHINES

Tension from the main spring drum is constantly attempting to pull the carriage assembly to the left hand side of the machine. The escapement assembly, when in the home (non-operated) position, inhibits carriage assembly movement toward the left hand side of the machine. This carriage assembly movement is inhibited as follows:

1. The main spring drum assembly pulls the escapement rack toward the left hand side of the machine.
2. The escapement rack rotates the escapement pinion.
3. The escapement pinion, when rotated, causes the escapement ratchet to rotate.
4. The escapement ratchet bears against the carriage return pawl.
5. The carriage return pawl, being attached to the carriage return ratchet, causes both the carriage return ratchet and the escapement wheel to rotate.
6. The rotation of the escapement wheel exerts a downward pressure on the escapement pawl (Figure 34).
7. The escapement pawl is inhibited from moving downward by the escapement pawl stop.
8. By inhibiting the escapement wheel from rotating, all components on the escapement shaft are restricted. Therefore, the carriage assembly cannot move toward the left hand side of the machine when the escapement assembly is in a non-operated position.

Friden 2200/2300 SERIES MACHINES

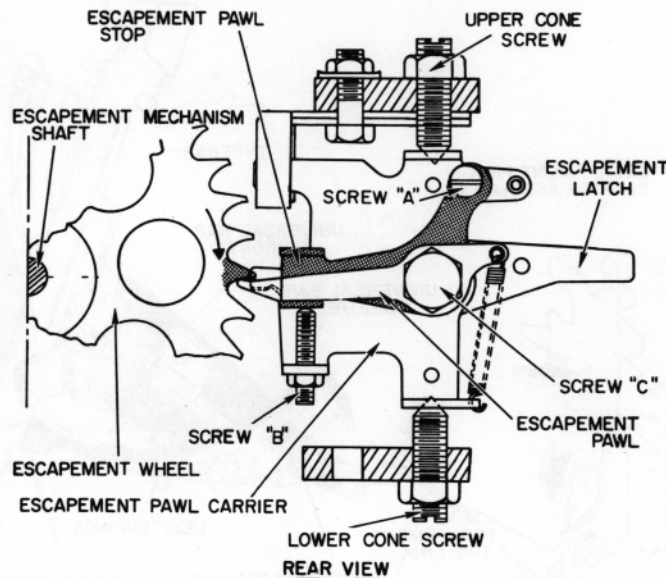


Figure 34.

The escapement pawl is mounted to the escapement pawl carrier by screw C. Screw C is a shouldered screw which allows the escapement pawl to rotate within the escapement pawl stop. The escapement pawl stop is held securely by screws A and B. The escapement pawl carrier is supported by upper and lower cone screws. The cone screws allow the entire assembly to pivot on its vertical axis. Screw C also holds the escapement latch to the escapement pawl carrier. However, the escapement latch is not free to rotate. The escapement latch provides the triggering action necessary to operate the escapement pawl carrier assembly (Figure 35).

Friden 2200/2300 SERIES MACHINES

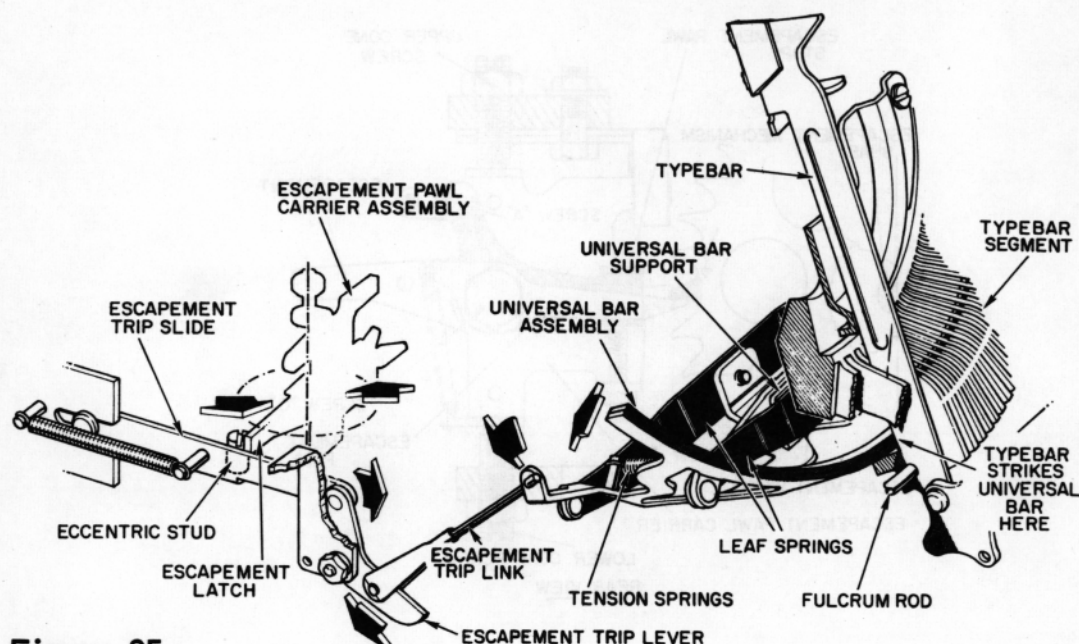


Figure 35.

As mentioned previously, the escapement assembly operates when a typebar strikes the platen. The typebar does not directly operate the escapement assembly. The typebar actuates the universal bar assembly and its associated linkage. The universal bar assembly, in turn, operates the escapement assembly.

The universal bar assembly is held in position by two leaf springs attached to the universal bar support. The universal bar assembly is mounted as such that it can only move in a forward or rearward direction. The front edge of the universal bar assembly is positioned against the rear of the segment casting. The leaf springs are designed to return the universal bar assembly to the segment casting immediately after it is operated by a typebar. To maintain speed, tension springs also assist in restoring the universal bar assembly in time for the next typing operation.

As a typebar strikes the platen, its lower part strikes the universal bar assembly. The universal bar assembly and the escapement trip link are moved rearward. The escapement trip link causes the escapement trip lever to pivot. The lower part of the escapement trip lever rotates rearward as the upper part rotates forward. As the upper part of the escapement trip lever moves forward, it pulls the escapement trip slide forward. As the escapement trip slide moves forward it causes the eccentric stud to contact the escapement latch. The escapement latch, as mentioned, triggers the operation of the escapement pawl carrier assembly.

Friden 2200/2300 SERIES MACHINES

The order in which the escapement mechanism operates is illustrated in four steps in Figure 36.

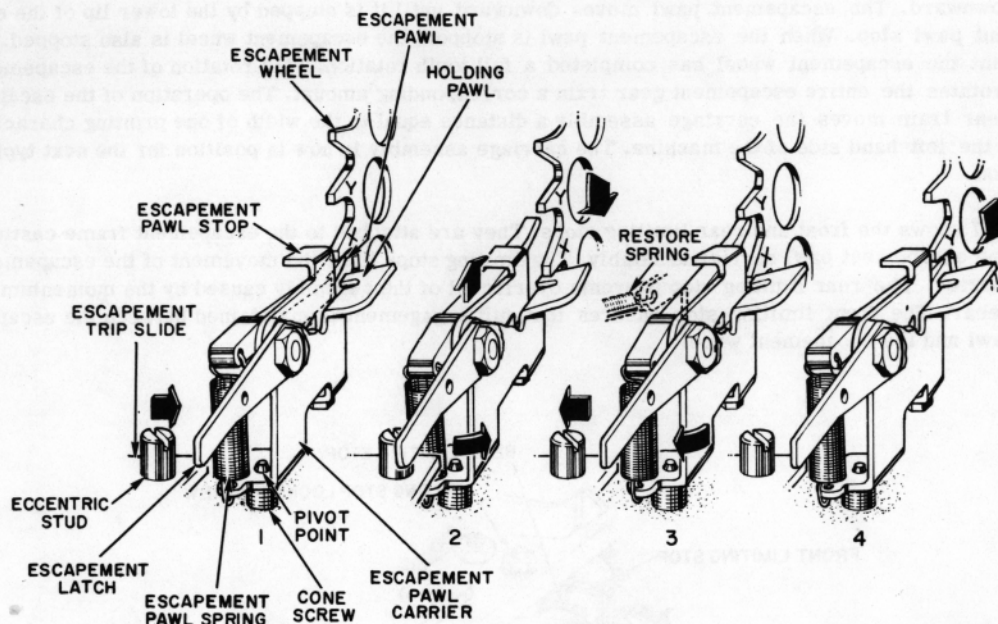


Figure 36.

Step 1 shows the eccentric stud moving forward to contact the escapement latch. In step 2, the eccentric stud contacts the escapement latch, moving it forward. The forward movement of the escapement latch rotates the escapement pawl carrier. The rotation of the escapement pawl carrier moves the escapement pawl and the holding pawl to the rear. During rearward movement, the escapement pawl moves from under tooth X on the escapement wheel. At the same time the holding pawl moves under tooth X, inhibiting its movement.

When the escapement pawl moves from under tooth X, it is moved upwards by the escapement pawl spring. The escapement pawl continues upward until it is stopped by the escapement pawl stop. The escapement pawl is now in position so that it can engage tooth Y on the escapement wheel.

Step 3 shows the position of the components when the typebar is returned to home position. The universal bar assembly is released and the eccentric stud moves to the rear. The restore spring rotates the escapement pawl carrier back to its original position. This causes the escapement pawl to position under tooth Y.

Friden 2200/2300 SERIES MACHINES

Step 4 shows the holding pawl in its original position. It has moved from under tooth X, thereby allowing the escapement wheel to rotate. As the escapement wheel rotates, tooth Y drives the escapement pawl downward. The escapement pawl moves downward until it is stopped by the lower lip of the escapement pawl stop. When the escapement pawl is stopped, the escapement wheel is also stopped. At this point the escapement wheel has completed a full tooth rotation. This rotation of the escapement wheel rotates the entire escapement gear train a corresponding amount. The operation of the escapement gear train moves the carriage assembly a distance equal to the width of one printing character toward the left hand side of the machine. The carriage assembly is now in position for the next typing operation.

Figure 37 shows the front and rear limiting stops. They are attached to the escapement frame casting, above the escapement pawl carrier assembly. The limiting stops limit the movement of the escapement pawl carrier. The rear limiting stop prevents overtravel of the assembly caused by the momentum of the typebar. The front limiting stop ensures that full engagement is maintained between the escapement pawl and the escapement wheel.

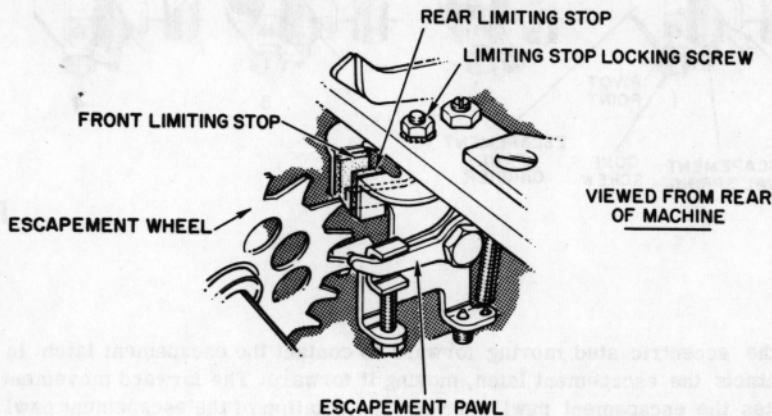


Figure 37.

Friden 2200/2300 SERIES MACHINES

SPACE BAR MECHANISM

The function of the space bar mechanism is to escape the carriage assembly one unit at a time. The space bar mechanism is used to separate words, or generally position the carriage assembly toward the left hand side of the machine. Since a typebar is not activated, the escapement assembly is actuated through special linkage (Figure 38).

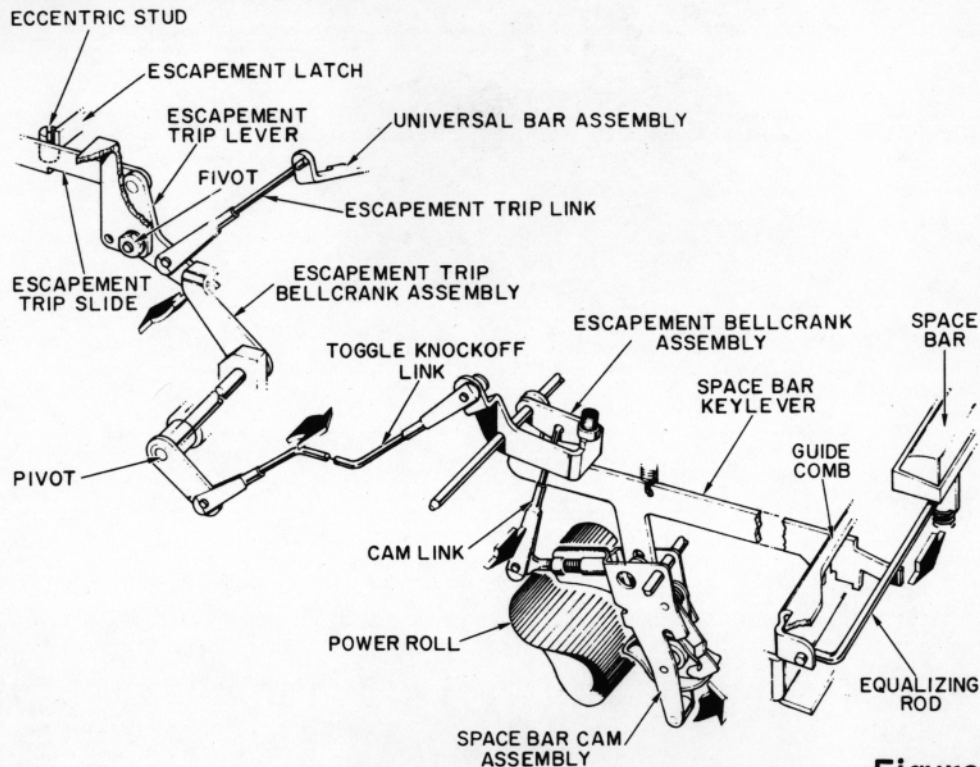


Figure 38.

The space bar is mounted on the equalizing rod. The equalizing rod is connected to each end of the front guide comb. The left hand end of the equalizing rod is directly over the space bar keylever. Depression of the space bar operates the space bar keylever. The space bar keylever then releases the space bar cam assembly. The space bar cam assembly then contacts the power roll. The power roll rotates the cam assembly, causing the cam link to rotate the escapement bellcrank assembly. The escapement bellcrank assembly then pulls the toggle knock off link forward. The toggle knock off link and the escapement trip bellcrank are connected to the same shaft. Therefore, as the knock off link moves forward, the escapement trip bellcrank moves rearward. As the escapement trip bellcrank moves rearward it pivots the escapement trip lever. As the escapement trip lever pivots, it pulls the escapement trip slide forward. As the escapement trip slide moves forward, the eccentric stud actuates the escapement latch. The actuation of the escapement latch triggers the operation of the escapement assembly. Once the escapement assembly is activated, a normal escapement of the carriage assembly takes place.

Friden 2200/2300 SERIES MACHINES

When the high lobe of the space bar cam is against the power roll, the escapement pawl carrier assembly is fully operated. As the cam rotates to home position, the escapement pawl carrier assembly returns to its rest position. Consequently, the escapement wheel advances one tooth and the carriage escapes one unit toward the left hand side of the machine.

Friden 2200/2300 SERIES MACHINES

FIELD CONTROL MECHANISM

The field control mechanism activates and de-activates various electrical circuits within the machine. It is positioned to allow the carriage assembly to open and close micro switches within the mechanism. Carriage assembly positioning, therefore, can initiate or terminate various automatic operations.

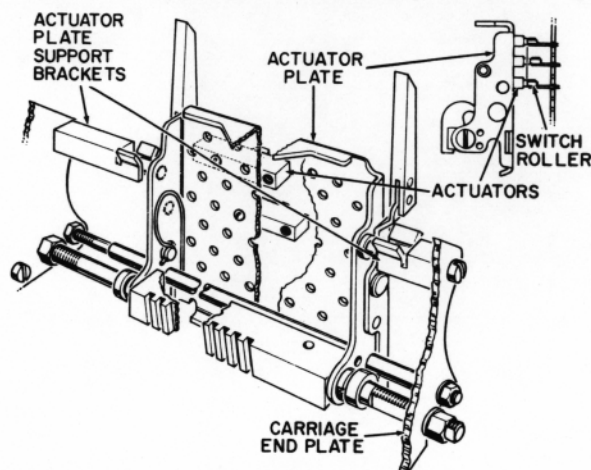


Figure 39.

The complete actuator plate & tab rack assembly is latched into position at the rear of the carriage assembly. Actuator plate & tab rack assemblies are interchangeable. The actuators can be mounted to the actuator plate to correspond to all lateral positions of the carriage assembly. They may also be mounted at any of the 12 vertical levels; each level corresponding to a different switch roller (Figure 39).

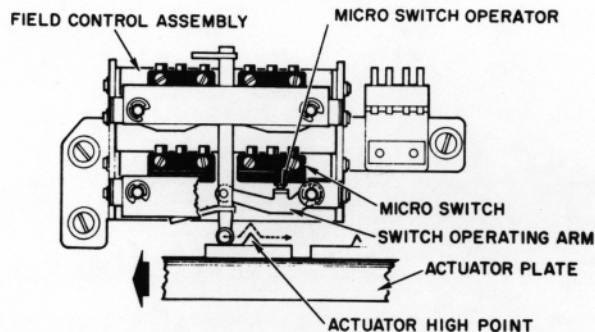


Figure 40.

As the carriage assembly moves toward the left hand side of the machine, the actuator high point pushes the lever operating link to the rear. The lever operating link causes the switch actuating lever to operate its associated micro switch. The switch remains operated as long as the carriage assembly remains in this position. As the carriage assembly escapes toward the left hand side of the machine, past the actuator high point, the micro switch returns to its normal position (Figure 40).

Friden 2200/2300 SERIES MACHINES

The operation of a micro switch activates or de-activates electrical circuits within the machine. Two functions commonly controlled by field control micro switches are:

1. Turning the punch on or off.
2. Terminating the skip tab operation.



Figure 39.

The complete actuator plate & lever assembly is inserted into position at the rear of the machine. The actuator plate is inserted into position at the rear of the machine. The lever is inserted into position at the rear of the machine. The spring is inserted into position at the rear of the machine. The switch body is inserted into position at the rear of the machine. The assembly is then secured in place.

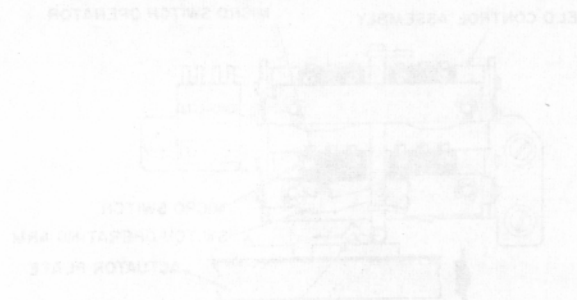


Figure 40.

As the carriage assembly moves toward the left end of the machine, the actuator plate lever passes the lever operating link to the rear. The lever operating link causes the switch actuating lever to operate its associated micro switch. The switch remains operated as long as the carriage assembly remains in this position. As the carriage assembly moves toward the left end of the machine, past the actuator high point, the lever returns to its normal position. (Figure 40)

Friden 2200/2300 SERIES MACHINES

CARRIAGE RETURN LATCHING AND UNLATCHING OPERATION

The carriage assembly returns to the left hand margin of a document when the carriage return keylever is depressed. The carriage return keylever activates a friction clutch which overcomes the tension of the main spring drum assembly. During a carriage return operation, the platen is also indexed one or two lines, depending on the setting of the line space lever. During normal operation the platen indexes before the carriage assembly starts moving toward the right hand side of the machine.

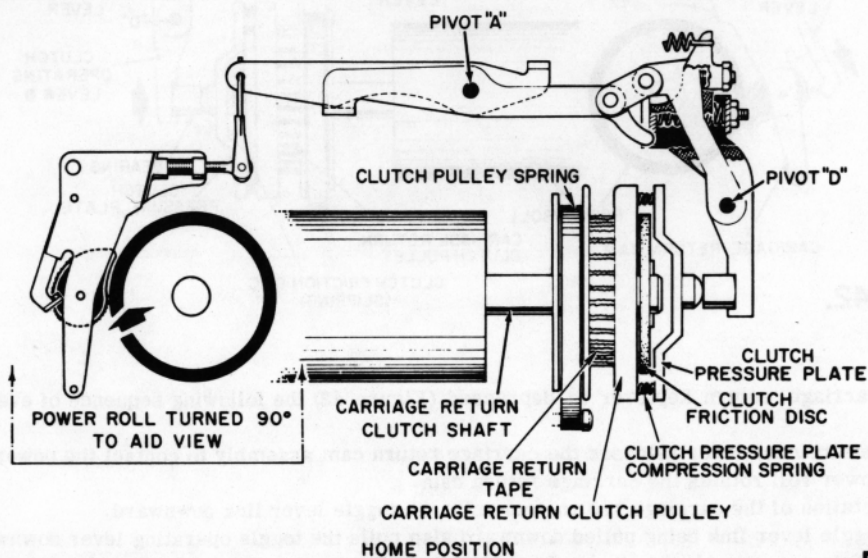


Figure 41.

The clutch friction disc is keyed to the right-hand end of the carriage return clutch shaft. The friction disc is constantly rotated by the power drive mechanism. The rotation of the friction disc does not affect machine operation. The normal position of the carriage return clutch mechanism is the disengaged position. The mechanism is engaged only during a carriage return operation.

To maintain the carriage return clutch mechanism in a disengaged position, three clutch pressure plate compression springs are used. The compression springs keep the pressure plate separated from the clutch friction disc.

As shown in Figure 41, the carriage return clutch mechanism includes the clutch pressure plate, the clutch friction disc, the carriage return clutch pulley, the clutch pulley springs, and the carriage return tape. The remaining components shown initiate and terminate clutch operation. Points A and B are stationary pivot points around which clutch engagement is accomplished.

Friden 2200/2300 SERIES MACHINES

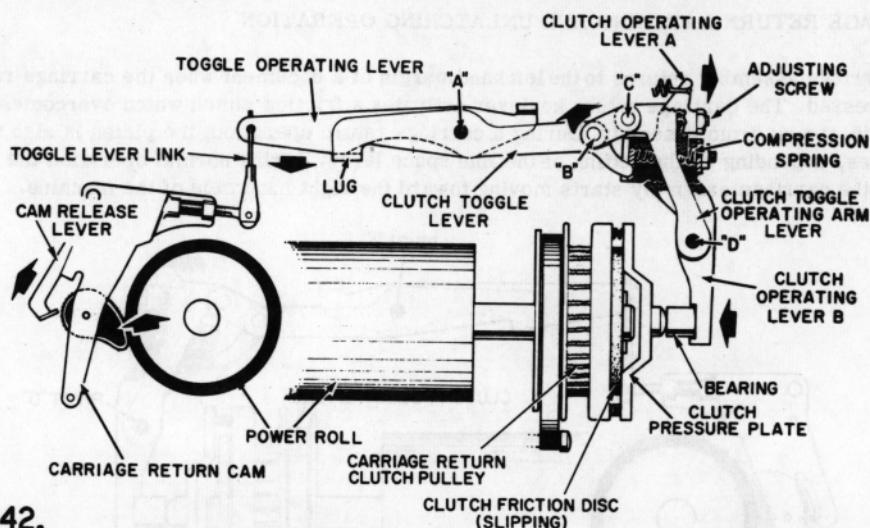


Figure 42.

When the carriage return keylever is depressed (Figure 42) the following sequence of events takes place:

1. The cam release lever releases the carriage return cam assembly to contact the power roll.
2. The power roll rotates the carriage return cam.
3. The rotation of the carriage return cam pulls the toggle lever link downward.
4. The toggle lever link being pulled downward also pulls the toggle operating lever downward.
5. The toggle operating lever pivots about point A until it strikes the lug on the clutch toggle lever.
6. The lug being struck causes the left hand end of the clutch toggle lever to move downward while the right hand end (point B) moves upward.
7. As point B moves upward, point C is forced to the right.
8. The movement of point C to the right causes the clutch toggle operating arm lever to pivot to the right about point D.
9. As the clutch toggle operating arm lever pivots to the right, it pushes against the adjusting screw on clutch operating lever A.
10. Clutch operating lever A is then rotated about pivot point D, applying pressure to the compression spring.
11. The pressure applied to the compression spring causes clutch operating lever B to rotate about point D; the top moving to the right and the bottom to the left.
12. The bottom of clutch operating lever B pushes the bearing and clutch pressure plate to the left.
13. This causes the clutch pressure plate to compress the clutch pressure plate compression springs.
14. When the clutch pressure plate compression springs are compressed, the space between the friction disc and the pressure plate is taken up.

NOTE: At this point, the clutch friction disc is slipping. There is not enough pressure on the clutch pressure plate to allow the friction disc to transmit power to the carriage return clutch pulley (Figure 43).

Friden 2200/2300 SERIES MACHINES

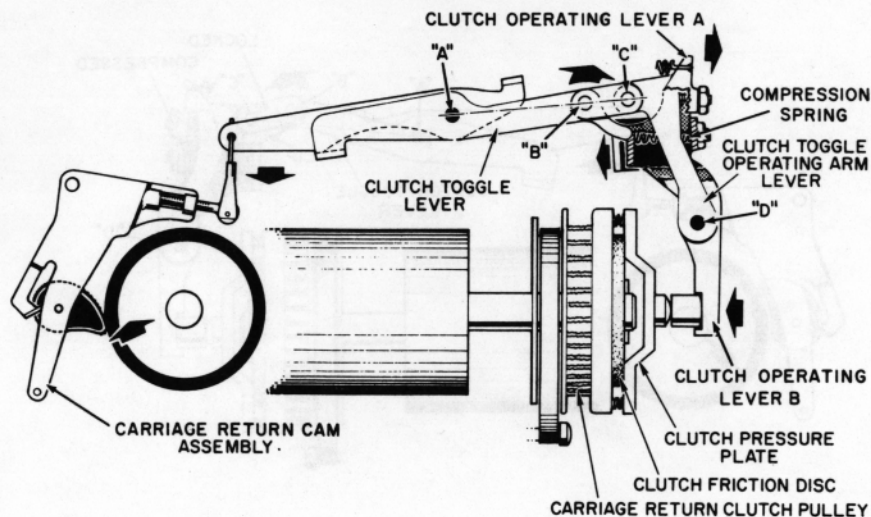


Figure 43.

More pressure is applied to the clutch pressure plate by continued rotation of the carriage return cam assembly. This causes the components to be further actuated in the same direction. Further pressure is applied as follows:

1. Point B on the clutch toggle lever is moved upward, directly between points A and C.
2. In doing so, the clutch toggle operating arm lever and clutch operating lever A move further toward the right.
3. This action continues to apply pressure against the compression spring.
4. The compression spring is again compressed. This time, it causes the clutch pressure plate to hold the friction disc firmly against the carriage return clutch pulley. There is considerable force since the space between the clutch pressure plate and friction disc was already taken up.

With the high point of the cam assembly against the power roll, point B moves further upward. As point B moves above the centerline between points A and C, point C settles back slightly to the left. This occurs because point C is under the pressure of the compression spring. As point C settles back, point B is forced further upward until the lip on the toggle lever limits at point C. This action locks the toggle lever and the carriage return cam assembly restores to the non-operated position. The clutch toggle lever being locked holds the clutch friction disc tightly against the carriage return clutch pulley (Figure 44).

Friden 2200/2300 SERIES MACHINES

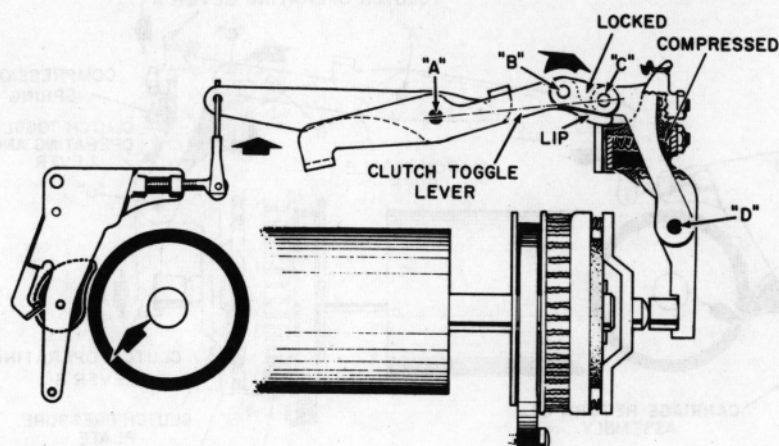


Figure 44.

As explained on preceding page, the clutch toggle lever is rotated to engage the carriage return clutch mechanism. When the clutch toggle lever rotates, it also initiates another function: its left end operates the toggle knockout lever. By operating the toggle knockout lever, various parts mounted to the rear carriage rail are positioned. This positioning does not accomplish any immediate function. It is a preparatory function necessary to restoring the carriage return mechanism at the end of the operation (Figure 45).

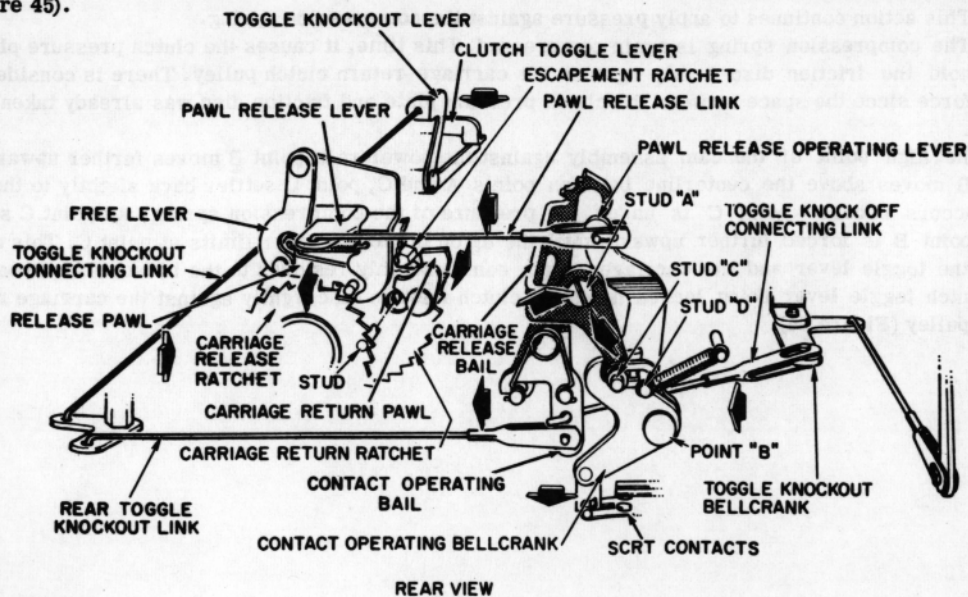


Figure 45.

Friden 2200/2300 SERIES MACHINES

As the clutch toggle lever moves downward, it rotates the toggle knockout lever. The toggle knockout lever pulls the toggle knockout connecting link and the rear toggle knockout link to the right. The rear toggle knockout link rotates the contact operating bail. The contact operating bail pulls the toggle knockoff connecting link to the right. The movement of the toggle knockoff connecting link to the right merely takes up the play in the slotted clevis. It does not rotate the toggle knockout bellcrank.

When the contact operating bail pulled the toggle knockoff connecting link to the right, it also rotated the carriage release bail. The carriage release bail rotates about stud A. (Stud A is a common pivot for both bails.) The carriage release bail was actually operated by the horseshoe spring connecting the two bails. As the carriage release bail rotates, it causes the pawl release operating lever to pivot about point B. The pawl release operating lever pivoted because of the link connecting stud C and D. This also causes stud D to rotate the contact operating bellcrank. The rotation of the contact operating bellcrank opens the SCRT contacts, breaking the circuit to the keylock relay. Breaking the circuit to the keylock relay locks the keyboard during the carriage return operation.

The pawl release operating lever, already pivoted about point B, serves to prevent damage to the escapement assembly. It is not essential to the carriage return operation. It prevents the carriage return pawl from ratcheting over the teeth of the escapement ratchet as the carriage moves to the right hand side of the machine.

The pawl release operating lever pushes the pawl release link to the right hand side. The pawl release link pivots the rear end of the pawl release lever to the right hand side, against the free lever. The free lever pulls the release pawl to the right hand side. The release pawl then engages a tooth on the carriage release ratchet. This causes a limited rotation of the carriage release ratchet. As the carriage release ratchet rotates, the stud mounted to it moves upward. The stud disengages the carriage return pawl from the teeth of the escapement ratchet.

To this point, all of the movements explained were actuated by the clutch toggle lever. All parts are held positioned by the same toggle locking action that holds the carriage return clutch mechanism engaged.

Through the carriage return keylever, the carriage return cam assembly, and the toggle locking action, the friction disc is now tightly clamped against the carriage return clutch pulley. The constantly rotating friction disc now drives the clutch pulley. As the clutch pulley rotates, the carriage return tape is rapidly wound onto the pulley. As the carriage return tape is wound, it rotates the platen index assembly about stud A (Figure 46). The platen index assembly then pulls the index pawl carrier downward.

Friden 2200/2300 SERIES MACHINES

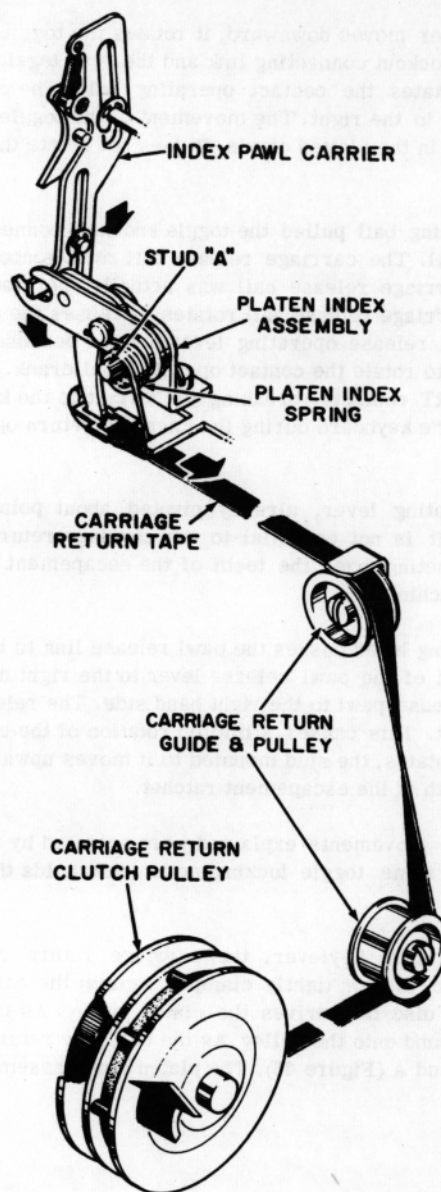


Figure 46.

Friden 2200/2300 SERIES MACHINES

As the index pawl carrier moves downward, the index pawl engages a tooth on the platen ratchet. Downward movement of the index pawl carrier and the index pawl is limited by the index pawl stop. At the same time, the detent arm positions into the next tooth space on the platen ratchet (Figure 47). Once the movement of the platen indexing assembly is completed, the carriage return tape pulls the carriage assembly toward the right hand side of the machine. The carriage return tape continues to wind onto the carriage return clutch pulley.

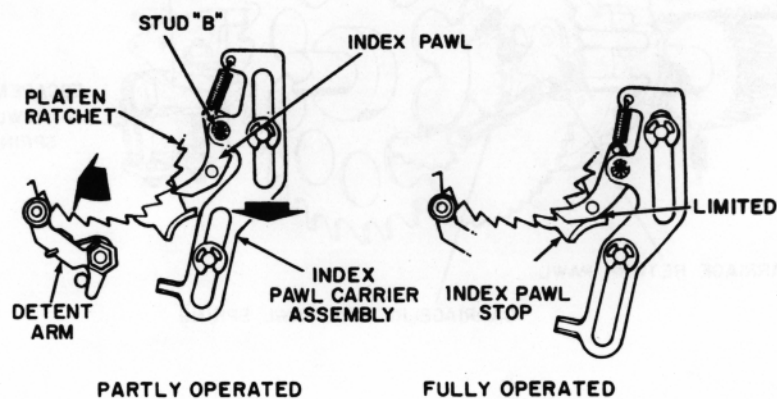


Figure 47.

The carriage return tape is now pulling the carriage assembly and the escapement rack to the right. The escapement rack rotates the escapement pinion & ratchet assembly. The carriage return pawl, through the clutch toggle lever, is disengaged at this time. The tension from the main spring drum assembly is no longer forcing the escapement wheel downward. Therefore, the tension of the escapement pawl spring raises the escapement pawl (Figure 48). The escapement pawl contacts a tooth in the escapement wheel. This causes the escapement wheel and the carriage return ratchet assembly to rotate. Rotation of the escapement wheel at this time is undesirable. This rotation would cause the carriage to escape one unit from the left hand margin at the completion of a carriage return operation.

Friden 2200/2300 SERIES MACHINES

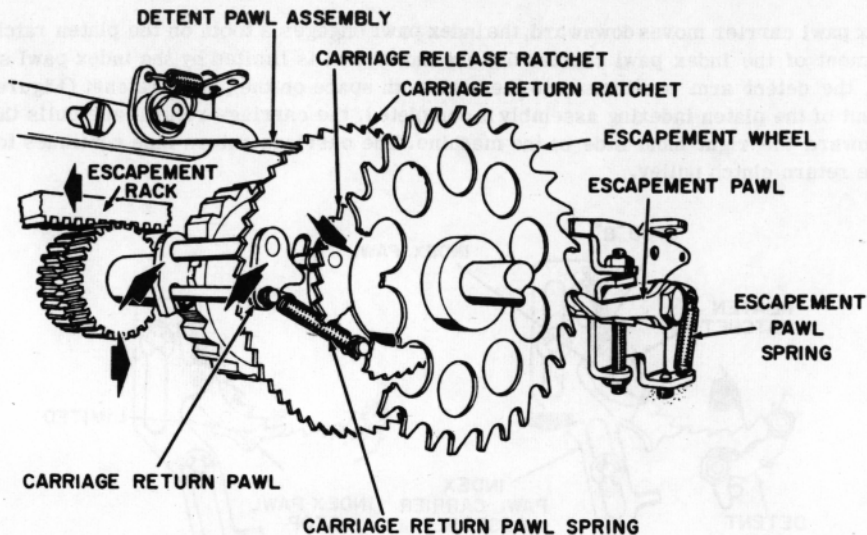


Figure 48.

The escapement wheel is prevented from moving backward by the detent pawl assembly. The detent pawl assembly engages the carriage return ratchet. The carriage return ratchet and the escapement wheel can only move together. The escapement wheel and the carriage return ratchet can rotate in the normal escapement direction, but cannot rotate backward.

The carriage assembly moves toward the right hand until the margin stop strikes the margin release lever (Figure 49). The margin stop pulls the margin release lever to the right hand side. The margin release lever rotates the butterfly and butterfly shaft. The butterfly shaft moves the rear and front latch release links forward to pivot the cam trip lever. (The cam trip lever is similar to the operation of a keylever.) The cam trip lever releases the unlatch cam assembly. The entire operation of the unlatch cam assembly occurs simultaneously with the margin stop striking the margin release lever.

Friden 2200/2300 SERIES MACHINES

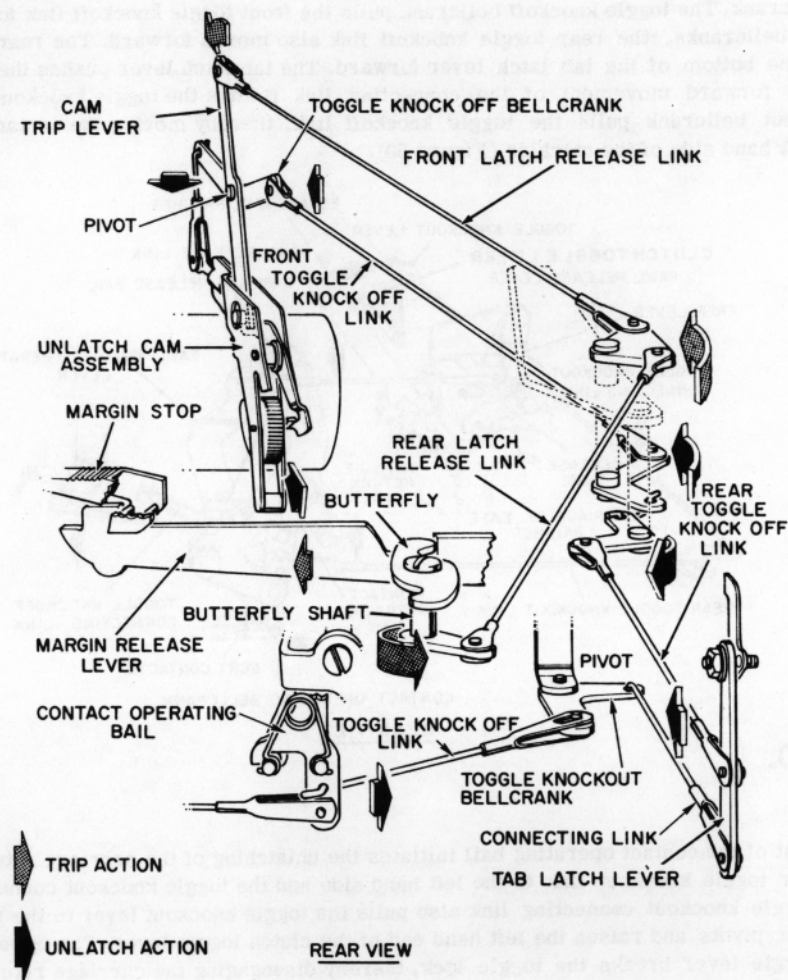


Figure 49.

Friden 2200/2300 SERIES MACHINES

The unlatching operation takes place in the normal manner. The unlatch cam assembly, when released, is rotated by the power roll. As the unlatch cam assembly rotates, it pulls the adjustable cam link downward. The adjustable cam link (shown at directional arrow below cam trip lever) pivots the toggle knockoff bellcrank. The toggle knockoff bellcrank pulls the front toggle knockoff link forward. Through a series of bellcranks, the rear toggle knockoff link also moves forward. The rear toggle knockoff link pivots the bottom of the tab latch lever forward. The tab latch lever pushes the connecting link forward. The forward movement of the connecting link rotates the toggle knockout bellcrank. The toggle knockout bellcrank pulls the toggle knockoff link, thereby moving the contact operating bail toward the left hand side of the machine (Figure 50).

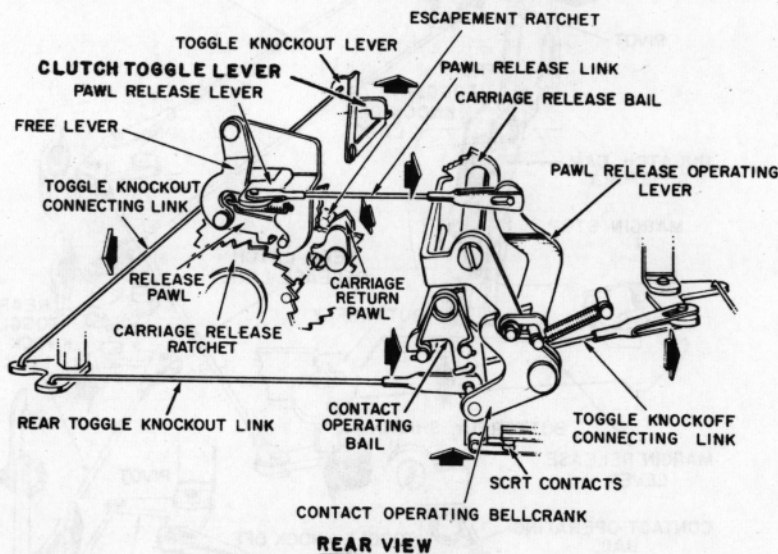


Figure 50.

The movement of the contact operating bail initiates the unlatching of the carriage return operation. It pulls the rear toggle knockout link to the left hand side and the toggle knockout connecting link to the rear. The toggle knockout connecting link also pulls the toggle knockout lever to the rear. The toggle knockout lever pivots and raises the left hand end of the clutch toggle lever. The upward movement of the clutch toggle lever breaks the toggle lock, thereby disengaging the carriage return clutch mechanism. The toggle locking action is broken since the upward movement of the clutch toggle lever overcomes the holding force of the compression spring. (The toggle locking action may be seen by referring back to Figure 44.)

The parts held by the toggle locking action are now restored to their normal position. The restoration sequence is as follows:

1. The toggle was unlocked by moving the contact operating bail to the left hand side as explained above.
2. The contact operating bail, through the horseshoe spring, restores the carriage release bail.
3. The carriage release bail rotates the pawl release operating lever to the left.
4. The pawl release operating lever pulls the pawl release link to the left hand side.

Friden 2200/2300 SERIES MACHINES

5. The pawl release link restores the pawl release lever, the free lever, and the release pawl.
6. The carriage release ratchet then rotates to its rest position.
7. The carriage return pawl can now re-engage the escapement ratchet.
8. The escapement ratchet is held, thereby inhibiting carriage assembly movement to the left hand side of the machine. This is important at this time because the carriage return clutch is disengaged. The carriage assembly is not being pulled to the right hand side of the machine.
9. As the pawl release operating lever restored(step 3), it also removed pressure from the contact operating bellcrank.
10. As the contact operating bellcrank is released, the SCRT contacts close.
11. When the SCRT contacts close, the circuit is completed and the keylock relay is energized.
12. The energizing of the keylock relay causes the keyboard to unlock and the machine operation may continue.

Once the carriage return clutch mechanism is disengaged, the carriage return tape releases the platen index spring. The tension of the spring rotates the platen index assembly upward (Figure 51). The platen index assembly then moves the index pawl carrier upward. The index pawl, connected to the index pawl carrier, also moves upward. The index pawl strikes the index pawl stop. The upper portion of the index pawl rotates forward; the bottom portion rotates to the rear. When the bottom portion of the index pawl rotates to the rear, it disengages from the platen ratchet. The platen indexing assembly is now in position to index the platen assembly during the next carriage return operation.

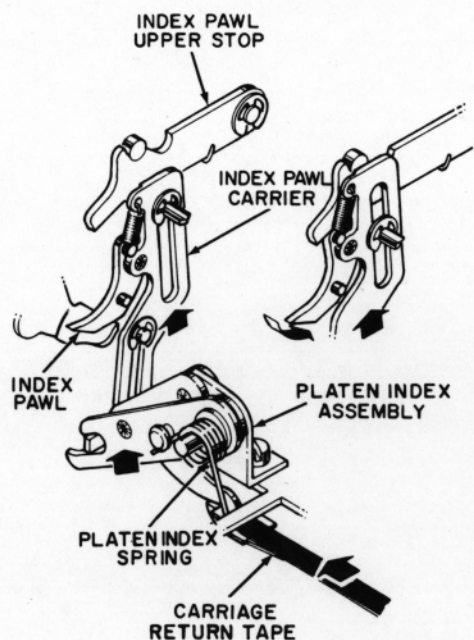


Figure 51.

Friden 2200/2300 SERIES MACHINES

The line space lever controls variable line spacing (Figure 52). In home position, the index pawl rests against the underside of the index pawl upper stop. By moving the line space lever to its rear position, the index pawl and the upper stop move upward. When operation of the platen indexing mechanism is initiated (carriage return), the index pawl engages the platen ratchet one tooth higher. In this case, the platen assembly rotates two full line spaces.

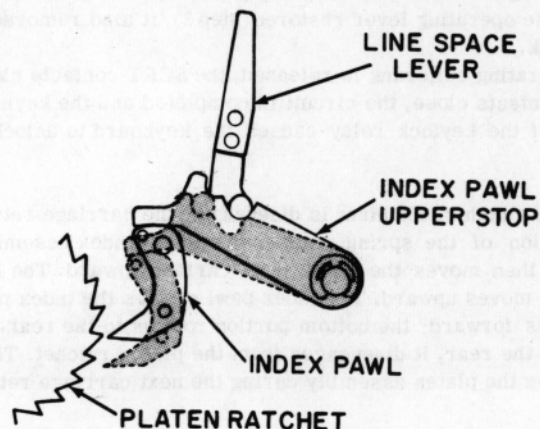


Figure 52.

Friden 2200/2300 SERIES MACHINES

TAB (TABULATION) OPERATION

The function of the tab operation is to automatically position the carriage assembly to the left hand side of the machine to a predetermined location. Upon reaching the predetermined location, the carriage assembly is stopped by a tab stop positioned on the tab rack. A tab operation is initiated by depressing the tab keylever. This causes a latching of the tab mechanism, thereby allowing the tab operation to take place (Figure 53 as seen from the rear of the machine).

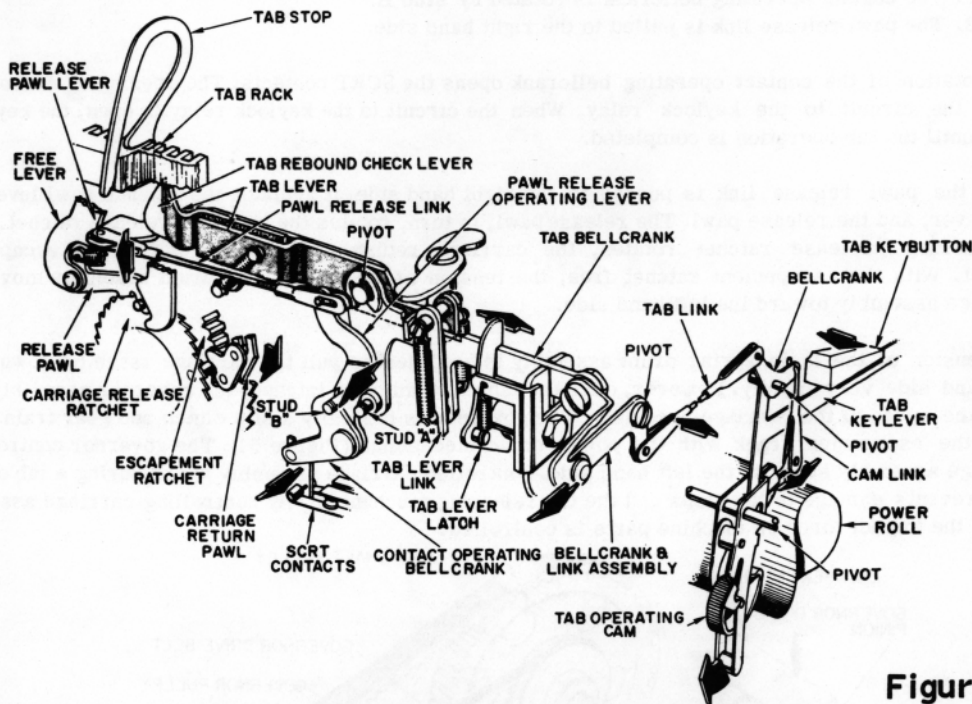


Figure 53.

Depression of the tab keylever releases the tab cam assembly. The tab cam assembly is then rotated by the power roll. As the tab cam assembly rotates, its lower portion pivots to the rear. This pulls the cam link downward and rotates the bellcrank. The rotation of the bellcrank pulls the tab link forward. The tab link then causes the rear of the bellcrank and link assembly to pivot downward. As the bellcrank and link assembly move downward, the tab bellcrank is also pulled downward. As the tab bellcrank moves downward, the tab lever latch moves forward. The tab lever latch holds the tab bellcrank in its operated position. The tab bellcrank must be latched in its operated position, since the completion of the tab cam operation would restore all parts.

When the left hand end of the tab bellcrank pivots downward, it causes the left hand end of the tab lever to pivot downward. The tab bellcrank and the tab lever rotate about the same pivot point. The left hand end of the tab lever is pulled down by two springs which connect the tab lever and the tab bellcrank. As the left hand end of the tab lever moves down, the right hand end moves up. As the right hand end

Friden 2200/2300 SERIES MACHINES

of the tab lever moves up, spring tension pulls the right hand end of the tab rebound check lever up. In the up position, the tab lever can be operated by the bottom of any tab stop on the tab rack.

In addition to operating the tab lever, the tab bellcrank also operates the pawl release operating lever. As the left hand end of the tab bellcrank moves downward, stud A pivots the pawl release operating lever. When the pawl release operating lever rotates, two actions occur:

1. The contact operating bellcrank is rotated by stud B.
2. The pawl release link is pulled to the right hand side.

The rotation of the contact operating bellcrank opens the SCRT contacts. The opening of the contacts opens the circuit to the keylock relay. When the circuit to the keylock relay is open, the keyboard locks until the tab operation is completed.

When the pawl release link is pushed to the right hand side, it actuates the release pawl lever, the free lever, and the release pawl. The release pawl, in turn, rotates the carriage release ratchet. When the carriage release ratchet rotates, the carriage return pawl disengages from the escapement ratchet. With the escapement ratchet free, the tension of the main spring drum assembly moves the carriage assembly toward the left hand side.

The tension of the main spring drum assembly is sufficient to pull the carriage assembly toward the left hand side very rapidly. However, once the tab mechanism is latched, the governor assembly controls the speed of the carriage assembly. The governor is basically a slip clutch and gear train which links the escapement rack with the power drive mechanism (Figure 54). The governor controls the carriage assembly speed to the left hand side. Controlled carriage assembly speed during a tab operation prevents damage to tab stops and the tab releasing mechanism. By controlling carriage assembly speed, the impact force on machine parts is controlled.

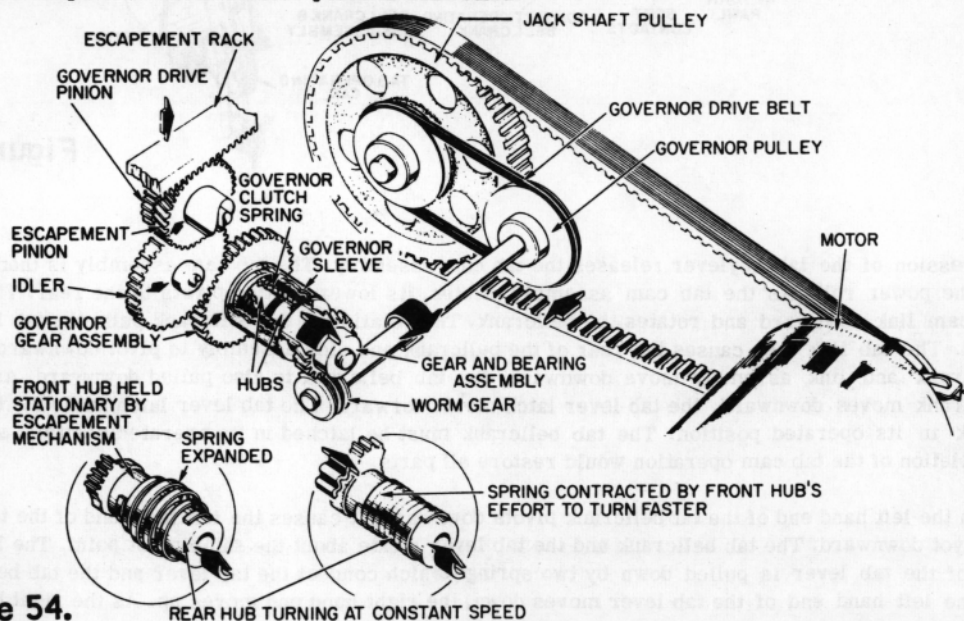


Figure 54.

Friden 2200/2300 SERIES MACHINES

The governor assembly is comprised of a clutch spring which encircles the hubs of the governor gear assembly and of the gear & bearing assembly. As the carriage assembly moves toward the left hand side of the machine, the escapement rack and the gear train are driven as indicated in Figure 54. As the governor gear assembly rotates, the clutch spring winds tightly around the two gear hubs. The tightly coiled spring inhibits rotation of the gear train unless the gear & bearing assembly and the worm gear are rotated. The worm gear is rotated by the power drive mechanism. The worm gear drives the gear & bearing assembly, thereby allowing the escapement rack and carriage assembly to move toward the left hand side of the machine. The carriage assembly can only move to the left hand side of the machine at the speed imparted to it by the power drive mechanism through the worm gear and the gear & bearing assembly.

The tightening of the clutch spring is caused by the movement of the carriage assembly. The carriage assembly attempts to rotate the governor gear assembly faster than the gear & bearing assembly. This causes the clutch spring to wind tighter onto both hubs clamping them to act as one unit. The clutch spring is unwound when the gear & bearing assembly continues to rotate after the escapement pinion is held secure by the escapement assembly. As the clutch spring is unwound, it expands to disengage the governor clutch. Because the governor clutch disengages, the power drive mechanism is not restricted when the carriage assembly stops.

NOTE: The governor clutch is also disengaged when the carriage assembly is manually or automatically moved toward the right hand side of the machine.

The carriage assembly moves toward the left hand side of the machine until a tab stop contacts the tab lever. When the tab stop approaches the cam lever (see inset, Figure 55), the tab stop cams the tab rebound check lever downward. The left hand end of the tab lever, being slotted, allows the carriage assembly to move slightly further toward the left hand side. This movement is limited when stud A contacts the right hand end of the horizontal slot. As the tab lever is pushed to the left hand side, it is separated from the tab rebound check lever. This separation allows the tab rebound check lever to move upward. As the tab rebound check lever moves upward, it engages the right-hand side of the tab stop, locking it in a fixed position. The locking of the tab stop prevents carriage assembly rebound.

Friden 2200/2300 SERIES MACHINES

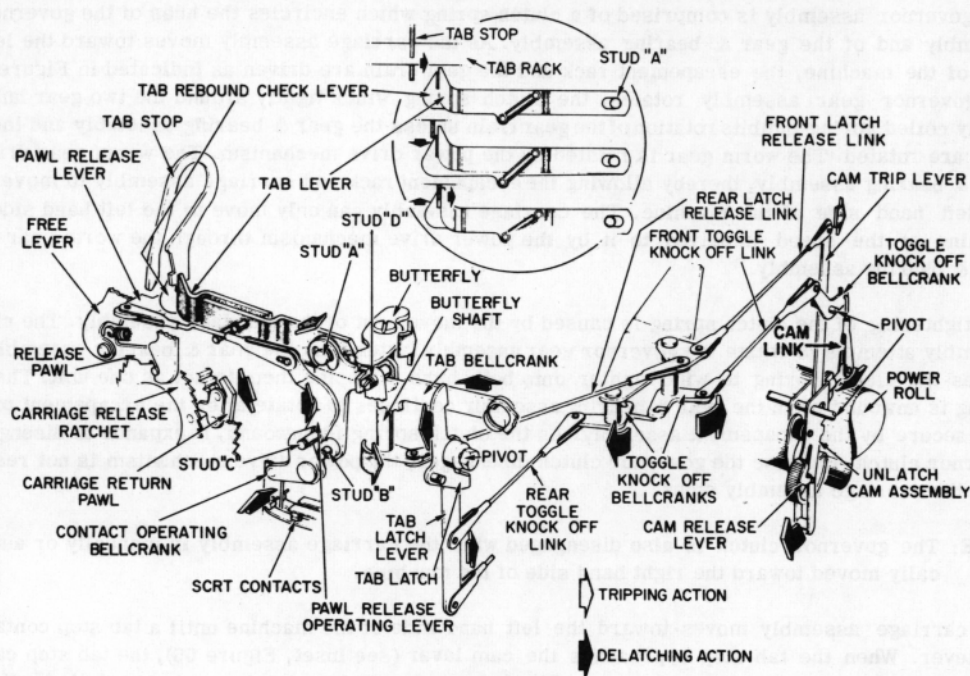


Figure 55.

REAR VIEW

The unlocking of the tab mechanism is initiated when the tab lever is moved to the left hand side. At this time, the tab lever rotates the butterfly and butterfly shaft to the left hand side. The butterfly shaft moves the rear and front latch release links forward. The front latch release link causes the cam trip lever to rotate about its pivot point. As the cam trip lever rotates, it releases the cam release lever within the unlatch cam assembly. This releases the unlatch cam assembly which is then operated by the power roll.

The unlatching of the tab mechanism occurs as the bottom of the unlatch cam assembly moves to the rear. This pulls the cam link downward and the toggle knockoff bellcrank forward. The toggle knockoff bellcrank pulls the front and rear toggle knockoff links forward. The rear toggle knockoff link then pulls the tab latch lever forward. As the tab latch lever moves forward, it rotates the top of the tab latch to the rear. This is accomplished by a lug at the bottom of the tab latch which contacts the front edge of the tab latch lever.

When the tab latch rotates to the rear, it releases the tab bellcrank. The left hand end of the tab bellcrank restores upward, assisted by the carriage release ratchet and release pawl springs. Stud B, on the lower extension of the tab bellcrank, also moves to the left hand side when the tab bellcrank moves upward. As stud B moves to the left hand side, it allows the following components to also move to the left hand side:

Friden 2200/2300 SERIES MACHINES

1. Pawl release operating lever.
2. Pawl release link.
3. Pawl release lever.
4. Free lever.
5. Release pawl.

As the pawl release operating lever moves to the left hand side, stud C releases the contact operating bellcrank. The bottom of the contact operating bellcrank rotates upward. This allows the SCRT contacts to close. The closing of the contacts completes the circuit to the keylock relay, thereby energizing the relay and unlocking the keyboard.

Once the release pawl restores, the carriage release ratchet returns to its rest position. The carriage return pawl can then re-engage the teeth of the escapement ratchet. Once the carriage return pawl restricts movement of the escapement wheel, the carriage assembly can move no further toward the left hand side of the machine. The tab lever, at the same time, disengages from the tab stop. Carriage assembly movement is now restricted by the escapement assembly rather than the tab mechanism.

Finally, the tab bellcrank moving upward also causes the tab lever to disengage from the tab stop as follows:

1. The tab bellcrank pushes stud D upward.
2. Stud D, attached to the tab lever, causes the tab lever to rotate about stud A.
3. The right hand end of the tab lever moves downward, pushing the tab rebound check lever ahead of it. (This is accomplished by a stud on the tab rebound check lever which projects under the tab lever.)
4. The downward movement of the tab lever and tab rebound check lever causes them to disengage from the tab stop.
5. With the tab lever disengaged from the tab stop, the carriage assembly settles slightly toward the left hand side of the machine. The escapement assembly at this time restricts further carriage assembly movement, as explained above.

Friden 2200/2300 SERIES MACHINES

SKIP TAB OPERATION (TAB DISABLING ASSEMBLY)

The purpose of the skip tab operation is to allow the carriage assembly to pass a predetermined number of tab stop positions before terminating the tab operation.

Normally during a tab operation, the first tab stop to the right hand side of the tab lever stops the carriage assembly. A normal tab operation is accomplished by moving the tab lever and tab rebound check lever upward, directly in the path of the tab stop positioned on the tab rack. However, during a skip tab operation, the upward movement of the tab lever into the path of the tab stops is delayed. The delayed operation of the tab lever allows the tab stops to pass by unrestricted.

The tab lever delay is accomplished mechanically but is initiated and terminated electrically. The standard method of initiating a skip tab operation is by sensing a predetermined code in the reader.

Normally, the skip tab operation is terminated through the operation of a field control micro switch. The following paragraph is a general description of a skip tab operation.

With the writing machine under automatic control of the reader, a skip tab code is sensed in the reader station. Upon sensing a skip tab code, the reader station generates an electrical signal which is used to engage the tab disabling assembly. Assuming that a tab code is read during the next reader cycle, the tab key lever operates. The operation of the tab key lever latches the tab mechanism. The tab mechanism is latched in the normal manner, but the tab lever and tab rebound check lever do not position upward in the path of the tab stops. Once the tab mechanism is fully latched, the carriage assembly begins moving toward the left hand side of the machine. The tab stops now pass over the tab lever. An actuator, selected to terminate the skip tab operation, actuates its associated field control micro switch. The actuation of the micro switch produces an electrical signal used to restore the tab disabling assembly. Upon application of the electrical signal, the tab lever moves upward to contact the next tab stop on the tab rack. Once the tab lever contacts the tab stop, the tab operation is terminated as described in the tab unlatching operation.

A detailed description of the skip tab operation appears next (Figure 56).

Friden 2200/2300 SERIES MACHINES

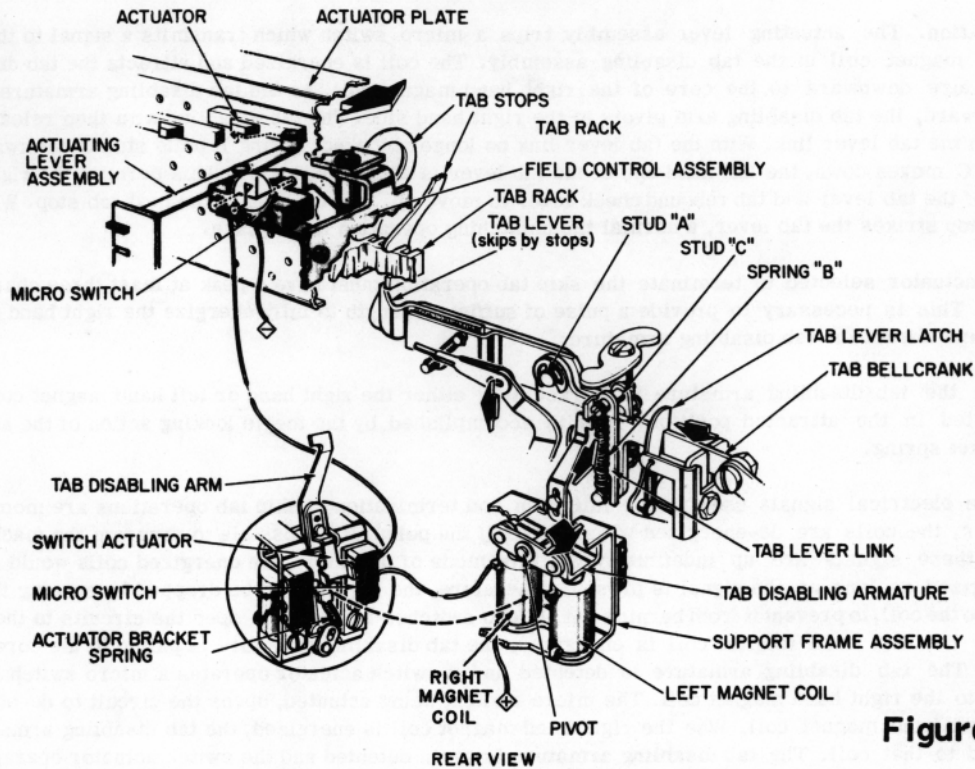


Figure 56.

To perform a skip tab operation, the tab disabling assembly must be operated and fully positioned before the tab mechanism is latched. When a skip tab code is sensed in the reader station, an electrical signal is transmitted to the left hand magnet coil. The coil is energized and attracts the tab disabling armature to the core of the coil. Attached to the tab disabling armature is the tab disabling arm which then pivots to the left hand side. The upper end of the tab disabling arm positions directly under the lip on the tab lever link. The tab lever link then prevents any downward movement of the tab lever. The tab disabling assembly is now operated and fully positioned. The tab mechanism may now be latched by the automatic operation of the tab keylever.

As the tab keylever is operated, the tab bellcrank pivots downward about stud A. In a normal tab operation this causes spring B to pull stud C on the tab lever downward. Since the tab lever link is also connected to stud C and is blocked by the tab disabling arm, stud C cannot move. Because stud C does not move down, the right hand end of the tab lever cannot move up. The tab lever, therefore, remains below the tab stops. The tab mechanism, at this point, is fully latched and the carriage assembly moves toward the left hand side of the machine. The tab stop can now be moved by the carriage assembly without being stopped by the tab lever.

As the carriage assembly moves toward the left hand side of the machine, a preselected actuator strikes its associated actuating lever assembly. The actuator is preselected to terminate the skip tab

Friden 2200/2300 SERIES MACHINES

operation. The actuating lever assembly trips a micro switch which transmits a signal to the right hand magnet coil in the tab disabling assembly. The coil is energized and attracts the tab disabling armature downward to the core of the right hand magnet coil. As the tab disabling armature moves downward, the tab disabling arm pivots to the right hand side. The tab disabling arm then releases the lip on the tab lever link. With the tab lever link no longer blocked, spring B pulls stud C downward. As stud C moves down, the left hand end of the tab lever is also moved down. This permits the right hand end of the tab lever and tab rebound check lever to move up, into the path of the next tab stop. When the tab stop strikes the tab lever, a normal tab unlatching operation takes place.

The actuator selected to terminate the skip tab operation must have a peak at least three characters long. This is necessary to provide a pulse of sufficient length to fully energize the right hand magnet coil and attract the tab disabling armature.

When the tab disabling armature is attracted by either the right hand or left hand magnet coil, it is detented in the attracted position. This is accomplished by the toggle locking action of the actuator bracket spring.

If the electrical signals used in the initiation and termination of skip tab operations are momentary pulses, the coils are de-energized with the fall of the pulse. It is possible to program the machine so that these signals are up indefinitely. In this mode of operation, the energized coils would remain energized as long as the signal is present. Therefore, the signal must be dropped by opening the circuit to the coil, to prevent it from burning out. Micro switches are used to open the circuits to the coils. When the left hand magnet coil is energized, the tab disabling armature is pulled to the core of the coil. The tab disabling armature is detented and a switch actuator operates a micro switch located next to the right hand magnet coil. The micro switch, being actuated, opens the circuit to de-energize the left hand magnet coil. When the right hand magnet coil is energized, the tab disabling armature is pulled to that coil. The tab disabling armature is again detented and the switch actuator operates another micro switch located next to the left hand magnet coil. This micro switch, being actuated, opens another circuit to de-energize the right hand magnet coil. Therefore, soon after each coil is energized, it is de-energized when the tab disabling armature is pulled downward.

Friden 2200/2300 SERIES MACHINES

MANUAL CARRIAGE RELEASE MECHANISM

The carriage assembly is normally restricted from moving toward the left hand side of the machine by the escapement assembly. The escapement assembly may be disengaged manually to position the carriage assembly to the left hand side of the machine. Manual positioning is accomplished by the operation of the carriage release levers. Depression of a carriage release lever pushes the carriage universal bar to the rear. The rearward movement of the carriage universal bar rotates the release pawl lever (Figure 57).

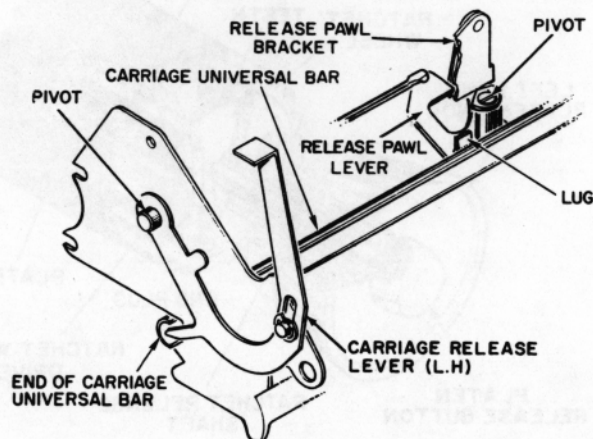


Figure 57.

Once the release pawl lever is rotated, the carriage assembly is released the same as during a normal carriage return operation. The release pawl lever rotates the release pawl bracket lever and pulls the release pawl to the right hand side. The release pawl then operates the carriage release ratchet. The rotation of the carriage release ratchet disengages the carriage return pawl from the escapement ratchet. The carriage return pawl being disengaged from the escapement ratchet allows the carriage assembly to be moved toward the left hand side of the machine. The carriage return pawl remains disengaged until the carriage release levers are released (Figure 58).

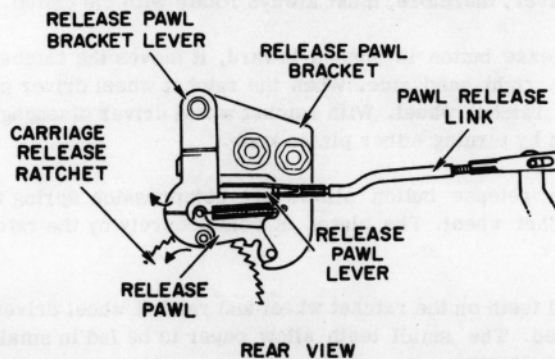


Figure 58.

Friden 2200/2300 SERIES MACHINES

PLATEN ASSEMBLY

The platen assembly can be variably controlled by operating the platen release button. With the platen release button pushed inward, the platen assembly may be indexed (rotated) in very small increments. Variable control of the platen assembly is necessary to position documents at desired horizontal levels. The platen is free to rotate independently of the detented ratchet wheel when the ratchet wheel driver is moved inward by the operation of the platen release button (Figure 59).

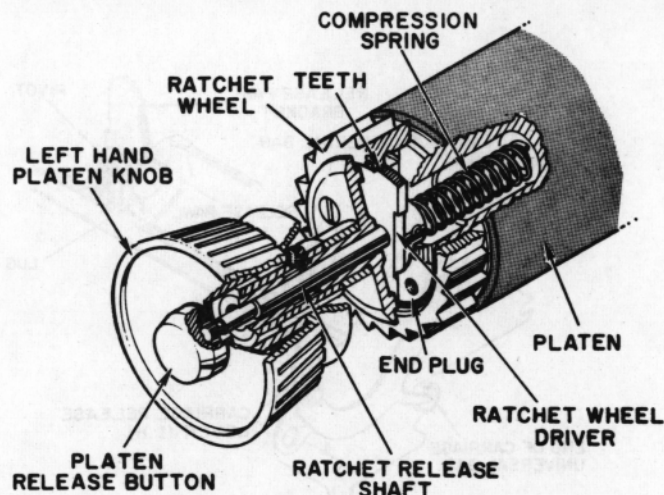


Figure 59.

Normally, any rotation of the platen by the platen knobs rotates the ratchet wheel. The ratchet wheel also rotates when indexing takes place during a carriage return operation. The physical connection between the platen and the ratchet wheel is the ratchet wheel driver. The ratchet wheel driver has small teeth on its circumference that mesh with the teeth on the inside surface of the ratchet wheel. Therefore, when the ratchet wheel rotates, it rotates the ratchet wheel driver.

The ratchet wheel driver is positioned in the slot of the left hand end plug. The plug is secured in the left hand end of the platen core. The slot in the plug permits sideward movement of the ratchet wheel driver. This sideward movement is limited so that the plug and ratchet wheel driver cannot separate. The ratchet wheel driver, therefore, must always rotate with the platen.

When the platen release button is pushed inward, it moves the ratchet release shaft and the ratchet wheel driver to the right hand side. When the ratchet wheel driver moves to the right hand side, it disengages from the ratchet wheel. With ratchet wheel driver disengaged from the ratchet wheel, the platen may be rotated by turning either platen knob.

Restoring the platen release button allows the compression spring to re-engage the ratchet wheel driver with the ratchet wheel. The platen is held securely by the ratchet wheel in its newly indexed position.

Because of the small teeth on the ratchet wheel and ratchet wheel driver, a wide range of platen positions can be obtained. The small teeth allow paper to be fed in small enough increments to satisfy nearly every possible situation.

Friden 2200/2300 SERIES MACHINES

DOCUMENT FEED AND RELEASE

Two functions are performed by the document feed and release mechanism. In the feed position it holds the document securely against the platen. When the platen assembly rotates, the document advances evenly. In the released position, the document can be inserted, removed, or adjusted to the writing line without rotating the platen. Figure 60 is an illustration of a deflector assembly.

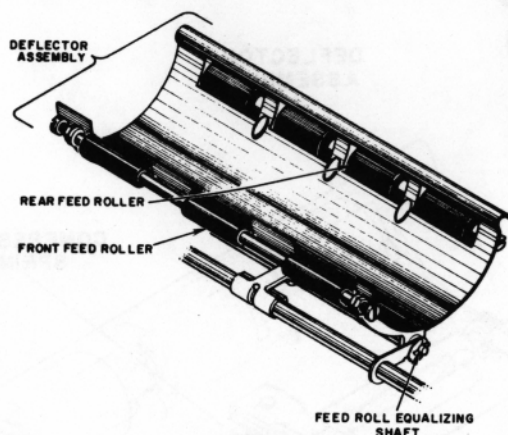


Figure 60.

There are two deflector assemblies (right hand side and left hand side) on machines with 16 inch and 20 inch platen assemblies. The deflector assemblies are positioned directly under each side of the platen. They are supported by the feed roll equalizing shaft. The deflector assemblies contain front and rear feed rollers which hold the document to the platen. The feed rollers do not actually feed the paper, but insure that the paper moves with the platen.

Friden 2200/2300 SERIES MACHINES

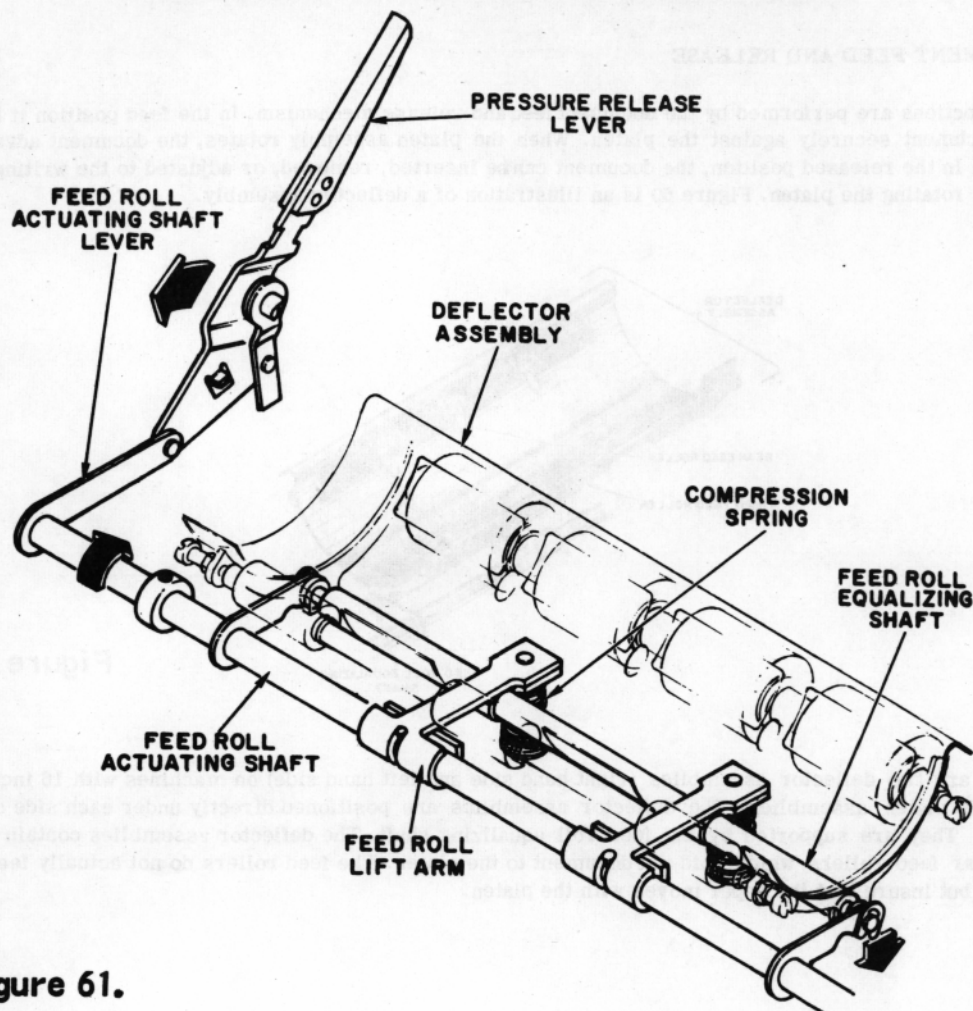


Figure 61.

The document release mechanism operates when the top of the pressure release lever is moved forward (Figure 61). The pressure release lever pivots the feed roll actuating lever, which in turn, rotates the feed roll actuating shaft. Fastened to the feed roll actuating shaft are the feed roll lift arms. As the feed roll actuating shaft rotates, the rear of the feed roll lift arms move downward. The feed roll lift arms then carry the feed roll equalizing shaft downward. The feed roll lift arms then carry the feed roll equalizing shaft downward. When the feed roll equalizing shaft moves downward, it causes the deflector assemblies to move downward and away from the platen. The document may now be adjusted to the writing line or multiple copy forms may be easily inserted (Figure 62). When lowered, the deflector assemblies tend to tilt to the rear. This is caused by the weight of the rear rollers. The deflector stops support the deflector assemblies and hold them concentric to the platen.

Friden 2200/2300 SERIES MACHINES

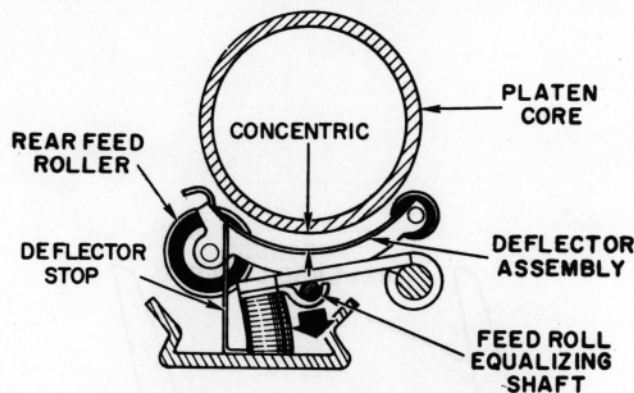


Figure 62.

With the document release mechanism in the non-operated position, the feed roll equalizing shaft is held upward by compression springs (Figure 63). The feed roll equalizing shaft support the deflector assemblies and the front and rear feed rollers. Therefore, in the non-operated position, the front and rear feed rollers are held firmly against the platen.

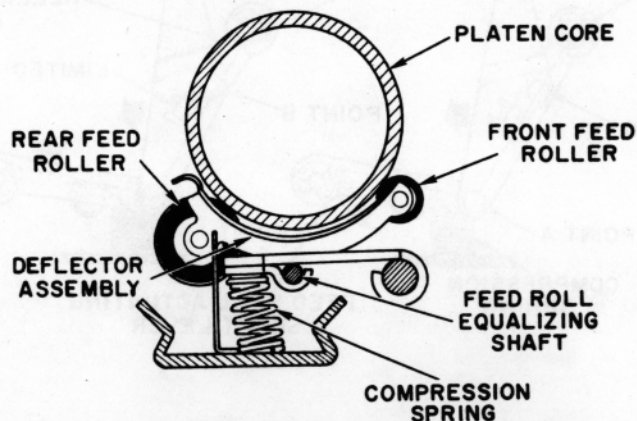


Figure 63.

The compression springs which provide the lifting action for the deflector assemblies also provide a toggle locking action for the pressure release lever (Figure 64). This is accomplished as follows:

1. The pressure release lever is moved forward.
2. Point B on the pressure release lever is also moved forward.
3. Point A on the feed roll actuating shaft lever moves downward.
4. Point B then reaches a position forward of the centerlines between points A and C.
5. Point A then rises very slightly.
6. The slight rise of point A allows the tension of the compression spring to drive point B forward.
7. Point B moves forward until the feed roll release lever link contacts the lug on the pressure release lever.

Friden 2200/2300 SERIES MACHINES

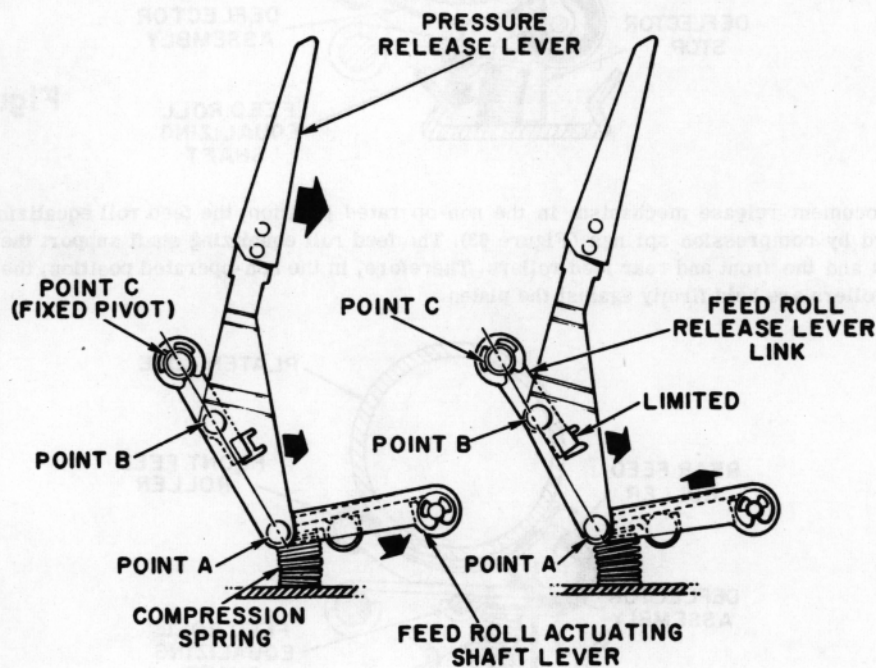


Figure 64.

Friden 2200/2300 SERIES MACHINES

PRINT IMPRESSION CONTROL MECHANISM

The platen control lever is manually operated to position the platen assembly forward or rearward (Figure 65). Platen assembly positioning maintains uniform printing quality for single or multiple form documents.

The machine is normally adjusted for a single sheet of paper so that the printed character is well defined without excessive embossing. When the impression of the typebars is light, it results in faint printing of characters. If the impression of the typebars is heavy, excessive embossing or cutting of the document results.

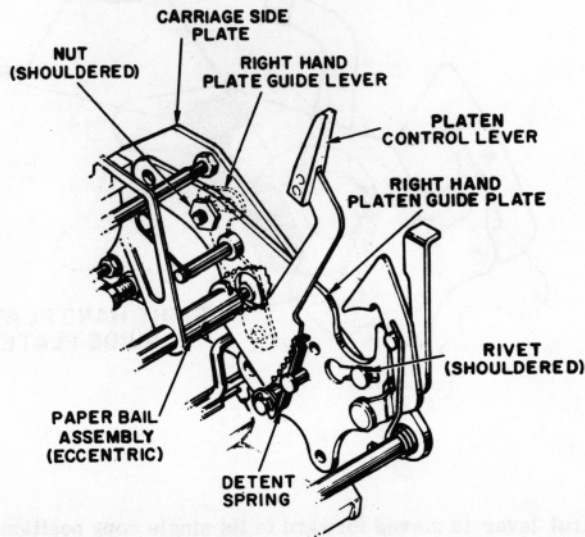


Figure 65.

The right hand and left hand platen guide plates support the platen assembly. The platen guide plates are connected at two points to each carriage side plate. The front mountings are shouldered rivets. The rear mountings are shouldered nuts. The shouldered rivets and nuts provide for movement of the platen guide plates and the platen assembly to the front and rear.

The eccentric paper bail assembly passes through the platen guide plate. The paper bail pivots in the plate guide lever attached to the carriage side plate (Figure 66). The paper bail assembly rotates when the platen control lever is moved to one of its seven detent positions.

Friden 2200/2300 SERIES MACHINES

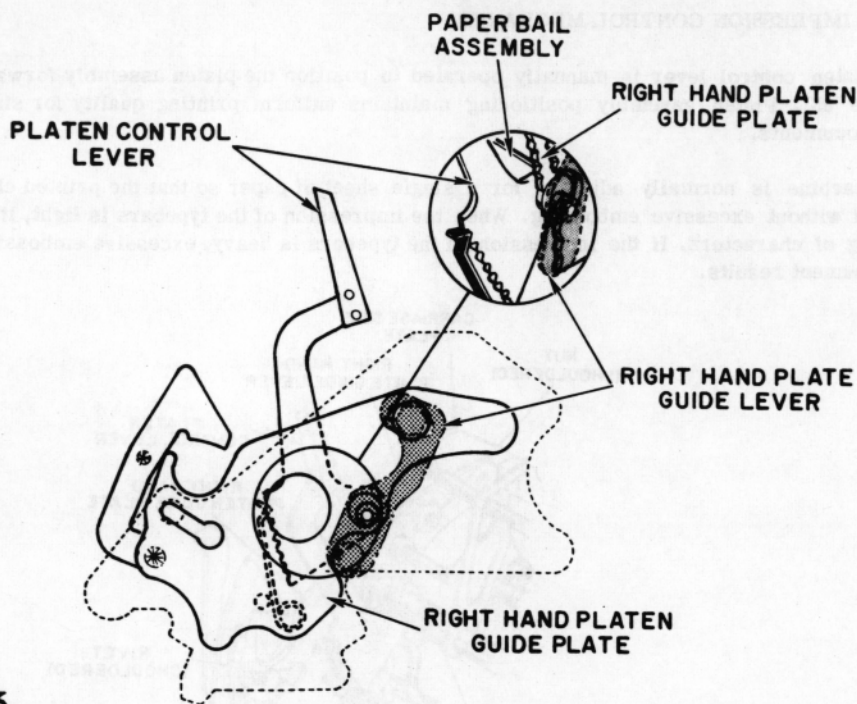


Figure 66.

As the platen control lever is moved forward to its single copy position, it rotates the paper bail assembly. The eccentric portion of the paper bail assembly forces the platen guide plate forward. The small end of the paper bail assembly pivots in the plate guide lever. The forward movement of the platen guide plates positions the platen assembly closer to the typebars.

When additional copies are being printed, the platen assembly can be moved further away from the typebars by moving the platen control lever to the rear. The rearward movement of the platen control lever causes the platen guide plates to position the platen assembly further away from the typebars.

Friden 2200/2300 SERIES MACHINES

RIBBON FEED MECHANISM

The function of the ribbon feed mechanism is to continuously feed the ribbon past the printing point. This is necessary to prevent the type slugs from constantly striking the ribbon in the same spot. The ribbon feed mechanism, therefore, provides for longer lasting ribbons and clear, sharp printed copy.

The ribbon is wound on a ribbon spool (left hand side as shown in Figure 67). The ribbon is threaded through the ribbon reverse levers (2), the ribbon guides (2), and the cloth ribbon guide. The ribbon is then attached to another spool on the right hand side of the machine. The ribbon is fed past the printing point by the operation of the ribbon feed pawls. The ribbon feed pawls are contained within the ribbon feed and check pawl assemblies (2) located beneath each ribbon spool.

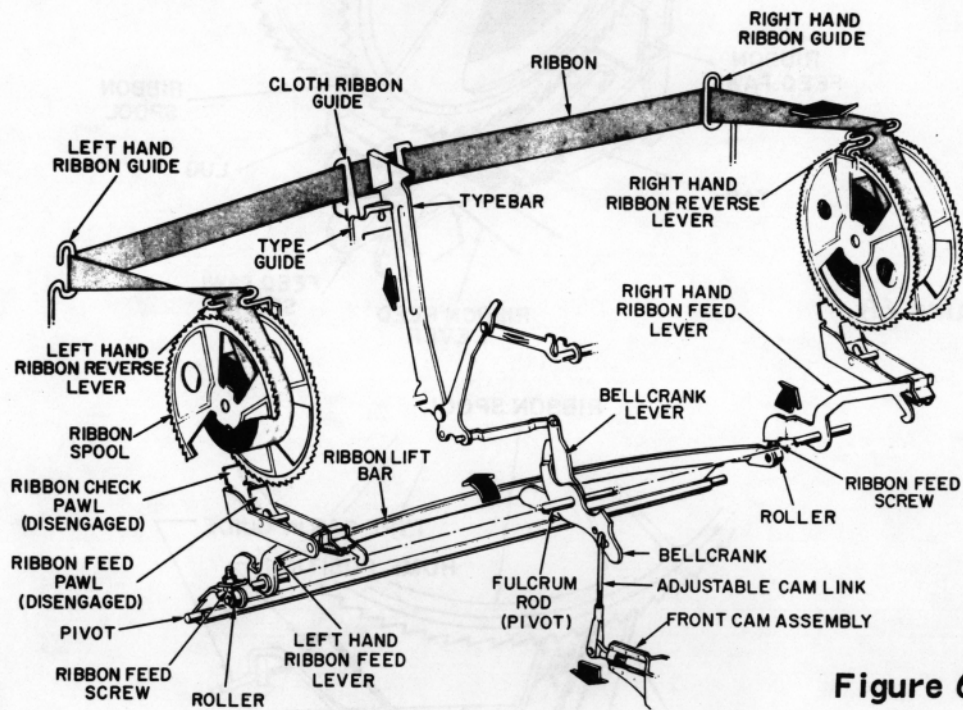


Figure 67.

Only one ribbon feed and check pawl assembly is engaged with a ribbon spool at a time. The ribbon is wound on the spool to which the ribbon feed and check pawl assembly is engaged (right hand spool as illustrated). The ribbon is pulled from the free turning spool (left hand spool as illustrated).

NOTE: The engagement of only one ribbon spool is accomplished by studs on the end plate of the ribbon reverse bar. See RIBBON REVERSE MECHANISM section, pages 1-64 through 1-67.

The feed pawls are operated to set the ribbon feed mechanism as the typebar moves toward the platen. The actual ribbon feed occurs when the typebar restores to the typebar rest.

Friden 2200/2300 SERIES MACHINES

When a keylever is depressed and its cam released, the tail of the bellcrank moves upward. The tail of the bellcrank moving upward pivots the ribbon lift bar as the typebar moves to the platen. The rollers on the ends of the ribbon lift bar contact and pivot the ribbon feed pawls forward, against the tension of the feed pawl spring. Figure 68 shows the feed mechanism in home position. Figure 69 shows the feed pawl in its operated position (typebar is in type guide against the platen).

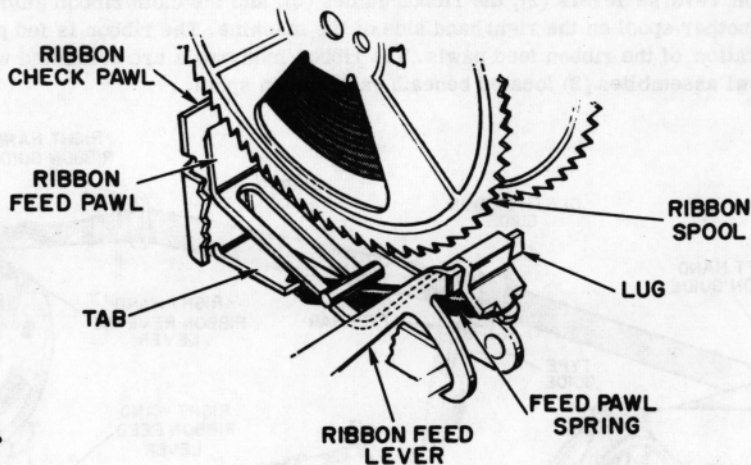


Figure 68.

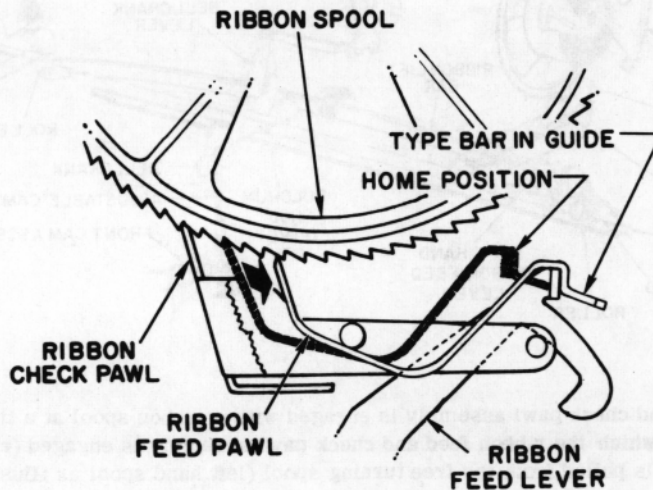


Figure 69.

Friden 2200/2300 SERIES MACHINES

When the ribbon feed pawl is operated as shown in Figure 69, it causes the ribbon spool to rotate counter clockwise until it is stopped by the ribbon check pawl. The ribbon feed pawl continues forward past two teeth of the ribbon spool, as illustrated in Figure 69. At this time, the typebar is against the typebar ring and within the type guide, and the feed mechanism is fully operated.

As the typebar restores, the bellcrank, the ribbon lift bar, and the ribbon feed levers also restore. The engaged ribbon feed pawl then rotates the spool clockwise more than two teeth with respect to the ribbon check pawl and winds the ribbon (Figure 70).

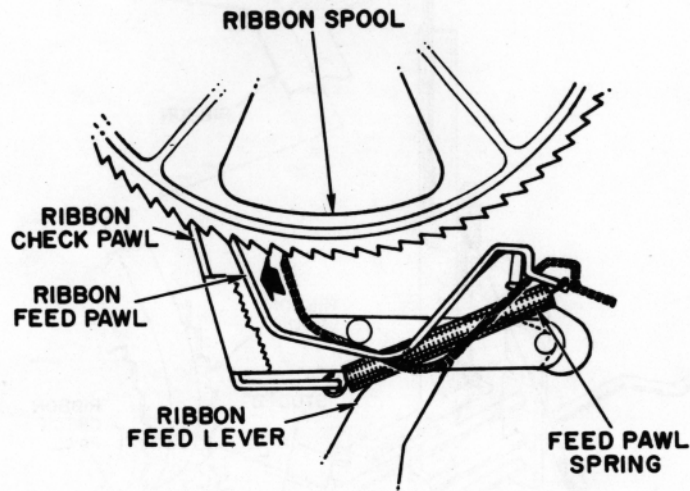


Figure 70.

Friden 2200/2300 SERIES MACHINES

RIBBON REVERSE MECHANISM

The function of the ribbon reverse mechanism is to change ribbon feed direction. If the ribbon is feeding from left hand to right hand, the right hand spool is engaged and the left hand spool is the free turning spool. When the ribbon is nearly unwound from the left hand spool and onto the right hand spool, the ribbon reverse mechanism causes the spools to change state. That is, the left hand spool will engage and the right hand spool will be free turning. The ribbon will now feed from the right hand side to the left hand side.

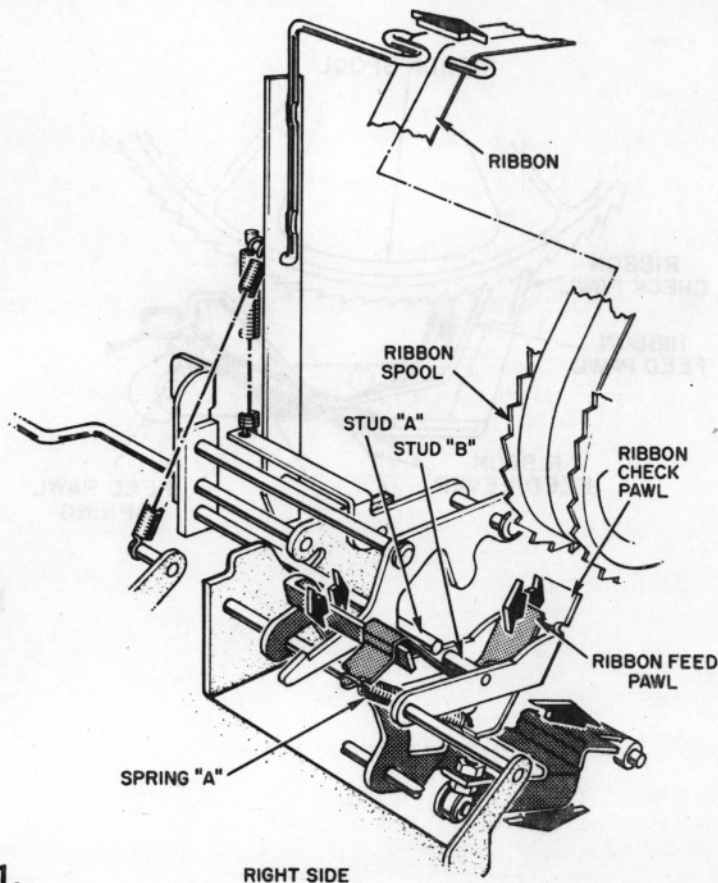


Figure 71.

RIGHT SIDE

Figure 71 shows the right hand feed mechanism disengaged; the ribbon is feeding from the right hand side to the left hand side. Disengagement of the right hand ribbon feed and ribbon check pawls allow the right hand ribbon spool to unwind. Although the right hand feed mechanism is disengaged, the ribbon feed pawl continues to move forward and rearward with each typing action. This movement of the right hand ribbon feed pawl does not interfere with ribbon feed since the ribbon feed and check pawls

Friden 2200/2300 SERIES MACHINES

are held well below the right hand ribbon spool by stud A. Stud A is positioned directly over the rear of the ribbon check pawl. Stud A prevents spring A from raising the ribbon check pawl into engagement with the ribbon spool. Stud B on the ribbon check pawl also prevents spring A from raising the ribbon feed pawl.

Automatic reversing of the ribbon is initiated when the ribbon is drawn taut by the feeding action. Both ends of the ribbon are attached to the hubs of the ribbon spools. The feeding action on the left side of the machine continues even after the right hand spool is completely unwound. As a result, the ribbon is drawn tightly against the ribbon reverse lever (Figure 72).

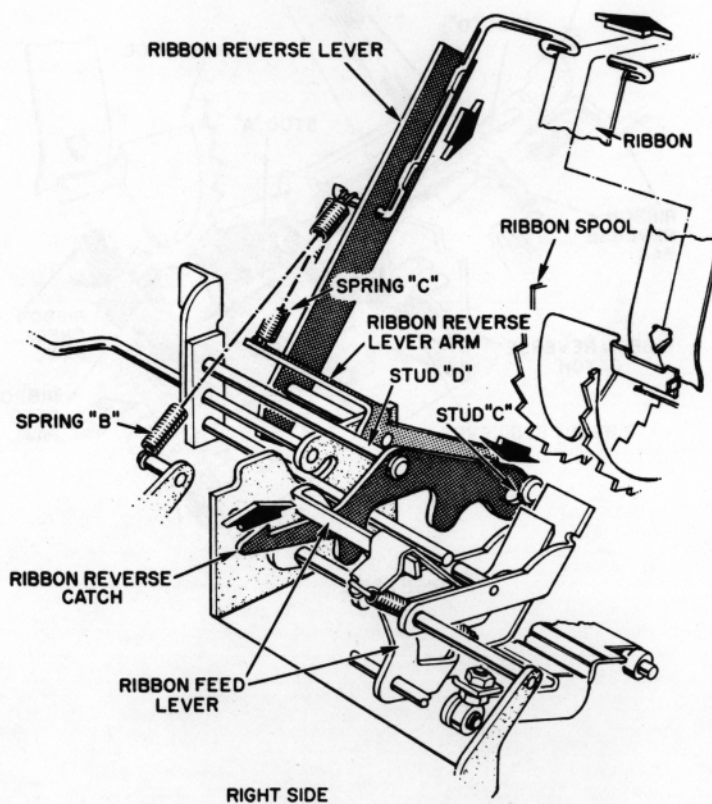


Figure 72.

The ribbon pulls the ribbon reverse lever until the tension of spring B is overcome. When the tension of spring B is overcome, the ribbon reverse lever pivots to the rear. As the ribbon reverse lever pivots to the rear, spring C causes the ribbon reverse lever arm to follow the ribbon reverse lever. As the ribbon reverse lever arm follows the ribbon reverse lever to the rear, Stud C on the ribbon

Friden 2200/2300 SERIES MACHINES

reverse lever arm moves downward. Stud C extends into the curved slot at the rear of the ribbon reverse catch. The downward movement of stud C moves the rear of the ribbon reverse catch downward. The ribbon reverse catch pivots freely about stud D. As the rear of the ribbon reverse catch moves downward, its front end moves upward until it is limited by the lug on the ribbon feed lever. The hook on the front end of the ribbon reverse catch now lies directly in the path of the lug on the ribbon feed lever.

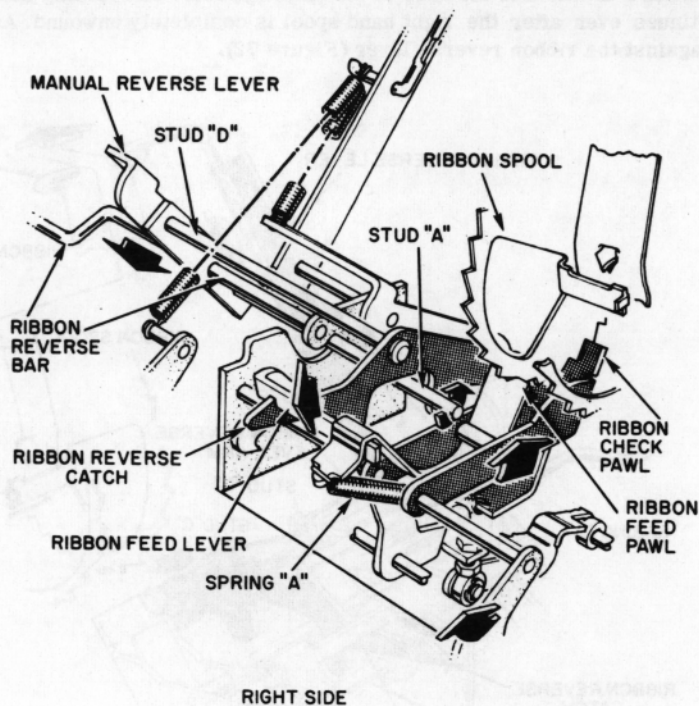


Figure 73.

The next typing action causes the lug on the ribbon feed lever to push the ribbon reverse catch forward (Figure 73). As the ribbon reverse catch moves forward, stud D also moves forward. The forward movement of stud D rotates the manual reverse lever about the ribbon reverse bar. As the manual reverse lever rotates about the ribbon reverse bar, stud A, which is mounted to the bottom of the manual reverse lever, rotates rearward and upward. As stud A moves upward, spring A raises the ribbon check pawl and ribbon feed pawl into engagement with the ribbon spool.

Friden 2200/2300 SERIES MACHINES

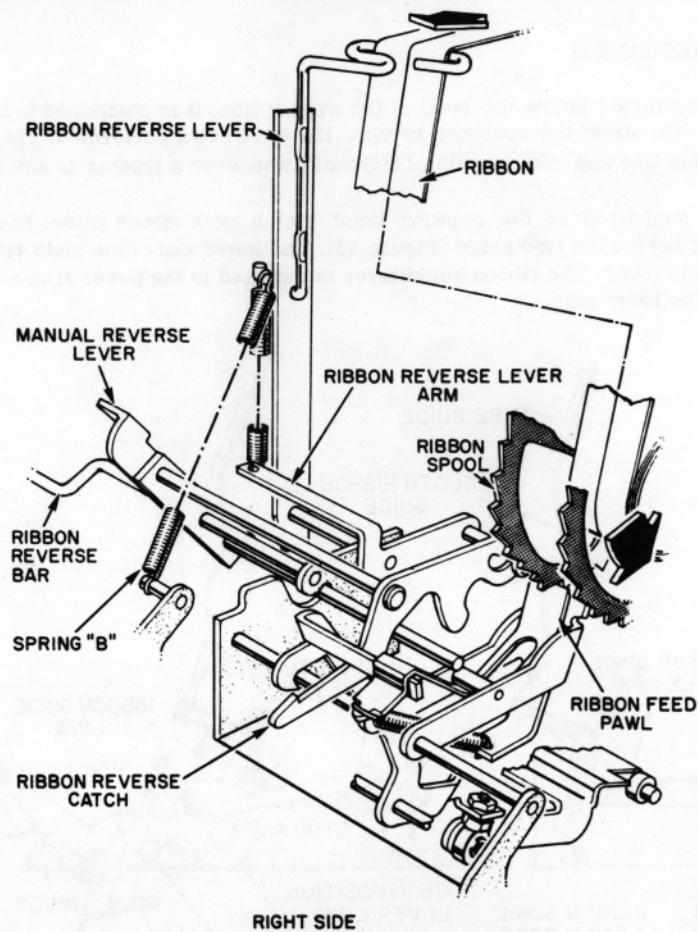


Figure 74.

When the manual reverse lever was rotated, the ribbon reverse bar was also rotated. The rotation of the ribbon reverse bar disengages the feed mechanism on the left hand side of the machine (Figure 74). The disengagement of the feed mechanism releases the tension on the ribbon. With the ribbon tension released, spring B restores the ribbon reverse lever, the ribbon reverse lever arm, and the ribbon reverse catch. The typing train then restores and causes the right hand ribbon feed pawl to rotate the ribbon spool. Feeding action now takes place on the right hand side of the machine. Ribbon reversing again takes place when the left hand ribbon spool is completely unwound. The reversing action on the left hand side of the machine is similar to that on the right hand side.

Friden 2200/2300 SERIES MACHINES

RIBBON LIFT MECHANISM

The ribbon is positioned below the level of the writing line. It is positioned below the height at which printing occurs to allow the operator to view the work being performed. The ribbon is lifted to the level of the writing line and into the path of a typebar whenever a typebar is activated

The ribbon is supported at the printing point by the cloth ribbon guide. The cloth ribbon guide is mounted directly behind the type guide (Figure 75). The lower end of the cloth ribbon guide is attached to the ribbon guide lever. The ribbon guide lever is mounted to the power frame casting and supported by the ribbon guide lever stop.

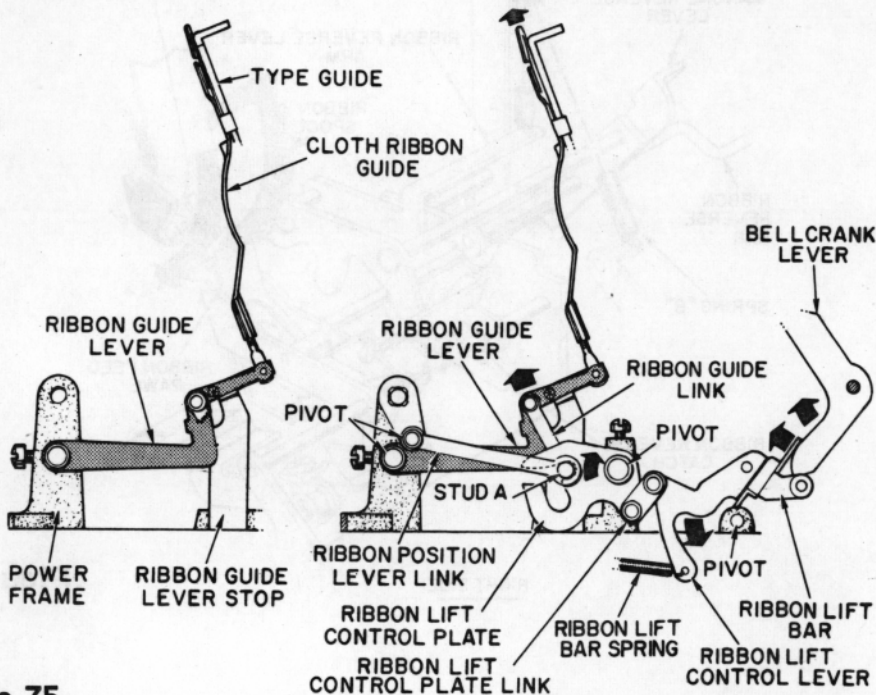


Figure 75.

When a typebar is activated, the lower portion of the bellcrank lever pivots upward. This upward movement cams the ribbon lift bar to the rear. The ribbon lift bar, which is attached to the ribbon lift control lever, pivots the ribbon lift control lever downward. The downward movement of the ribbon lift control lever overcomes the tension of the ribbon lift bar spring. By overcoming the tension of the ribbon lift bar spring, the ribbon lift control lever pulls the front end of the ribbon lift control plate link downward. As the front end of the ribbon lift control plate link moves downward, its other end moves rearward and rotates the ribbon lift control plate about its pivot. The rotation of the ribbon lift control plate raises stud A and the ribbon guide link. The ribbon guide lever, which is connected to the ribbon guide link, also moves upward. The ribbon guide lever and the cloth ribbon guide move up together to position the ribbon at the writing line level.

Friden 2200/2300 SERIES MACHINES

As the typing train restores, the ribbon lift mechanism also restores to its home position. The components of the ribbon lift mechanism are restored by the tension of the ribbon lift bar spring.

The ribbon lift mechanism is a spring-controlled device which restores the ribbon lift bar to its home position after it has been depressed by the typing train. The ribbon lift bar is a curved bar which is pivoted at one end to the frame and at the other end to the ribbon lift mechanism. The ribbon lift bar is held in its home position by a spring. When the typing train depresses the ribbon lift bar, the spring tension restores it to its home position.

When the ribbon lift mechanism is in its home position, the ribbon lift bar is in its home position. The ribbon lift bar is held in its home position by a spring. When the typing train depresses the ribbon lift bar, the spring tension restores it to its home position. The ribbon lift mechanism is a spring-controlled device which restores the ribbon lift bar to its home position after it has been depressed by the typing train. The ribbon lift bar is a curved bar which is pivoted at one end to the frame and at the other end to the ribbon lift mechanism. The ribbon lift bar is held in its home position by a spring. When the typing train depresses the ribbon lift bar, the spring tension restores it to its home position.

TYPER IN LOWER
HALF POSITION

TYPER IN UPPER
HALF POSITION

STANDARD POSITION



REBOW COIL SPRING

Figure 10

The ribbon lift mechanism is controlled by the ribbon lift bar which is depressed by the typing train. The ribbon lift bar is a curved bar which is pivoted at one end to the frame and at the other end to the ribbon lift mechanism. The ribbon lift bar is held in its home position by a spring. When the typing train depresses the ribbon lift bar, the spring tension restores it to its home position.

Friden 2200/2300 SERIES MACHINES

COLOR SHIFT MECHANISM

The writing machine can print documents in two colors by replacing the single-color ribbon with a dual-color ribbon (usually black and red). The dual-color ribbon is threaded into the machine in the same manner as the single-color ribbon. The dual-color ribbon should be threaded so that the red half is below the black half. The printing color is varied by the manual color shift mechanism which controls ribbon lift to different heights.

When the machine is in a non-operated position, the ribbon guide holds the ribbon below the writing line. With the color shift mechanism in the black position, the actuation of a typebar raises the ribbon guide and the typebar strikes the black (upper) portion of the ribbon (Figure 76). With the color shift mechanism in the red position, the actuation of a typebar raises the ribbon guide higher and the typebar strikes the red (lower) portion of the ribbon. The color shift mechanism can also be set in a stencil position. In the stencil position, a typing action does not raise the ribbon guide from its position below the writing line. Therefore, the type slug does not strike the ribbon, but strikes the document directly.

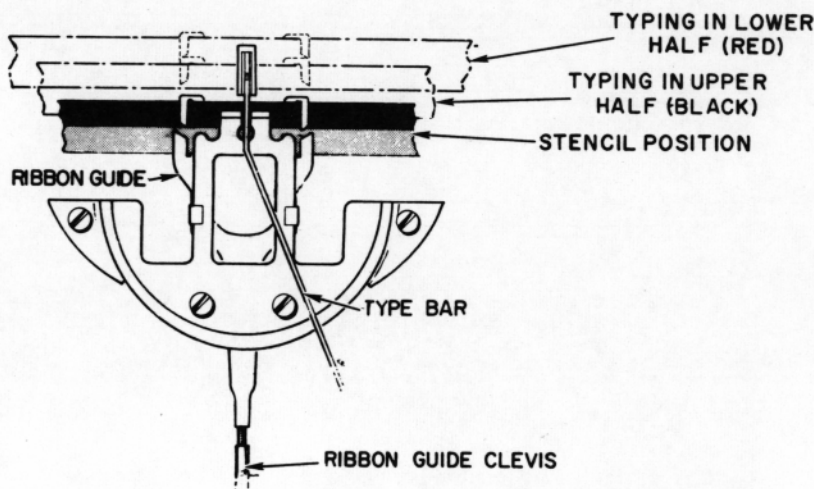


Figure 76.

The manual color shift mechanism is controlled by the manual color shift lever. Figure 77 shows the mechanism in the stencil position. In the stencil position, stud A is centered over the vertical slot in the ribbon lift control plate. When a typing action occurs and the ribbon lift control plate is rotated, stud A merely rides in the vertical slot. Consequently, the ribbon does not move from its home position.

Friden 2200/2300 SERIES MACHINES

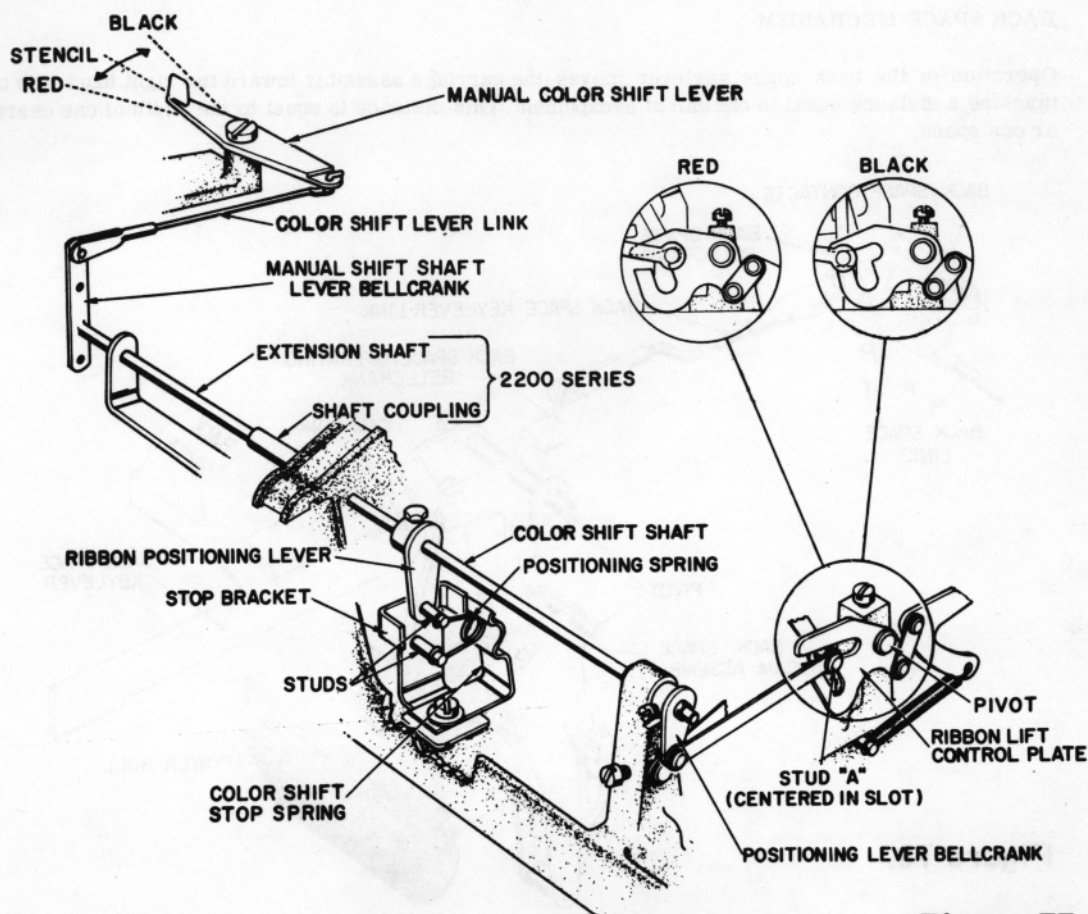


Figure 77.

In the stencil position, the color shift stop spring overcomes the toggle action of the positioning spring. Consequently, stud A is held in a centralized position. When the manual color shift lever is moved to the black position, the color shift is rotated. Rotation of the color shift shaft positions stud A forward in the horizontal slot in the ribbon lift control plate (see inset-BLACK). A typing action now moves the ribbon lift control plate to raise stud A, thereby raising the ribbon to the black position.

When the manual color shift lever is moved to the red position, stud A is positioned rearward in the horizontal slot on the ribbon lift control plate (see inset-RED). In this position stud A is further from the point of the ribbon lift control plate. Therefore, the same amount of rotation of the ribbon lift control plate lifts stud A higher and raises the ribbon to the red position.

Friden 2200/2300 SERIES MACHINES

BACK SPACE MECHANISM

Operation of the back space keylever moves the carriage assembly toward the right hand side of the machine a distance equal to one unit of escapement. This distance is equal to the width of one character or one space.

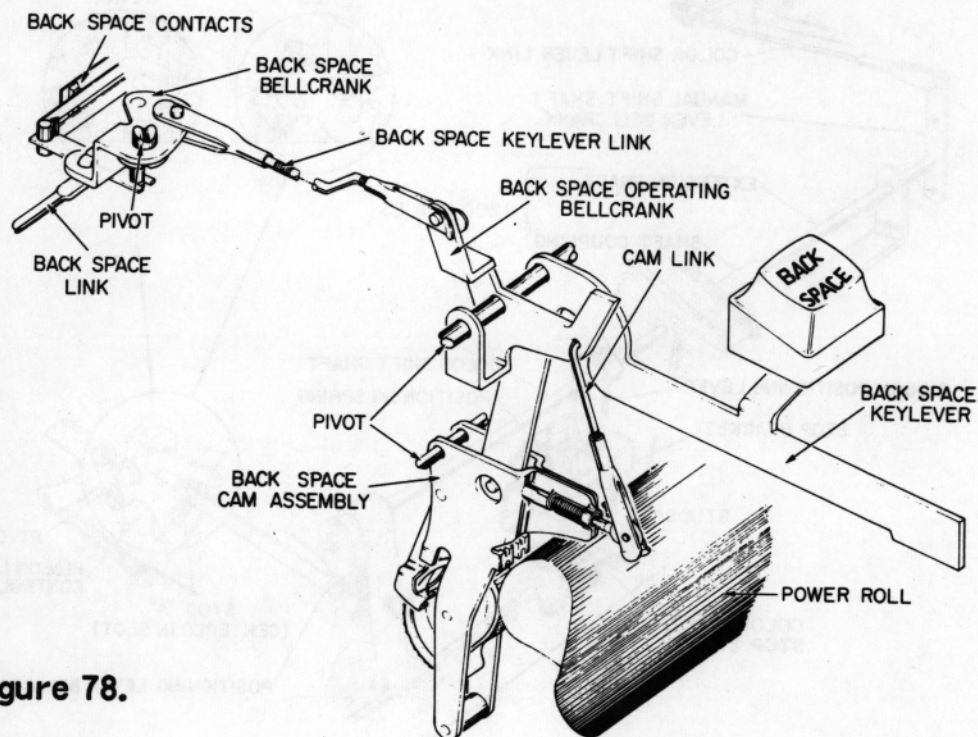


Figure 78.

The back space cam assembly is released against the power roll by depression of the back space keylever (Figure 78). The rotation of the power roll pivots the back space cam assembly which pulls the cam link downward. The cam link then rotates the back space operating bellcrank. The rotation of the back space operating bellcrank pulls the back space keylever link forward. The back space keylever link rotates the back space bellcrank which operates the back space contacts. As the back space contacts open, the keylock relay is de-energized to lock the keyboard.

Friden 2200/2300 SERIES MACHINES

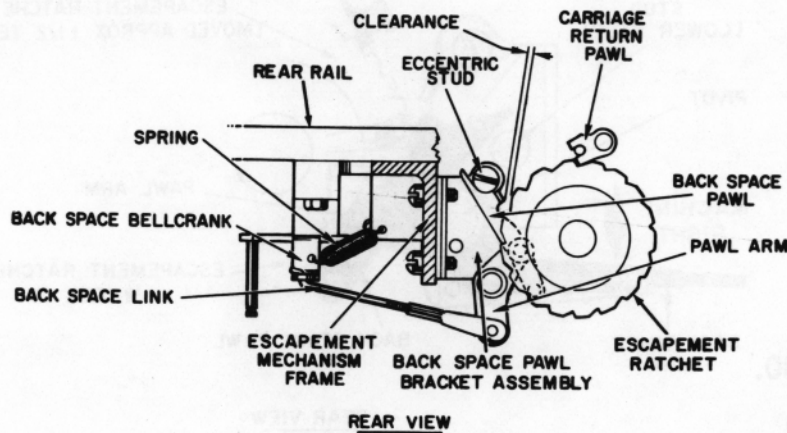


Figure 79.

The rotation of the back space bellcrank also operates the parts mounted on the back space pawl bracket assembly (Figure 79). The back space pawl bracket assembly is mounted to the right hand side of the escapement frame casting. It functions as a carrier for the pawl arm and back space pawl. The spring connected to the back space bellcrank holds these parts in a restored position. Spring tension on the back space link and pawl arm forces the back space pawl upward against the eccentric stud. This spring tension keeps the back space pawl from engaging the escapement ratchet.

As the back space bellcrank is operated, the back space link is pulled to the right hand side (Figure 80). The back space link rotates the pawl arm about its pivot. The pawl arm pulls the back space pawl downward. The back space pawl then engages a tooth on the escapement ratchet. The back space pawl rotates the escapement ratchet approximately 1 1/2 teeth. The additional half-tooth movement allows the carriage return pawl to position into the next tooth of the escapement rack with the required clearance. (The carriage return pawl is held stationary at this time by the escapement assembly.) The rotation of the escapement ratchet moves the carriage assembly as explained previously (see MONO-SPACING ESCAPEMENT ASSEMBLY).

NOTE: When the back space pawl overtravels the 1 1/2 teeth distance, it is limited by the lower stop.

Friden 2200/2300 SERIES MACHINES

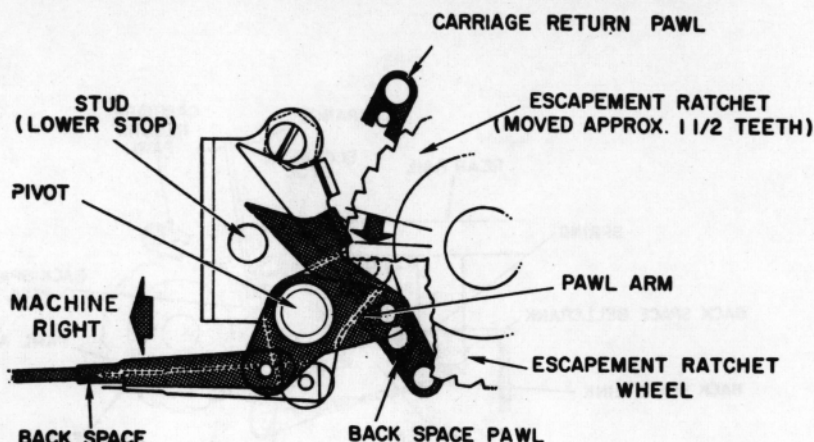


Figure 80.

REAR VIEW

As the back space cam assembly restores, the back space contacts close (Figure 78). When the back space contacts close, the keylock relay is energized to unlock the keyboard. The back space pawl restores simultaneously. This permits the carriage assembly to settle to the left hand side until the escapement ratchet is limited by the carriage return pawl.

Friden 2200/2300 SERIES MACHINES

THE READER

The reader performs two basic functions within the Flexowriter:

1. It senses for coded holes in pre-punched paper tape or edge cards and converts them into electrical signals which are transmitted to the translator.
2. It automatically feeds the tape or the edge card being read. After each tape or edge card is read, the tape or the edge card is advanced to the next code position.

The reader clutch pulley is the coupling between the power drive mechanism and the reader. When the reader clutch is engaged, mechanical power is transmitted to the reader cam shaft. The rotation of the reader cam shaft operates the reader.

One complete revolution of the reader cam shaft constitutes one reader cycle. During a reader cycle one code position is sensed and transmitted to the translator, various electrical circuits are qualified, and the tape or the edge card is advanced to the next code position. These functions are accomplished through various cams mounted on the reader cam shaft.

There are four cams mounted on the reader cam shaft: the interposer cam, the feed cam, and two circuit breaker cams.

The codes which are sensed by the reader are combinations of holes perforated in a tape or in an edge card. Most of the code combinations represent the keylevers in the Flexowriter keyboard. Figure 1 shows a width of tape divided into 8 channels. One code is a combination of holes extending across the width of the tape. For example, the code for the letter A has holes punched in channels 1, 6, and 7. When the reader sensing device detects this particular combination of code holes, it transmits this information electrically to the translator. The translator then decodes this information and mechanically operates the letter A keylever.

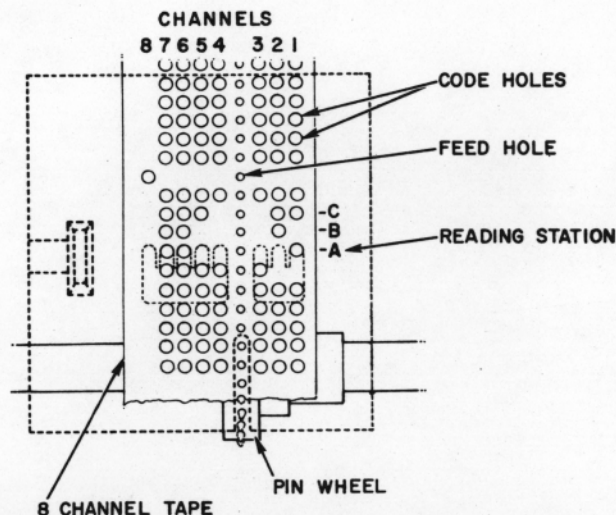


Figure 1.

Friden 2200/2300 SERIES MACHINES

Only one code at a time can be sensed by the reader. For a code to be read, it must be positioned at the reading station of the reader. Figure 1 also shows the pinwheel which is a part of the tape feeding mechanism. When a code has been read, the pinwheel positions the next code at the reading station. The pinwheel contains pins around its circumference which engage the feed holes in the tape. The feed holes extend along the length of the tape between channels 3 and 4. The feed holes provide the means by which the pinwheel uniformly feeds each successive code into the reading station. The feed holes are not sensed during a read operation.

The readers on the standard 2200 and 2300 series Flexowriters recognize an 8 channel code system. However, the 2200 and 2300 series machines can be modified to recognize other code systems.

The 2200 series machines have a keylever for every code combination on the code chart (Figure 2) with the exception of the tape feed code (1-2-3-4-5-6-7). Whenever any of these codes are sensed by the reader, the associated keylever is automatically operated. When a tape feed code is sensed, the electrical signals generated by the reader are sent directly to the writing machine control circuitry.

The 2300 series machines also have keylevers associated with every code combination except for certain function codes such as the NP code (non-print), TSR code (tape skip restore), and others. When a function code is sensed, the electrical signals generated by the reader are sent directly to the writing machine control circuitry.

Friden 2200/2300 SERIES MACHINES

CODE CHART

Tape Channels									
CARD	1	2	3	4	5	6	7	8	9
SPACE									
SP0	0	1	2	3	4	5	6	7	8
SP-3	0	1	2	3	4	5	6	7	8
0	0	1	2	3	4	5	6	7	8
1	1	2	3	4	5	6	7	8	9
2	2	3	4	5	6	7	8	9	0
3	3	4	5	6	7	8	9	0	1
4	4	5	6	7	8	9	0	1	2
5	5	6	7	8	9	0	1	2	3
6	6	7	8	9	0	1	2	3	4
7	7	8	9	0	1	2	3	4	5
8	8	9	0	1	2	3	4	5	6
9	9	0	1	2	3	4	5	6	7
A	0	1	2	3	4	5	6	7	8
B	1	2	3	4	5	6	7	8	9
C	2	3	4	5	6	7	8	9	0
D	3	4	5	6	7	8	9	0	1
E	4	5	6	7	8	9	0	1	2
F	5	6	7	8	9	0	1	2	3
G	6	7	8	9	0	1	2	3	4
H	7	8	9	0	1	2	3	4	5
I	8	9	0	1	2	3	4	5	6
J	9	0	1	2	3	4	5	6	7
K	0	1	2	3	4	5	6	7	8
L	1	2	3	4	5	6	7	8	9
M	2	3	4	5	6	7	8	9	0
N	3	4	5	6	7	8	9	0	1
O	4	5	6	7	8	9	0	1	2
P	5	6	7	8	9	0	1	2	3
Q	6	7	8	9	0	1	2	3	4
R	7	8	9	0	1	2	3	4	5
S	8	9	0	1	2	3	4	5	6
T	9	0	1	2	3	4	5	6	7
U	0	1	2	3	4	5	6	7	8
V	1	2	3	4	5	6	7	8	9
W	2	3	4	5	6	7	8	9	0
X	3	4	5	6	7	8	9	0	1
Y	4	5	6	7	8	9	0	1	2
Z	5	6	7	8	9	0	1	2	3
0	6	7	8	9	0	1	2	3	4
1	7	8	9	0	1	2	3	4	5
2	8	9	0	1	2	3	4	5	6
3	9	0	1	2	3	4	5	6	7
4	0	1	2	3	4	5	6	7	8
5	1	2	3	4	5	6	7	8	9
6	2	3	4	5	6	7	8	9	0
7	3	4	5	6	7	8	9	0	1
8	4	5	6	7	8	9	0	1	2
9	5	6	7	8	9	0	1	2	3
A	6	7	8	9	0	1	2	3	4
B	7	8	9	0	1	2	3	4	5
C	8	9	0	1	2	3	4	5	6
D	9	0	1	2	3	4	5	6	7
E	0	1	2	3	4	5	6	7	8
F	1	2	3	4	5	6	7	8	9
G	2	3	4	5	6	7	8	9	0
H	3	4	5	6	7	8	9	0	1
I	4	5	6	7	8	9	0	1	2
J	5	6	7	8	9	0	1	2	3
K	6	7	8	9	0	1	2	3	4
L	7	8	9	0	1	2	3	4	5
M	8	9	0	1	2	3	4	5	6
N	9	0	1	2	3	4	5	6	7
O	0	1	2	3	4	5	6	7	8
P	1	2	3	4	5	6	7	8	9
Q	2	3	4	5	6	7	8	9	0
R	3	4	5	6	7	8	9	0	1
S	4	5	6	7	8	9	0	1	2
T	5	6	7	8	9	0	1	2	3
U	6	7	8	9	0	1	2	3	4
V	7	8	9	0	1	2	3	4	5
W	8	9	0	1	2	3	4	5	6
X	9	0	1	2	3	4	5	6	7
Y	0	1	2	3	4	5	6	7	8
Z	1	2	3	4	5	6	7	8	9
0	2	3	4	5	6	7	8	9	0
1	3	4	5	6	7	8	9	0	1
2	4	5	6	7	8	9	0	1	2
3	5	6	7	8	9	0	1	2	3
4	6	7	8	9	0	1	2	3	4
5	7	8	9	0	1	2	3	4	5
6	8	9	0	1	2	3	4	5	6
7	9	0	1	2	3	4	5	6	7
8	0	1	2	3	4	5	6	7	8
9	1	2	3	4	5	6	7	8	9
A	2	3	4	5	6	7	8	9	0
B	3	4	5	6	7	8	9	0	1
C	4	5	6	7	8	9	0	1	2
D	5	6	7	8	9	0	1	2	3
E	6	7	8	9	0	1	2	3	4
F	7	8	9	0	1	2	3	4	5
G	8	9	0	1	2	3	4	5	6
H	9	0	1	2	3	4	5	6	7
I	0	1	2	3	4	5	6	7	8
J	1	2	3	4	5	6	7	8	9
K	2	3	4	5	6	7	8	9	0
L	3	4	5	6	7	8	9	0	1
M	4	5	6	7	8	9	0	1	2
N	5	6	7	8	9	0	1	2	3
O	6	7	8	9	0	1	2	3	4
P	7	8	9	0	1	2	3	4	5
Q	8	9	0	1	2	3	4	5	6
R	9	0	1	2	3	4	5	6	7
S	0	1	2	3	4	5	6	7	8
T	1	2	3	4	5	6	7	8	9
U	2	3	4	5	6	7	8	9	0
V	3	4	5	6	7	8	9	0	1
W	4	5	6	7	8	9	0	1	2
X	5	6	7	8	9	0	1	2	3
Y	6	7	8	9	0	1	2	3	4
Z	7	8	9	0	1	2	3	4	5
0	8	9	0	1	2	3	4	5	6
1	9	0	1	2	3	4	5	6	7
2	0	1	2	3	4	5	6	7	8
3	1	2	3	4	5	6	7	8	9
4	2	3	4	5	6	7	8	9	0
5	3	4	5	6	7	8	9	0	1
6	4	5	6	7	8	9	0	1	2
7	5	6	7	8	9	0	1	2	3
8	6	7	8	9	0	1	2	3	4
9	7	8	9	0	1	2	3	4	5
A	8	9	0	1	2	3	4	5	6
B	9	0	1	2	3	4	5	6	7
C	0	1	2	3	4	5	6	7	8
D	1	2	3	4	5	6	7	8	9
E	2	3	4	5	6	7	8	9	0
F	3	4	5	6	7	8	9	0	1
G	4	5	6	7	8	9	0	1	2
H	5	6	7	8	9	0	1	2	3
I	6	7	8	9	0	1	2	3	4
J	7	8	9	0	1	2	3	4	5
K	8	9	0	1	2	3	4	5	6
L	9	0	1	2	3	4	5	6	7
M	0	1	2	3	4	5	6	7	8
N	1	2	3	4	5	6	7	8	9
O	2	3	4	5	6	7	8	9	0
P	3	4	5	6	7	8	9	0	1
Q	4	5	6	7	8	9	0	1	2
R	5	6	7	8	9	0	1	2	3
S	6	7	8	9	0	1	2	3	4
T	7	8	9	0	1	2	3	4	5
U	8	9	0	1	2	3	4	5	6
V	9	0	1	2	3	4	5	6	7
W	0	1	2	3	4	5	6	7	8
X	1	2	3	4	5	6	7	8	9
Y	2	3	4	5	6	7	8	9	0
Z	3	4	5	6	7	8	9	0	1
0	4	5	6	7	8	9	0	1	2
1	5	6	7	8	9	0	1	2	3
2	6	7	8	9	0	1	2	3	4
3	7	8	9	0	1	2	3	4	5
4	8	9	0	1	2	3	4	5	6
5	9	0	1	2	3	4	5	6	7
6	0	1	2	3	4	5	6	7	8
7	1	2	3	4	5	6	7	8	9
8	2	3	4	5	6	7	8	9	0
9	3	4	5	6	7	8	9	0	1
A	4	5	6	7	8	9	0	1	2
B	5	6	7	8	9	0	1	2	3
C	6	7	8	9	0	1	2	3	4
D	7	8	9	0	1	2	3	4	5
E	8	9	0	1	2	3	4	5	6
F	9	0	1	2	3	4	5	6	7
G	0	1	2	3	4	5	6	7	8
H	1	2	3	4	5	6	7	8	9
I	2	3	4	5	6	7	8	9	0
J	3	4	5	6	7	8	9	0	1
K	4	5	6	7	8	9	0	1	2
L	5	6	7	8	9	0	1	2	3
M	6	7	8	9	0	1	2	3	4
N	7	8	9	0	1	2	3	4	5
O	8	9	0	1	2	3	4	5	6
P	9	0	1	2	3	4	5	6	7
Q	0	1	2	3	4	5	6	7	8
R	1	2	3	4	5	6	7	8	9
S	2	3	4	5	6	7	8	9	0
T	3	4	5	6	7	8	9	0	1
U	4	5	6	7	8	9	0	1	2
V	5	6	7	8	9	0	1	2	3
W	6	7	8	9	0	1	2	3	4
X	7	8	9	0	1	2	3	4	5
Y	8	9	0	1	2	3	4	5	6
Z	9	0	1	2	3	4	5	6	7
0	0	1	2	3	4	5	6	7	8
1	1	2	3	4	5	6	7	8	9
2	2	3	4	5	6	7	8	9	0
3	3	4	5	6	7	8	9	0	1
4	4	5	6	7	8	9	0	1	2
5	5	6	7	8	9	0	1	2	3
6	6	7	8	9	0	1	2	3	4
7	7	8	9	0	1	2	3	4	5
8	8	9	0	1	2	3	4	5	6
9	9	0	1	2	3	4	5	6	7
A	0	1	2	3	4	5	6	7	8
B	1								

Figure 2.

Codes are sensed in the reader by means of the reader pins. The reader pins are operated by their respective interposers (Figure 3). Each interposer engages a notch near the base of its respective reader pin. There are 8 interposers and 8 reader pins, one for each tape channel. The interposer springs move the rear parts of the interposers and the reader pins upward to sense for code holes in the tape. When a code hole is positioned directly over a reader pin, the pin passes through the hole in the tape. Those tape channels which do not contain a code hole restrict upward movement of the reader pin and its interposer.

Friden 2200/2300 SERIES MACHINES

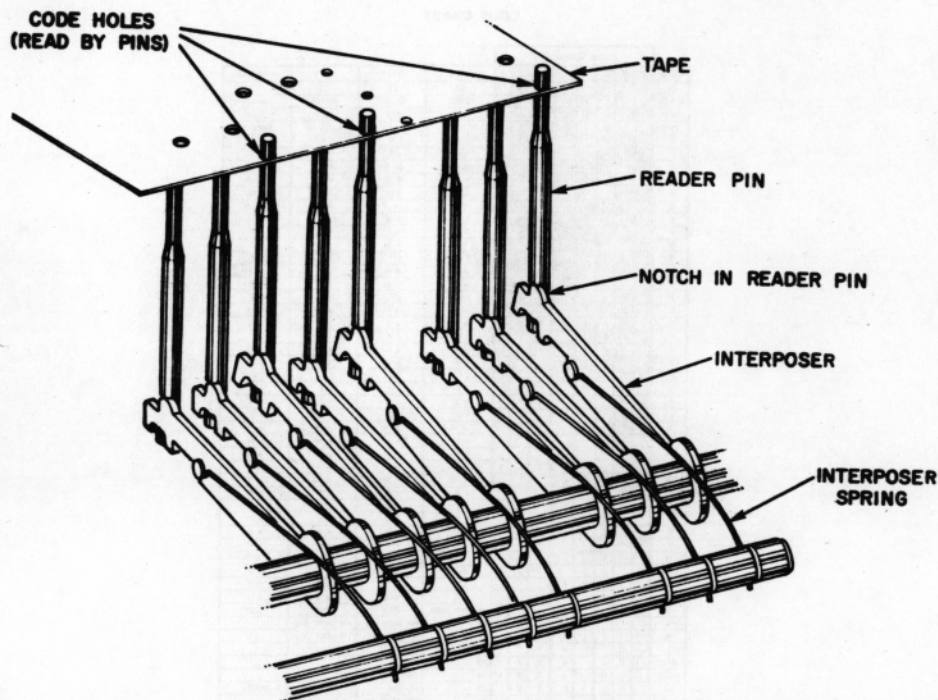


Figure 3.

The interposer bail controls the operation of the sensing mechanism (Figure 4). The sensing mechanism is disabled (retracted) when the interposer bail is held restored by the high dwell of the interposer cam. When the interposer bail is in a restored position, the bridge of the interposer bail is in a restored position, the bridge of the interposer bail restricts upward movement of the interposers. The upward restriction of the interposers thereby holds the reader pins below the top surface of the guide block.

Friden 2200/2300 SERIES MACHINES

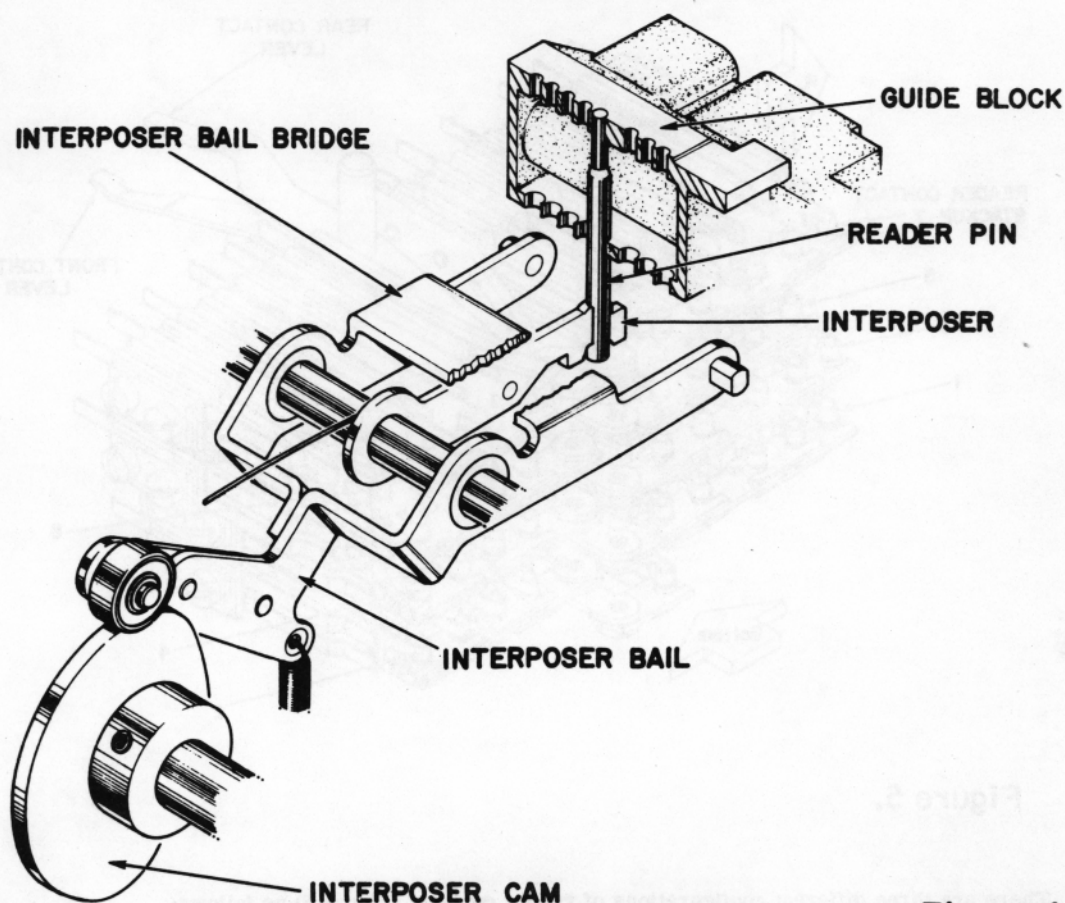


Figure 4.

The interposers and reader pins are the means by which the reader detects the presence or absence of holes in a tape. When the reader pins detect code holes in a tape, the information is transferred by the contact levers to the reader contacts.

The reader contacts are comprised of nine individual contact stackups (Figure 5). Eight of the nine contact stackups are associated with interposers and reader pins. The contact stackups are alternately positioned at the front and the rear of the reader. The contacts associated with the even numbered tape channels (2, 3, 6, and 8) are at the front of the reader. There are many contacts on each stackup. Only the two contacts nearest the contact levers are responsible for transmitting information from the tape to the translator. The circuitry for the remaining contacts is distributed throughout the machine to enable further automatic operation of the Flexowriter.

Friden 2200/2300 SERIES MACHINES

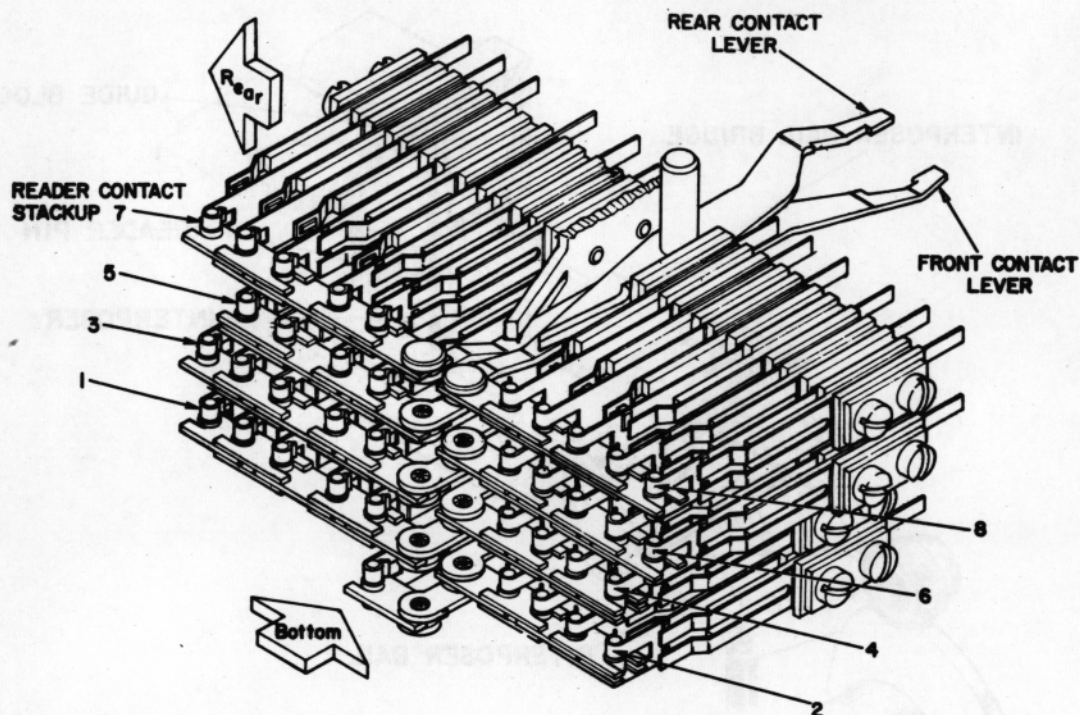


Figure 5.

There are three different configurations of reader contacts (Figure 6) as follows:

1. Class A contacts - normally open (home position)
2. Class B contacts - normally closed (home position)
3. Class C contacts - break before make (home position)

Friden 2200/2300 SERIES MACHINES

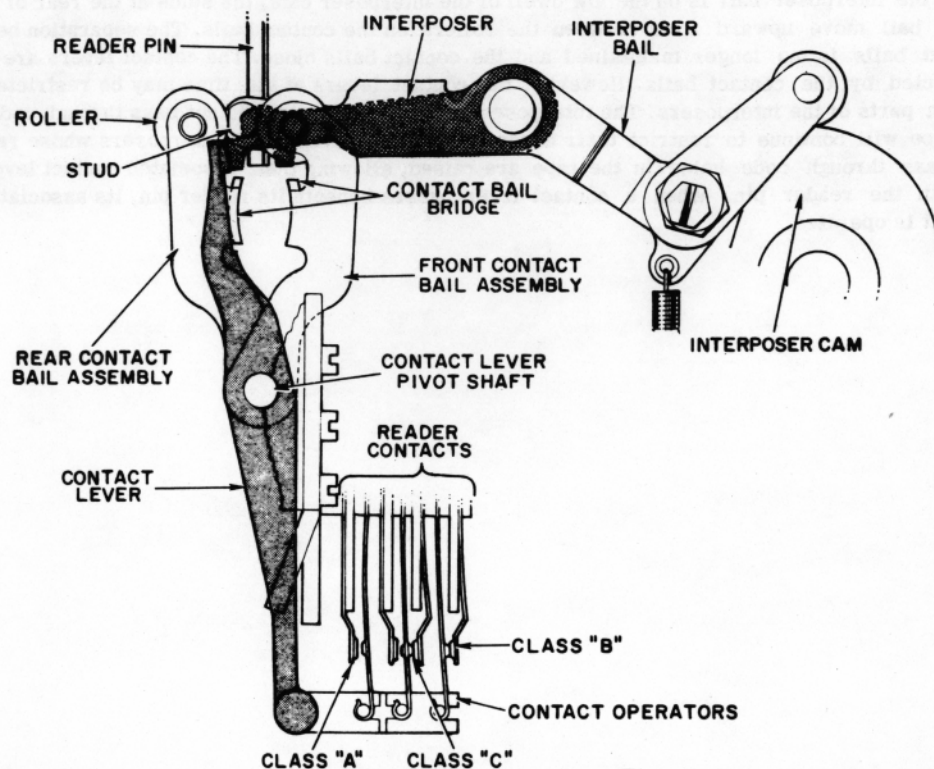


Figure 6.

Class A and B contacts are comprised of two contact springs, one stationary and one moveable. Class C contacts are comprised of three contact springs, two stationary and one moveable. Class C contacts are a combination of both normally open and normally closed contacts.

The moveable contact springs are linked to each other and to the bottom of their respective contact lever by contact operators. The moveable contact springs are tensioned to move toward the contact lever. The moveable contact springs are held in home position by the contact bails.

The contact levers which pivot on the contact lever pivot shaft are under tension from the moveable contact springs. Consequently, the contact levers are always attempting to move under the reader pins. The contact levers are restricted from moving beneath the reader pins by either the contacts bails or the interposers. The contact bails and the interposers are operated by the interposer bail.

When the interposer bail is on the high dwell of the interposer cam, the studs at the rear of the interposer bail are positioned between the rollers on the contact bails. The positioning of these studs maintain a separation between the contact bails. With the contact bails separated, the contact bail bridge holds the upper parts of the contact levers away from the rear bottom parts of the interposers.

Friden 2200/2300 SERIES MACHINES

When the interposer bail is on the low dwell of the interposer cam, the studs at the rear of the interposer bail move upward from between the rollers on the contact bails. The separation between the contact bails is no longer maintained and the contact bails close. The contact levers are no longer restricted by the contact bails. However, the contact levers at this time may be restricted by rear bottom parts of the interposers. The interposers whose reader pins did not pass through code holes in the tape will continue to restrict their associated contact levers. The interposers whose reader pins did pass through code holes in the tape are raised, allowing their associated contact lever to pass beneath the reader pin. When a contact lever passes beneath its reader pin, its associated reader contact is operated.

Friden 2200/2300 SERIES MACHINES

READER CLUTCH

The power drive mechanism is the source of power that rotates the reader clutch pulley. The reader clutch acts as the coupling between the power drive mechanism and the reader cam shaft. When the reader clutch is engaged, the reader cam shaft rotates with the power drive mechanism; disengagement of the clutch halts the rotation of the reader cam shaft. The reader clutch allows the reader cam shaft to remain stationary when the reader is not functioning (Figure 7).

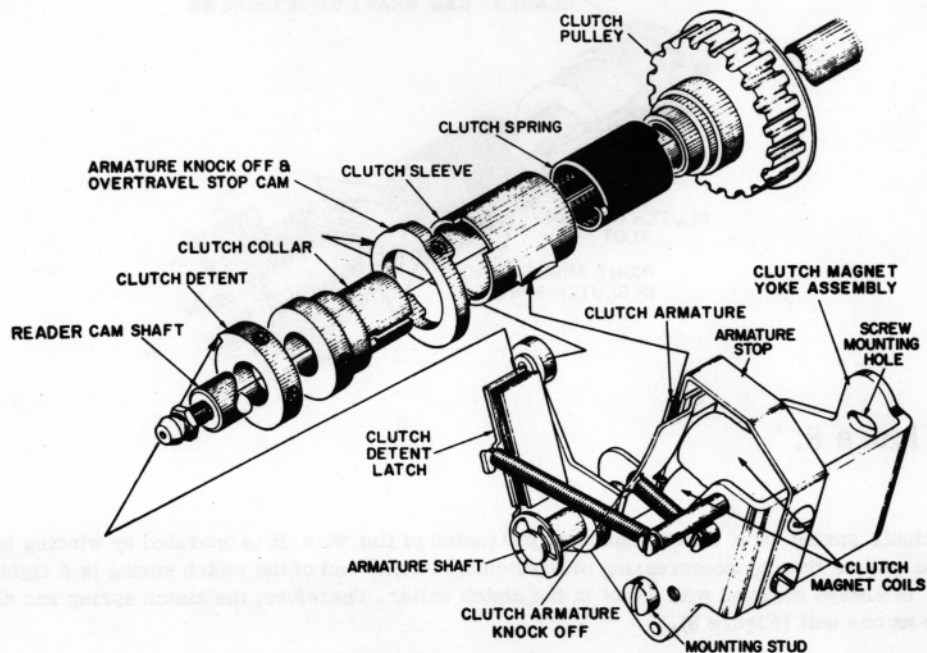


Figure 7.

Some of the clutch parts which are mounted on the magnet yoke assembly are the clutch armature, clutch armature knockoff, clutch detent latch, and the clutch magnet coils. The remainder of the clutch parts are mounted on the reader cam shaft.

The clutch detent is securely fastened to the reader cam shaft. The clutch detent and the clutch detent latch provide a home position for the reader drive shaft (Figure 7).

The clutch collar is fastened to the reader cam shaft. The clutch collar provides the connection between the clutch mechanism and the reader cam shaft.

The clutch pulley is an extension of the power drive mechanism. The clutch pulley rotates constantly while the motor is operating.

The clutch sleeve operates in conjunction with the clutch armature and clutch magnet coils. The clutch

Friden 2200/2300 SERIES MACHINES

sleeve, clutch armature, and the clutch magnet coils provide the means for engaging and disengaging the reader clutch. The operation of the reader is synchronized to the operation of the translator.

The clutch spring is the decisive component of the clutch. The clutch spring provides the means by which the clutch pulley rotates the clutch collar, thereby also rotating the reader cam shaft.

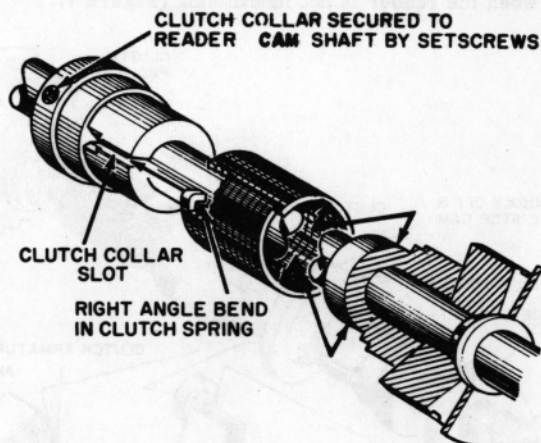


Figure 8.

The clutch spring is a torsion spring constructed of flat wire. It is operated by winding in a circular motion rather than by compressing or stretching. At one end of the clutch spring is a right angle bend which is always engaged with a slot in the clutch collar. Therefore, the clutch spring and clutch collar rotate as one unit (Figure 8).

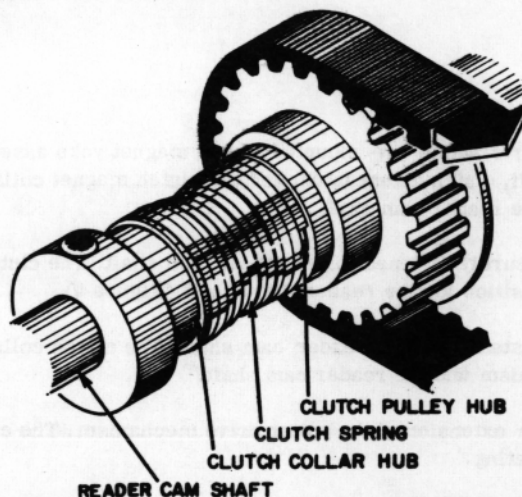


Figure 9.

Friden 2200/2300 SERIES MACHINES

The clutch spring encircles the hubs of the clutch collar and the clutch pulley. The diameter of the hubs is greater than the normal inside diameter of the clutch spring. To insert the clutch spring onto the hubs during assembly, the clutch spring must be unwound. This unwinding causes the spring to become tensioned. When the spring is attached to the hubs, this tension causes the spring to firmly grip the two hubs (Figure 9).

The clutch pulley which is constantly rotated when the motor is operating, causes the clutch spring to wind tighter on the hubs of the clutch collar and clutch pulley. As the clutch spring winds on both hubs, power is transmitted from the rotating clutch pulley, through the clutch spring, to the clutch collar. The clutch collar, being fastened to the reader cam shaft, rotates the reader cam shaft when the clutch is engaged (Figure 9).

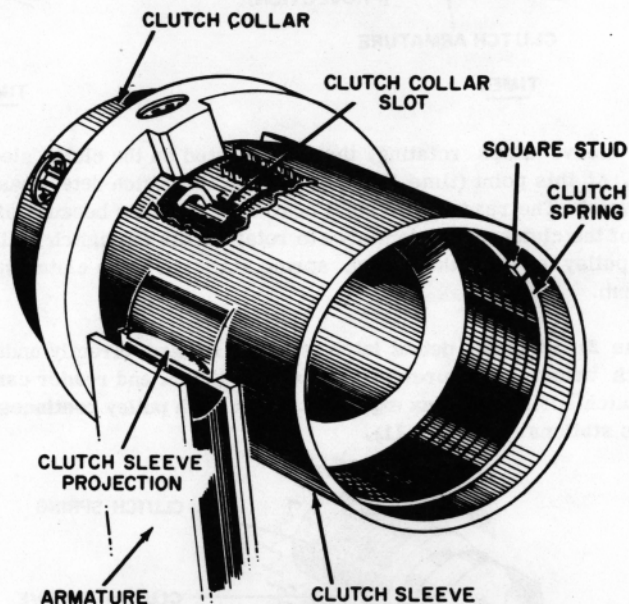


Figure 10.

The clutch sleeve is instrumental in latching and unlatching the clutch mechanism. During a clutch cycle the clutch sleeve rotates with the clutch pulley and the clutch spring. The clutch pulley end of the clutch spring is positioned directly behind a square stud on the inside surface of the clutch sleeve. As the clutch spring is wound by the clutch pulley, the clutch spring pushes the clutch sleeve.

The clutch sleeve continues to rotate until the clutch mechanism reaches home position. At this time the projection on the outer surface of the clutch sleeve strikes the clutch armature. The clutch armature restricts further rotation of the clutch sleeve (Figure 10).

Friden 2200/2300 SERIES MACHINES

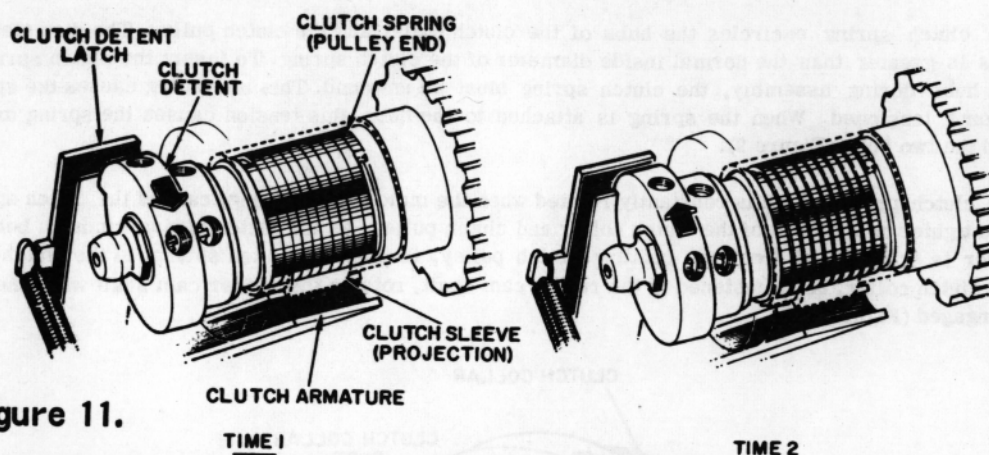


Figure 11.

When the clutch sleeve stops rotating, the square stud on the clutch sleeve limits the clutch at the clutch pulley end. At this point (time 1) the dropoff on the clutch detent has not yet reached the end of the clutch detent latch. The reader cam shaft continues to rotate because of its inertia and speed. The clutch collar end of the clutch spring continues to rotate while the clutch pulley end remains stationary. With the clutch pulley end of the clutch spring stationary, the clutch spring expands and releases the clutch pulley hub.

At this point (time 2) the clutch detent latch is pulled inward, directly under the dropoff on the clutch detent. The clutch detent latch prevents the clutch detent and reader cam shaft from settling back. Therefore, the clutch spring remains expanded. The clutch pulley continues to rotate while the reader cam shaft remains stationary (Figure 11).

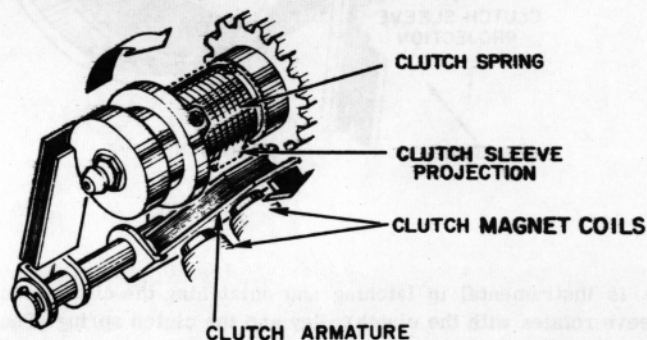


Figure 12.

Engagement of the clutch is accomplished when the clutch armature is attracted by the clutch magnet coils. The clutch magnet coils are energized by a voltage level generated within the machine. When the clutch magnet coils are energized, the clutch armature moves out from under the projection on the clutch sleeve. The clutch spring, attempting to rewind, pushes the projection of the clutch sleeve past the latching surface of the clutch armature. The clutch spring then contracts and tightly grips the hub of the rotating clutch pulley. The clutch pulley now rotates the clutch spring, the clutch collar and the reader cam shaft (Figure 12).

Friden 2200/2300 SERIES MACHINES

KNOCK OFF AND OVERTRAVEL STOP

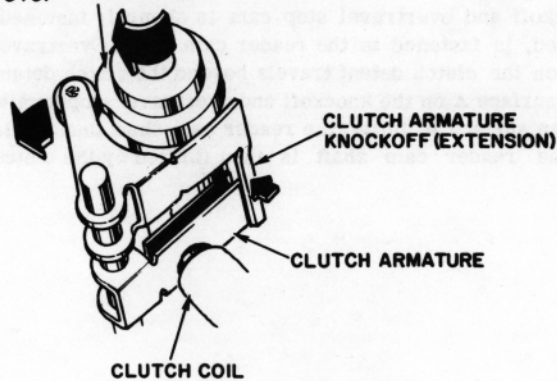


Figure 13.

The knockoff and overtravel stop cam has a high lobe on its circumference. This high lobe actuates the clutch armature knockoff in the third quarter of the clutch cycle. An extension of the clutch armature knockoff then moves the clutch armature toward the clutch sleeve. The speed of the reader cam shaft and the residual magnetism in the clutch magnet coil necessitates this knockoff action. The knockoff action insures positive restoring of the clutch armature in sufficient time to restrict the clutch sleeve (Figure 13).

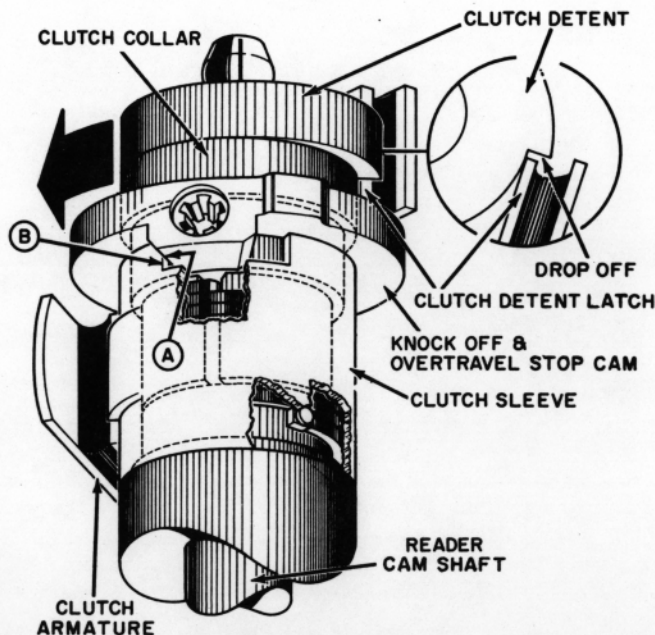


Figure 14.

Friden 2200/2300 SERIES MACHINES

The knockoff and overtravel stop cam also prevents excessive overtravel of the reader cam shaft in home position. The knockoff and overtravel stop cam is securely fastened to the clutch collar. The clutch collar, as mentioned, is fastened to the reader cam shaft. Overtravel of the reader cam shaft occurs when the dropoff on the clutch detent travels beyond the clutch detent latch. Overtravel of the reader cam shaft causes surface A on the knockoff and overtravel stop cam to limit against surface B on the clutch sleeve. When surface A limits, the reader cam shaft then settles back to home position. Backward rotation of the reader cam shaft is then limited by the clutch detent and clutch detent latch (Figure 14).

Figure 13.

The knockoff and overtravel stop cam has a high rise on its circumference. This high rise causes the clutch detent to drop in the first quarter of the clutch cycle. In response to the clutch detent drop, the clutch detent latch moves the clutch detent away from the high rise. The speed of the reader cam shaft and the clutch detent are such that the clutch detent latch will disengage the clutch detent. The knockoff and overtravel stop cam is then free to rotate and the clutch detent latch will engage the clutch detent. This action limits the backward rotation of the clutch detent and the clutch detent latch.

Figure 13.



Figure 14.

Friden 2200/2300 SERIES MACHINES

READER CYCLE

A reader cycle is initiated when the magnet coils in the clutch are energized by an electrical signal generated within the machine - engaging the clutch. Engagement of the reader clutch causes the reader cam shaft to cycle. Various cams mounted on the reader cam shaft then initiate the operation of the reader mechanisms.

NOTE: The following explanation assumes that a code has just been read and the next tape code has been advanced to the reading station.

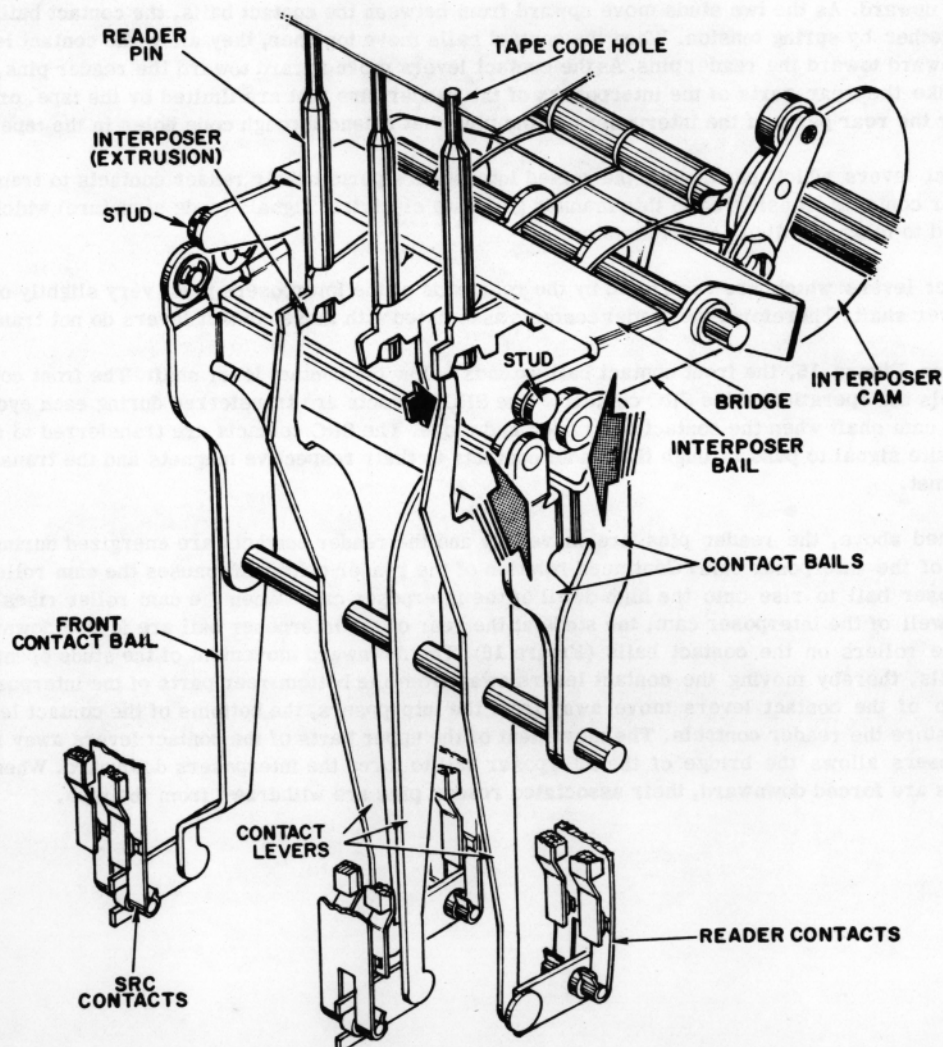


Figure 15.

Friden 2200/2300 SERIES MACHINES

One of the cams mounted to the reader cam shaft is the interposer cam (Figure 15). As the reader cam shaft rotates, a cam roller on the interposer bail arm follows the contour of the interposer cam. When the roller falls into the low dwell of the interposer cam, the bridge of the interposer bail rises. When the bridge rises, the interposers and reader pins are no longer restricted. Consequently, the reader pins move upward to detect the code in the tape. The reader pins either pass through a code hole in the tape or are restricted by the tape. Figure 15 shows one reader pin extended through a code hole in a tape and two reader pins limited by the tape. The interposer associated with the reader pin extending through the code hole therefore rises higher than the interposers whose pins are limited by the tape.

As the interposer bail allows the reader pins to move upward, the two studs on the interposer bail also move upward. As the two studs move upward from between the contact bails, the contact bails are forced together by spring tension. When the contact bails move together, they allow the contact levers to move inward toward the reader pins. As the contact levers move inward toward the reader pins, they either strike the rear parts of the interposers of the reader pins that are limited by the tape, or they pass under the rear parts of the interposers of the pins that extend through code holes in the tape.

The contact levers which pass under the raised interposers permit their reader contacts to transfer. The reader contacts transferred in this manner generate electrical signals (code structure) which are transmitted to magnet coils in the translator.

The contact levers which are restricted by the rear ends of the interposers pivot very slightly on the contact lever shaft. Therefore, the reader contacts associated with these contact levers do not transfer.

As shown in Figure 15, the front contact bail extends below the contact lever shaft. The front contact bail controls the operation of the SRC contacts. The SRC contacts are transferred during each cycle of the reader cam shaft when the contact bails open and close. The SRC contacts are transferred to allow the composite signal to pass through the reader contacts to their respective magnets and the translator clutch magnet.

As explained above, the reader pins are moved up and the reader contacts are energized during the low dwell of the interposer cam. Continued rotation of the reader cam shaft causes the cam roller on the interposer bail to rise onto the high dwell of the interposer cam. When the cam roller rises onto the high dwell of the interposer cam, the studs at the rear of the interposer bail are forced downward between the rollers on the contact bails (Figure 16). The downward movement of the studs opens the contact bails, thereby moving the contact levers away from the bottom rear parts of the interposers. As the top of the contact levers move away from the interposers, the bottoms of the contact levers pivot to restore the reader contacts. The movement of the upper parts of the contact levers away from the interposers allows the bridge of the interposer bail to force the interposers downward. When the interposers are forced downward, their associated reader pins are withdrawn from the tape.

Friden 2200/2300 SERIES MACHINES

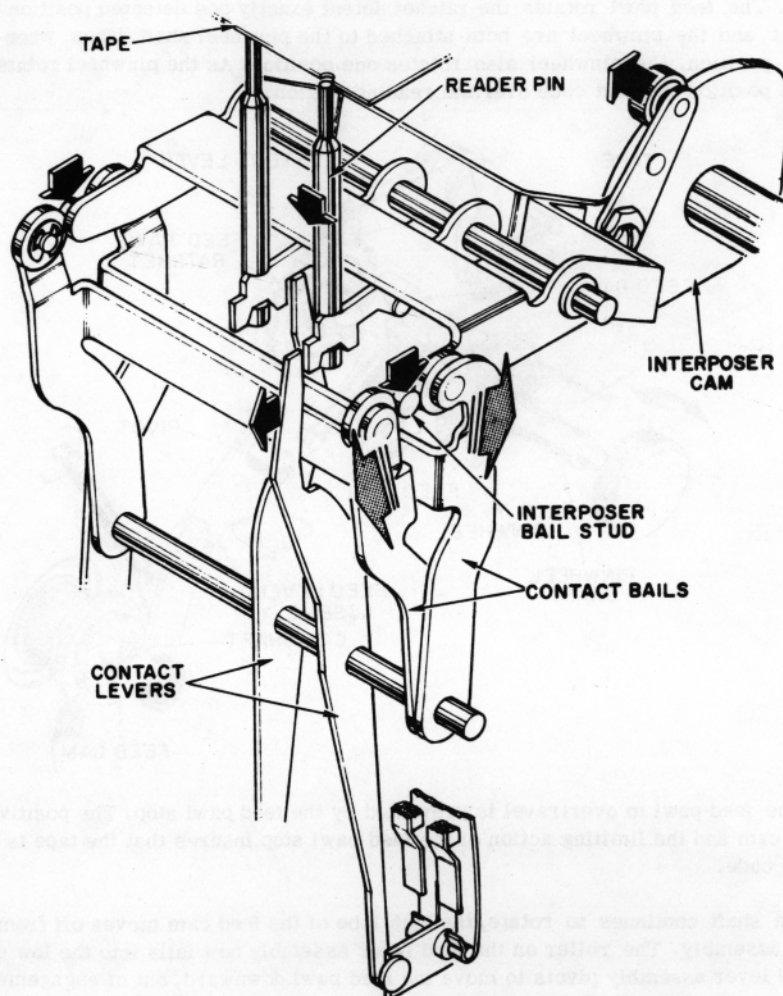


Figure 16.

Friden 2200/2300 SERIES MACHINES

Continued rotation of the reader cam shaft causes the high lobe of the feed cam to pivot the feed lever assembly (Figure 17). When the feed lever assembly pivots, the feed pawl is driven upward to engage the ratchet detent. The feed pawl rotates the ratchet detent exactly one detented position (one tooth). The ratchet detent and the pinwheel are both attached to the pinwheel shaft. Thus, when the ratchet detent rotates one position, the pinwheel also rotates one position. As the pinwheel rotates, it draws the tape forward to position the next code over the reading station.

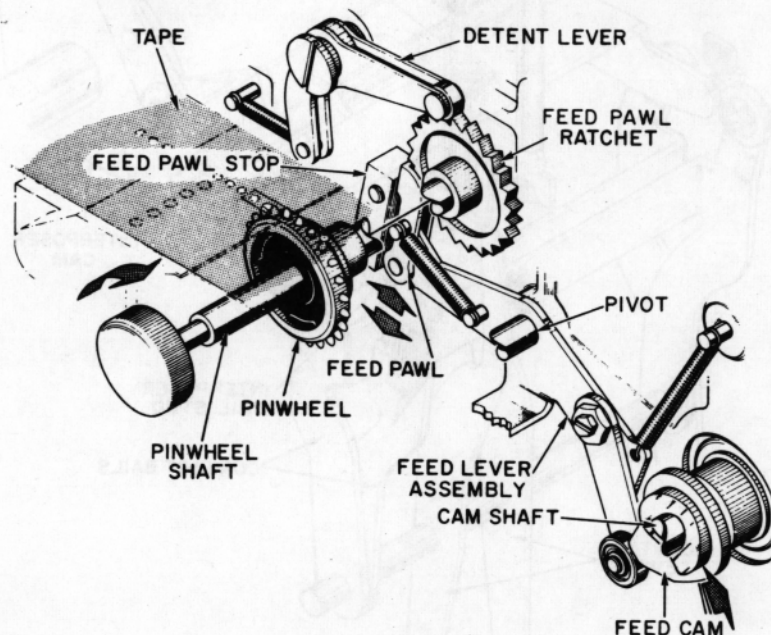


Figure 17.

Any tendency of the feed pawl to overtravel is prevented by the feed pawl stop. The positive camming action of the feed cam and the limiting action of the feed pawl stop insures that the tape is fed exactly the distance on one code.

As the reader cam shaft continues to rotate, the high lobe of the feed cam moves off from the roller on the feed lever assembly. The roller on the feed lever assembly now falls into the low dwell of the feed cam. The feed lever assembly pivots to move the feed pawl downward, out of engagement with the ratchet detent. When the feed pawl is withdrawn, the detent arm holds the feed pawl ratchet firmly detented.

The feed operation is now completed and a new code is positioned in the reading station. The new code will be read during the next reader cycle. After the code is read, the feed mechanism will again advance the tape. It is evident, therefore, that the code is sensed at the beginning of cam shaft rotation, and the tape is advanced at the end of cam shaft rotation.

There are two other cams on the reader cam shaft which are functioning during a reader cycle. Both cams are circuit breaker cams which operate individual circuit breaker assemblies (Figure 18). The high dwell on each circuit breaker cam causes the circuit breaker arm to pivot downward. As the

Friden 2200/2300 SERIES MACHINES

circuit breaker arm pivots downward, it causes the spring to push the plunger and contact strap downward. The contact points on the contact strap make with the points on the dampener to complete an electrical circuit.

The contacts on the two circuit breaker assemblies are SRCC-1 and SRCC-2. The SRCC-1 contacts qualify the reader contacts so that code information is transmitted from the reader only when the reader pins are sensing the tape. The SRCC-2 contacts qualify the circuit to the reader clutch to prevent unnecessary energizing of the clutch coils once the clutch has been released.

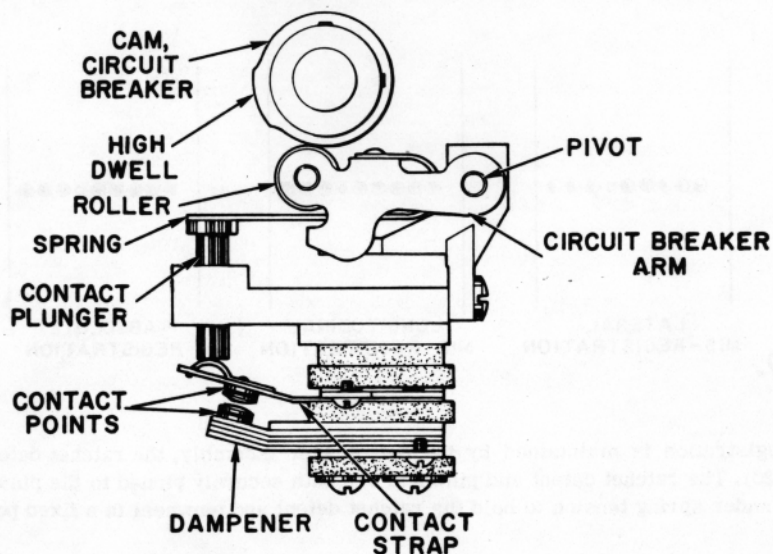


Figure 18.

Friden 2200/2300 SERIES MACHINES

REGISTRATION

The term registration refers to the relationship between the reader pins and the code holes. The tape or the edge card must be properly positioned (registered) in the reading station, both laterally and longitudinally. Lateral registration refers to the side-to-side positioning of the tape or card. Longitudinal registration refers to front-to-back positioning of the tape or card. Mis-registration in either direction can cause the reader pins to be restricted by the tape or the card when a code hole should be sensed. Proper registration, laterally and longitudinally, results in absolute registration. Absolute registration means that the code holes are directly over, and concentric to, the reader pins (Figure 19).

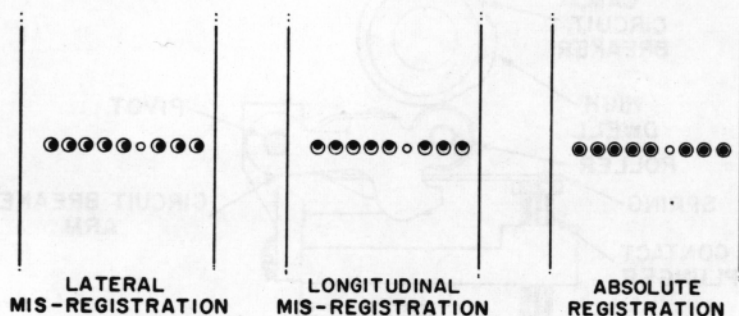


Figure 19.

Longitudinal registration is maintained by the detent arm assembly, the ratchet detent, and the pinwheel (Figure 20). The ratchet detent and pinwheel are both securely pinned to the pinwheel shaft. The detent lever is under spring tension to hold the ratchet detent and pinwheel in a fixed position.

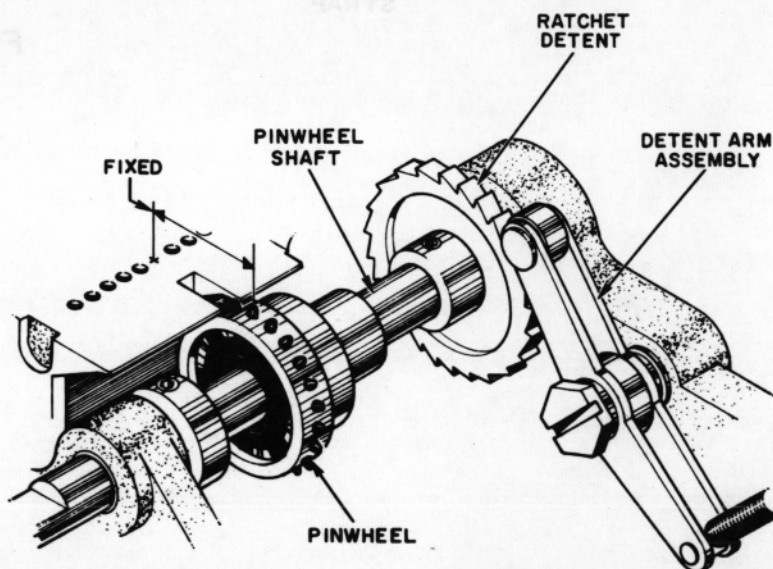


Figure 20.

Friden 2200/2300 SERIES MACHINES

Lateral registration of the tape is maintained by the fixed position of the pinwheel and the fixed position of the inner and outer tape guides (Figure 21). Because the pinwheel is stationary and engages the perforated holes in the tape, lateral movement is minimized. Further lateral registration is maintained by the inner and outer tape guides. Because both edges of the tape are against the tape guides, lateral movement is further minimized since the tape cannot be fed into the reading station at an angle.

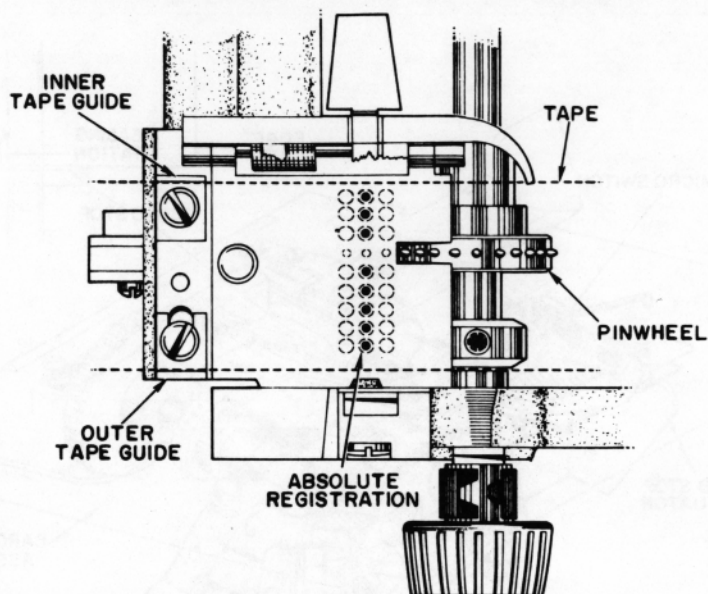


Figure 21.

Lateral registration on Tape/Edge Card Readers is achieved by the use of two pinwheels, one on either side of the reading station (Figure 22). The fixed position of both pinwheels holds the tape or card centered over the reader pins.

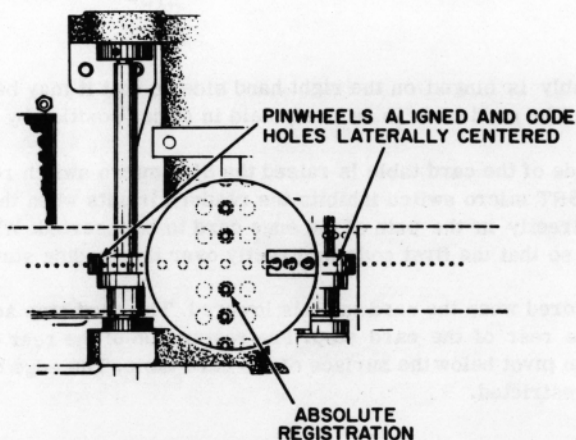


Figure 22.

Friden 2200/2300 SERIES MACHINES

CARD TABLE ASSEMBLY

The card table assembly (Figure 23) provides a mounting surface for inserting and reading tape or edge cards. The card table can be manually raised so that an edge card may be inserted correctly in the reading station.

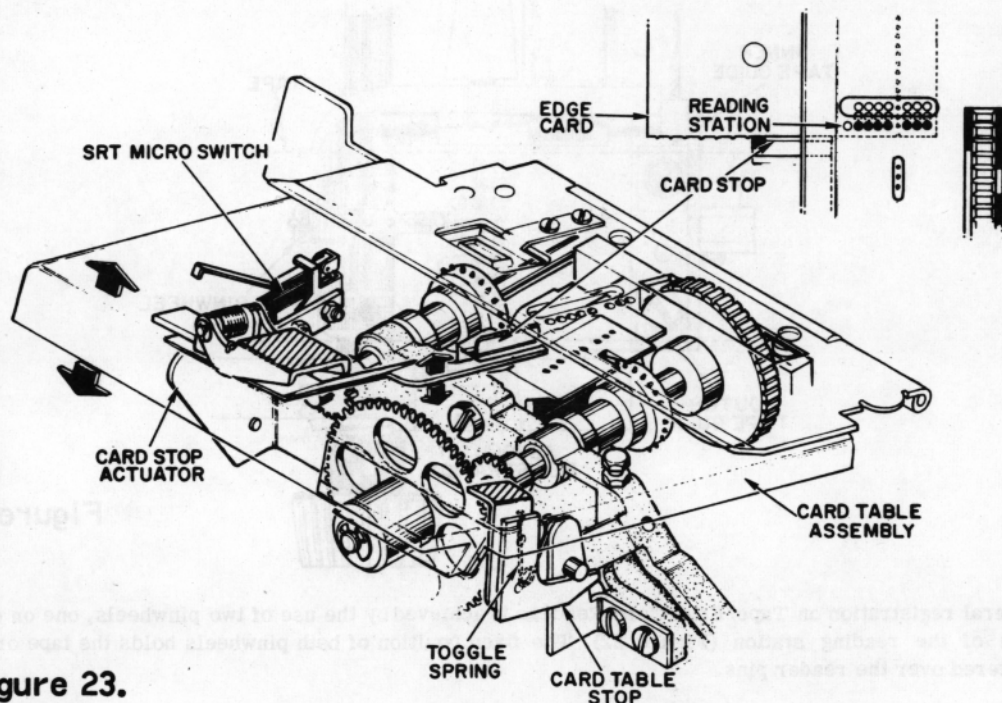


Figure 23.

The card table assembly is hinged on the right hand side so that it may be raised and lowered within the limits of its stops. The card table is securely held in either position by the toggle spring.

When the left hand side of the card table is raised the SRT micro switch restores and the front of the card stop rises. The SRT micro switch inhibits the reader circuits when the card table is raised. The card stop positions directly in the path of the edge card to be inserted. When inserted, the edge card contacts the card stop so that the first code is directly over the reading station.

The card stop is restored when the card table is lowered. The card stop actuator restricts the downward movement of the rear of the card stop. The restriction of the rear of the card stop causes the front of the card stop to pivot below the surface of the card table. The edge card may now pass through the reading station unrestricted.

Friden 2200/2300 SERIES MACHINES

THE TRANSLATOR

The translator performs three functions within the Flexowriter:

1. It receives electrical signals from the reader and converts these signals to mechanically operate the keylevers.
2. It initiates a momentary delay of reader operation. This delay occurs when a carriage positioning code (Carriage Return, Tab, or Backspace) is read. This delay of the reader is required to allow carriage assembly movement to take place. (On 2200 series machines certain function keylevers also initiate automatic reader delay.)
3. It qualifies electrical signals which are used to synchronize reader-translator operation.

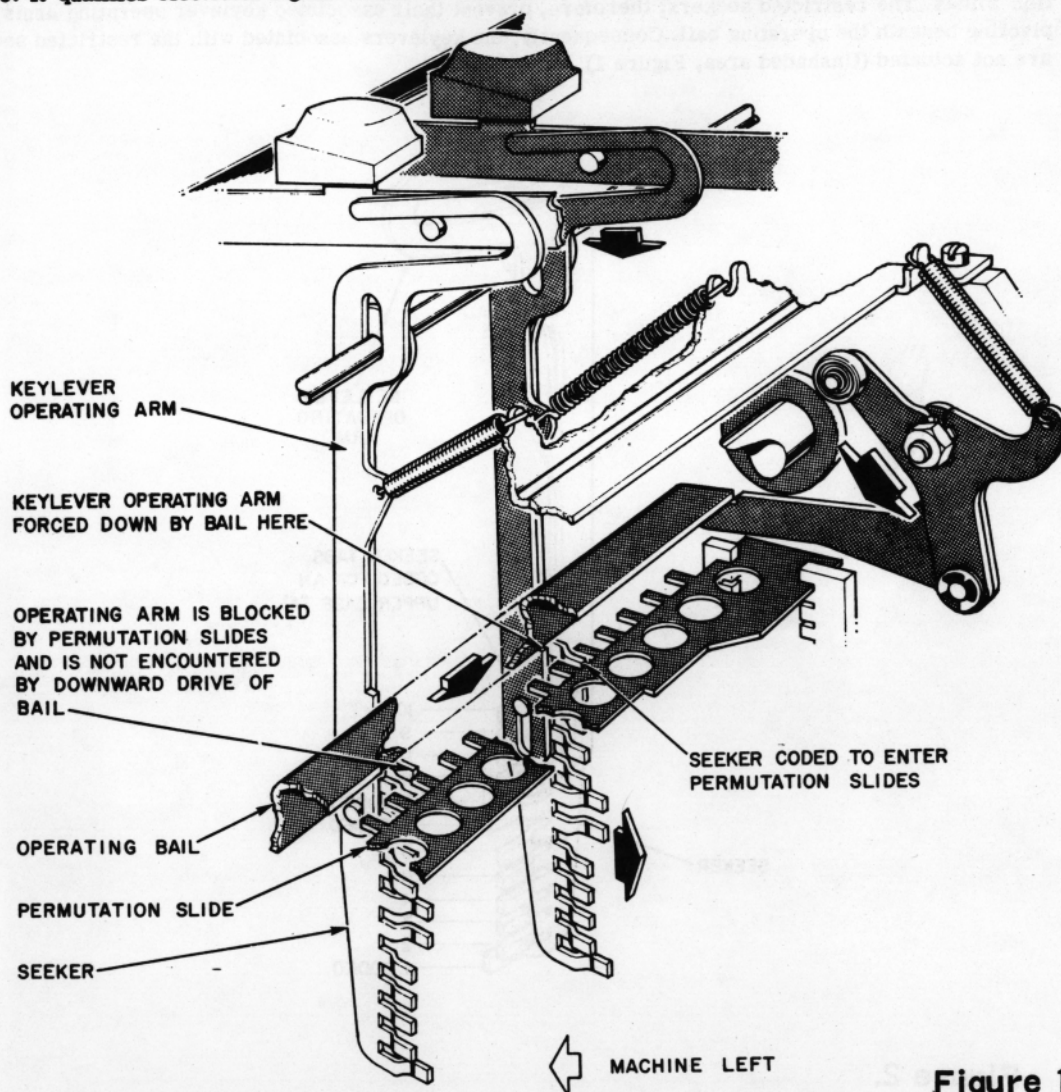


Figure 1.

Friden 2200/2300 SERIES MACHINES

As shown in Figure 1, each keylever is connected to the translator by a keylever operating arm and a seeker. A keylever is operated when its associated keylever operating arm is moved downward by the operating bail. The keylever to be operated is selected by the interaction of its associated seeker and a permutation slide.

During a translator cycle, the seekers attempt to move forward. However, all seekers are restricted except the one which corresponds to the code sent from the reader. The seeker which is unrestricted allows its keylever operating arm to pivot beneath the operating bail. The operating bail then descends to contact the keylever operating arm, thereby actuating the associated keylever (Shaded area Figure 1). The seekers which do not correspond to the code sent by the reader are restricted by the permutation slides. The restricted seekers, therefore, prevent their associated keylever operating arms from pivoting beneath the operating bail. Consequently, the keylevers associated with the restricted seekers are not actuated (Unshaded area, Figure 1).

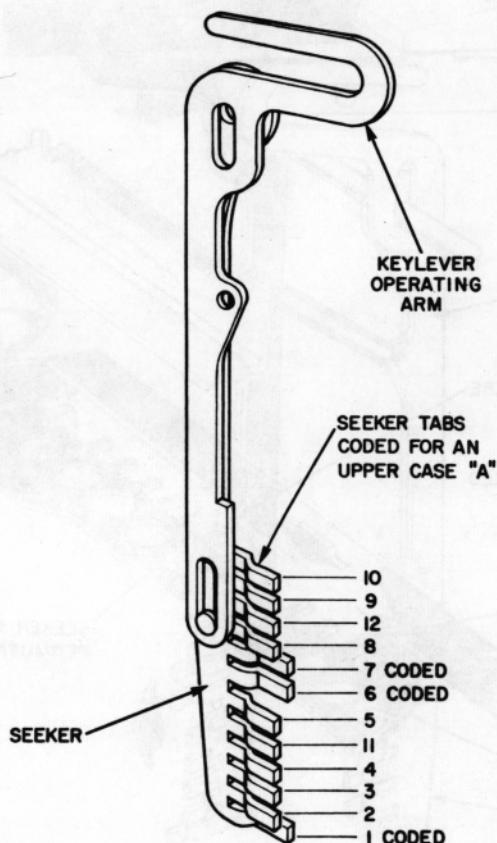


Figure 2.

Friden 2200/2300 SERIES MACHINES

As shown in Figure 2, the seekers in the translator are individually coded. This coding corresponds to the code read by the reader. Each seeker has twelve tabs which are pre-formed to the left or right. Eight of the twelve tabs (numbered 1 through 8) are associated with the code channels in the reader. The remaining four tabs (numbered 9 through 12) are associated with automatic operations such as non-print and tape skip.

The seeker tabs which are formed to the right (viewed as shown in Figure 2) correspond to the code assigned to that particular keylever position. The seeker shown in Figure 2 is coded for an upper case A. The tabs formed to the right (positions 1, 6, and 7) determine the A keylever position. All remaining tabs for the A position are formed to the left. The seeker for the B keylever position has tabs 2, 6, and 7 formed to the right. (See code chart, READER Section.)

Each tab position corresponds to a permutation slide within the translator. For purposes of simplification, Figure 3 shows only three permutation slides, three seekers, and three tabs on each seeker.

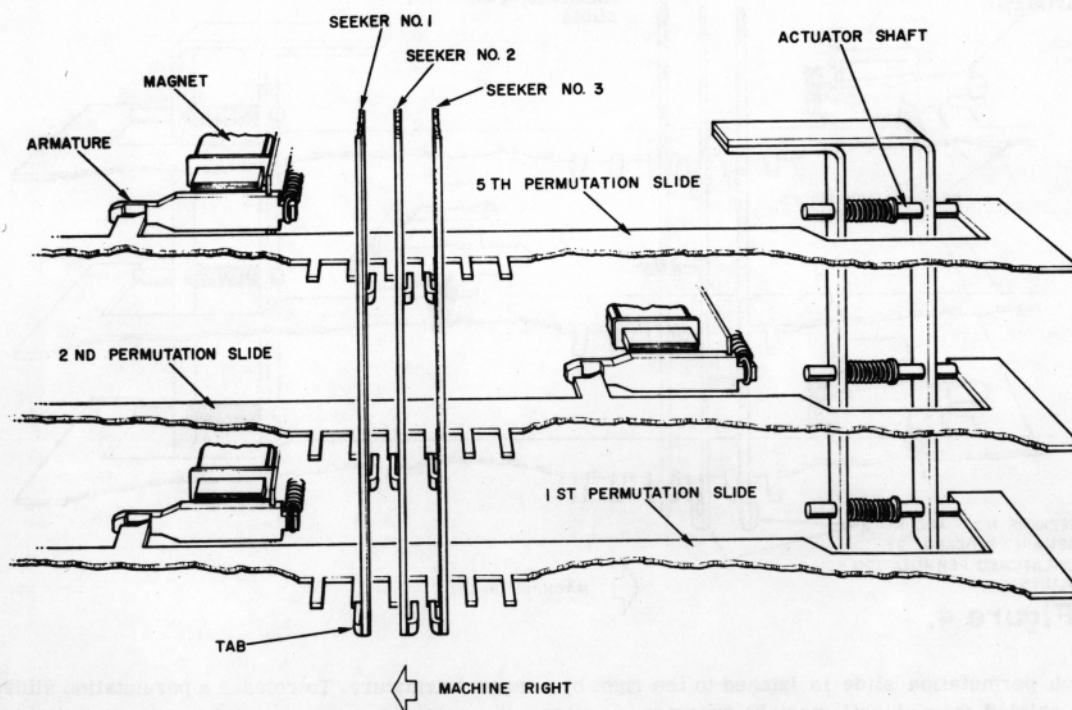


Figure 3.

Friden 2200/2300 SERIES MACHINES

Seeker #1 has one tab formed to the right and two formed to the left, as viewed from the rear of the machine. The tab formed to the right is at the first permutation slide position. The two tabs formed to the left are at the second and fifth permutation slide positions. Therefore, seeker #1 is restricted only by the first permutation slide.

Seeker #2 also has one tab formed to the right and two formed to the left. In this case, however, the tab formed to the right is at the second permutation slide position. Seeker #2, therefore, is restricted only by the second permutation slide. Seeker #3 has all three tabs formed to the right and is restricted by all three permutation slides.

In order for a particular seeker to move forward and allow its associated keylever to be actuated, the permutation slides restricting that seeker must be moved to the left (Figure 4).

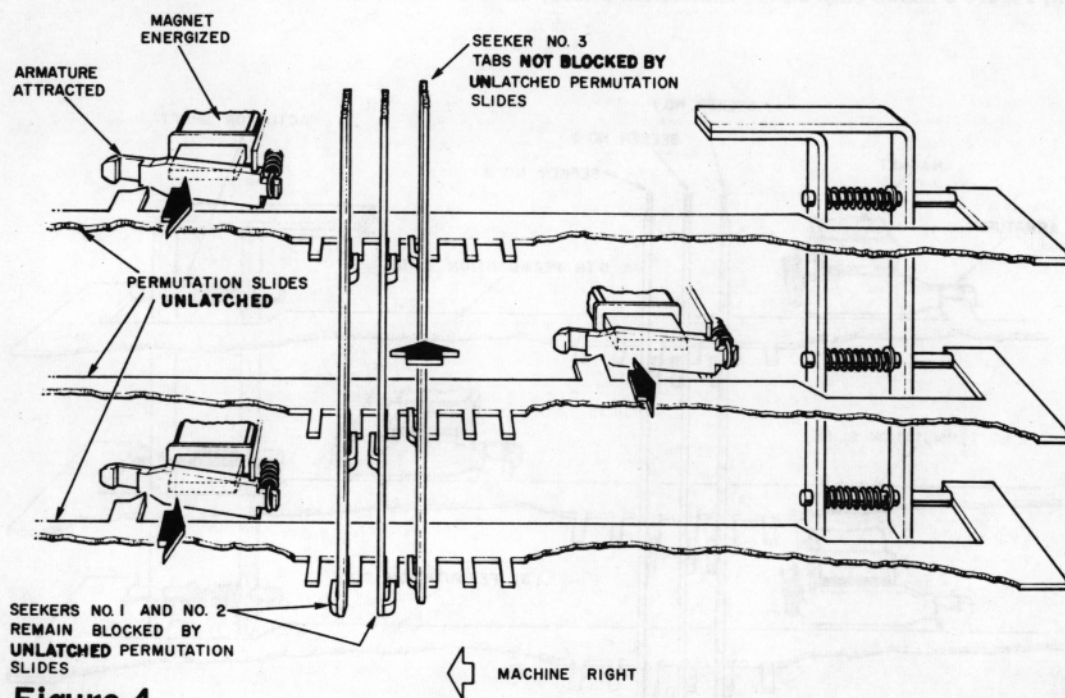


Figure 4.

Each permutation slide is latched to the right by a magnet armature. To release a permutation slide, its related magnet coil must be energized to attract the magnet armature away from the permutation slide. A magnet coil is energized when the translator receives a corresponding code signal from the reader. To release the three permutation slides in our example (first, second and fifth) the reader senses a punched hole in channels 1, 2, and 5 on the tape being read. The signal generated energizes all three magnet coils, thereby allowing the three permutation slides to move to the left. This movement is accomplished by the tension from the actuator shaft and spring.

Friden 2200/2300 SERIES MACHINES

With the three permutation slides in our example unlatched and to the left, they are no longer in position to restrict seeker #3. The #3 seeker pivots forward during a translator cycle and its keylever arm positions under the operating ball. When the operating ball descends, the associated keylever is actuated.

When all three permutation slides in our example were released, it would seem that seekers #1 and #2 would also be unrestricted and be allowed to pivot. This is not the case since seekers #1 and #2 have tabs which are formed to the left in the fifth permutation slide position (Figure 4). When the fifth permutation slide moved to the left, the slide projections were positioned to restrict the forward movement of seekers #1 and #2. The #2 seeker is also restricted by the permutation slide in the first tab position. The #1 seeker is also restricted by the permutation slide in the second tab position. It is evident, then, that the permutation slides perform two functions during seeker selection: They allow the selected seeker to be unrestricted and they restrict the seekers that respond to a fragment of the particular code concerned.

Each permutation slide is assigned a number. Each permutation slide number also identifies its magnet coil and magnet armature. For example, when LT-1 magnet coil is energized to attract its armature, the permutation slide in the first position is released.

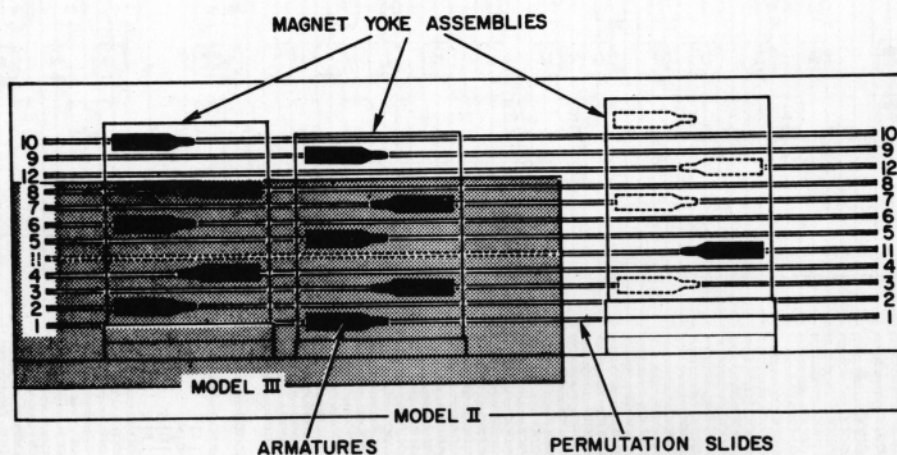


Figure 5.

Friden 2200/2300 SERIES MACHINES

There are three magnet yoke assemblies on 2200 series translators and two magnet yoke assemblies on 2300 series translators (Figure 5). Each magnet yoke assembly contains the magnet coils and the magnet armatures. The magnet coil and magnet armature positions within the magnet yoke assemblies are essentially the same on 2200 and 2300 series translators. The 2300 series translators contain no permutation slides, magnet coils, or magnet armatures in positions nine, ten, and eleven. Nor do the 2200 or 2300 series translators contain a permutation slide, a magnet coil, or a magnet armature in position twelve. Figure 6 shows the translator coding and keyboard layout for a model 2201 Flexowriter. The most outstanding difference in the 2300 series machines is the absence of the function code keys (F1 through F13 shown in the upper right hand corner of Figure 6). There are two basic layouts for the 2201 Flexowriter and many different layouts for the 2300 series Flexowriters.

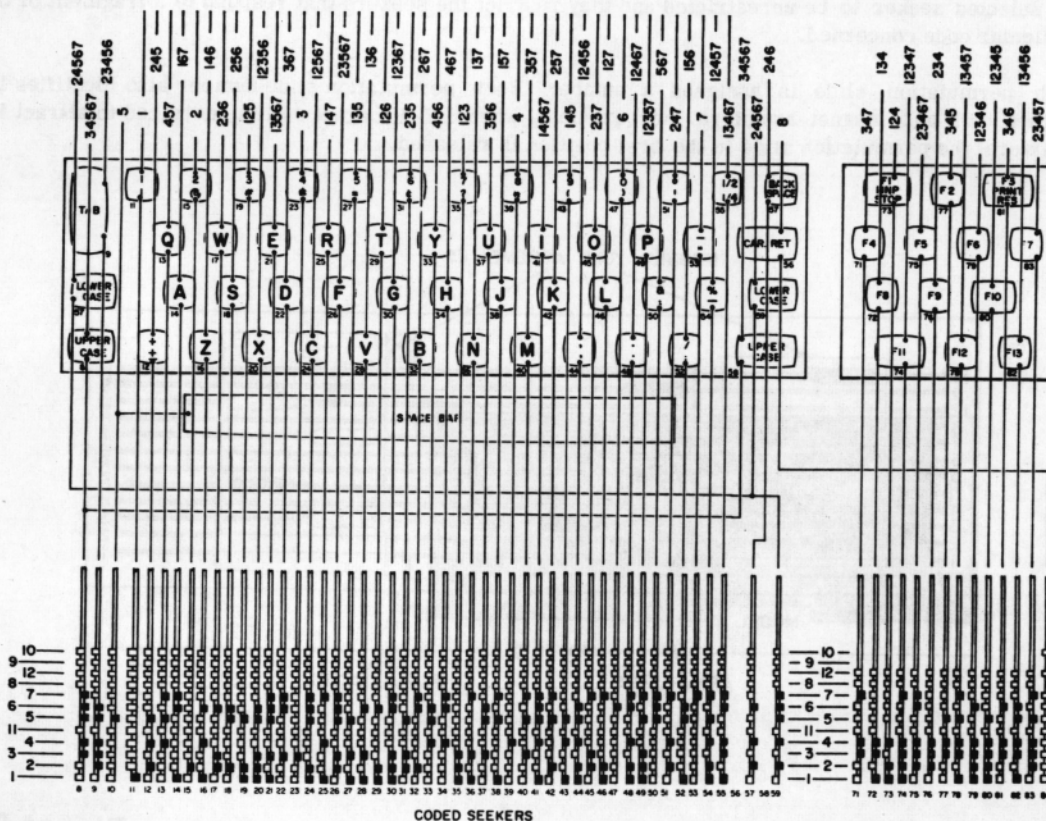


Figure 6.

Friden 2200/2300 SERIES MACHINES

The number below each seeker designates the position of the seeker in the translator (8 through 59 and 71 through 84). The number below each keybutton denotes the keylever position. The lines connecting the keylevers and seekers indicate which seeker operates a particular keylever; for example, the seeker in position 84 operates the keylever (carriage return) in position 56.

The numbers at the top of the lines extending upward from the keybuttons signify the code structure for each position of the tape. Each of these numbers corresponds with the coding of the seekers. The seeker tabs, as mentioned, are formed to the left or right. In Figure 6, the tabs formed to the right (darkened) indicate the code structure for that particular seeker. For example, the seeker in position 8 has tabs 3, 4, 5, 6, and 7 formed to the right. The line extending upward from seeker position 8 indicates that it operates the upper case keylevers. The numbers at the top of the lines extending upward from the upper case keybuttons are 3, 4, 5, 6, and 7. These numbers are the same as the tabs which are formed to the right on the seeker in position 8. Therefore, to allow the seeker in position 8 to operate, the reader must send a signal indicating that it has sensed punched holes in channels 3, 4, 5, 6 and 7 of the tape that is being read.

On the 2201 series translator, the function code seekers have certain tabs removed. The seeker in position 73 has tabs removed in the ninth, tenth and eleventh permutation slide positions. The removal of tabs prevents restriction of the seeker by the permutation slide whether the slide is latched or unlatched.

Friden 2200/2300 SERIES MACHINES

TRANSLATOR CLUTCH

Some of the translator clutch parts are mounted on a clutch magnet yoke assembly. These parts are the clutch armature, the clutch armature knock off, the clutch detent latch and the clutch magnet coils. The remainder of the translator clutch parts are mounted on the translator cam shaft (Figure 7).

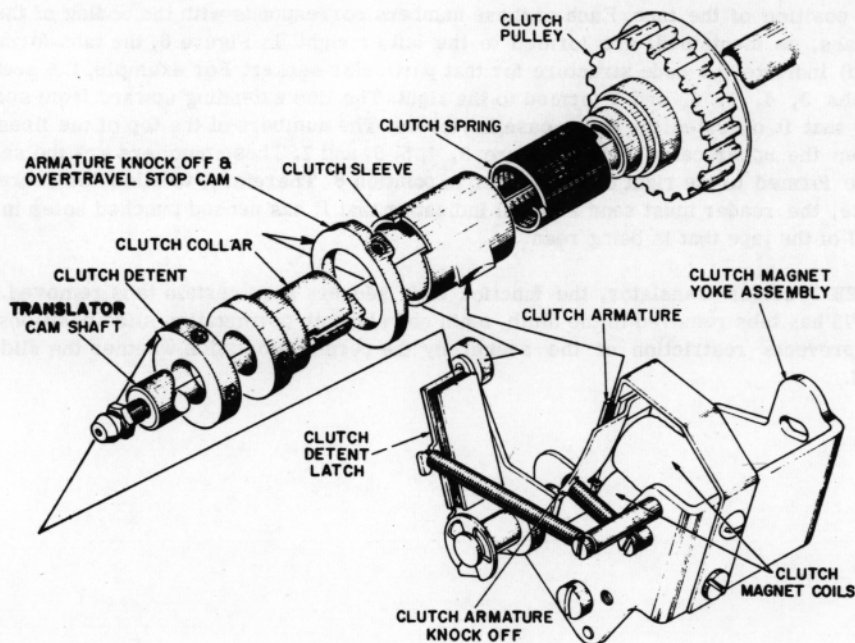


Figure 7.

The clutch detent is securely fastened to the translator cam shaft. The clutch detent and the clutch detent latch provide a home position for the shaft.

The clutch collar is fastened to the translator cam shaft. The clutch collar provides the connection between the clutch mechanism and the translator cam shaft.

The clutch pulley is the coupling between the translator and the power drive mechanism. The clutch pulley rotates constantly while the motor is operating.

The clutch sleeve operates in conjunction with the clutch armature and the clutch magnet coils. The clutch sleeve, clutch armature, and the clutch magnet coils provide the means for engaging and disengaging the translator clutch. The operation of the reader, as mentioned previously, is synchronized to the operation of the translator.

Friden 2200/2300 SERIES MACHINES

The clutch spring is the decisive component of the clutch. The clutch spring provides the means by which the clutch pulley rotates the clutch collar, thereby also rotating the translator cam shaft.

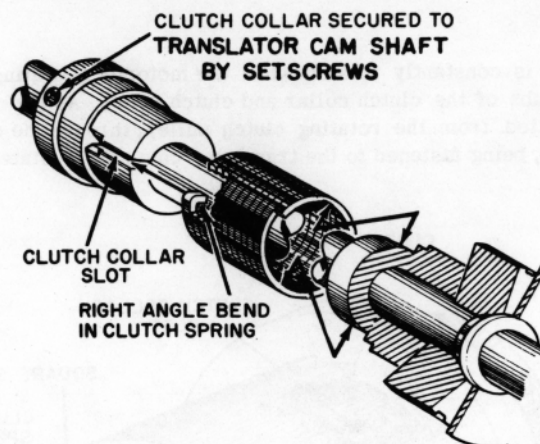


Figure 8.

The clutch spring is constructed of flat wire. It is operated by winding in a circular motion rather than by compressing or stretching. At one end of the clutch spring is a right angle bend which is always engaged with a slot in the clutch collar. Therefore, the clutch spring and the clutch collar rotate as one unit (Figure 8).

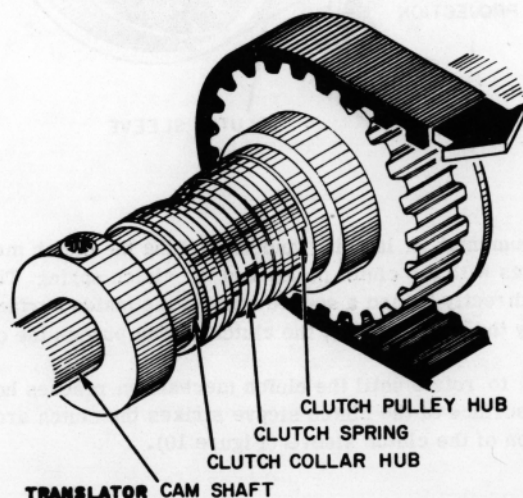


Figure 9.

Friden 2200/2300 SERIES MACHINES

The clutch spring encircles the hubs of the clutch collar and the clutch pulley. The diameter of the hubs is greater than the normal inside diameter of the clutch spring. To insert the clutch spring onto the hubs during assembly, the clutch spring must be unwound. This unwinding causes the clutch spring to become tensioned. When the spring is attached to the hubs, this tension causes the spring to firmly grip the two hubs.

The clutch pulley which is constantly rotated when the motor is operating, causes the clutch spring to wind tighter on the hubs of the clutch collar and clutch pulley. As the clutch spring winds on both hubs, power is transmitted from the rotating clutch pulley, through the clutch spring, to the clutch collar. The clutch collar, being fastened to the translator cam shaft, rotates the shaft when the clutch is engaged (Figure 9).

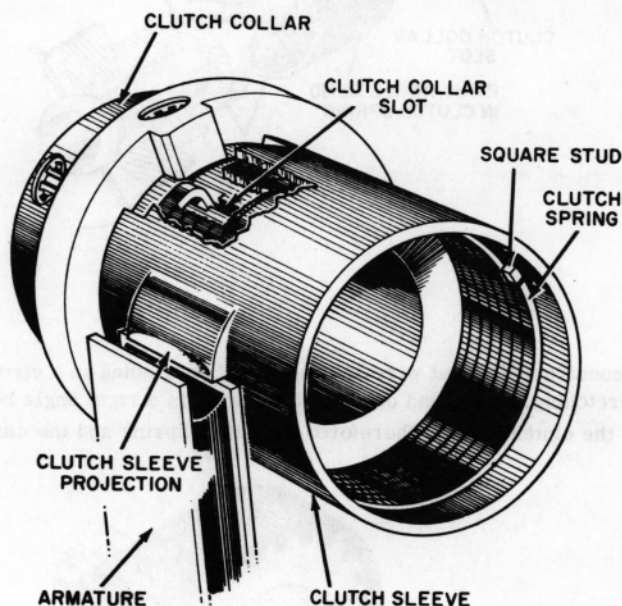


Figure 10.

The clutch sleeve is instrumental in latching and unlatching the clutch mechanism. During a clutch cycle the clutch sleeve rotates with the clutch pulley and the clutch spring. The clutch pulley end of the clutch spring is positioned directly behind a square stud on the inside surface of the clutch sleeve. As the clutch spring is wound by the clutch pulley, the clutch spring pushes the clutch sleeve.

The clutch sleeve continues to rotate until the clutch mechanism reaches home position. At this time the projection on the outer surface of the clutch sleeve strikes the clutch armature. The clutch armature restricts further rotation of the clutch sleeve (Figure 10).

Friden 2200/2300 SERIES MACHINES

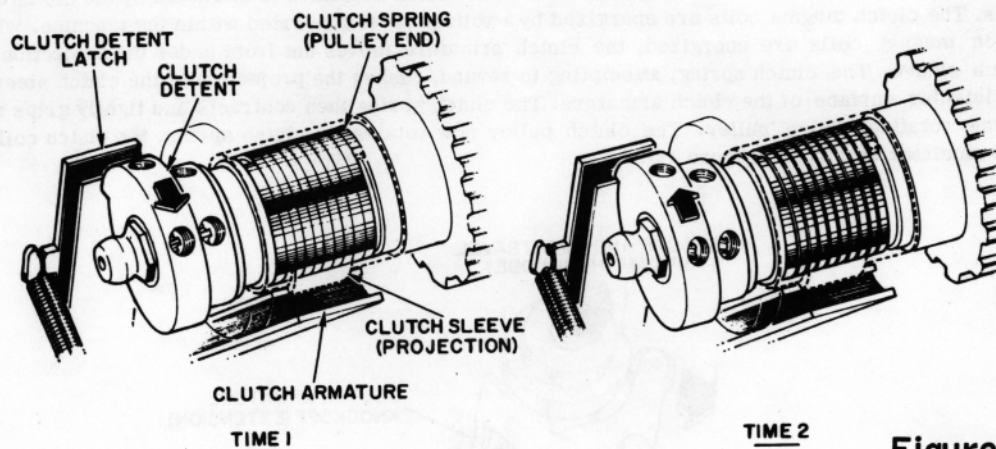


Figure 11.

When the clutch sleeve stops rotating, the square stud on the clutch sleeve limits the clutch at the clutch pulley end. At this point (time 1) the dropoff on the clutch detent has not yet reached the end of the clutch detent latch. The translator cam shaft continues to rotate because of its inertia and speed. The clutch collar end of the clutch spring continues to rotate while the clutch pulley end remains stationary. With the clutch pulley end of the clutch spring stationary, the clutch spring expands and releases the clutch pulley hub.

At this point (time 2) the clutch detent latch is pulled inward, directly under the dropoff on the clutch detent. The clutch detent latch prevents the clutch detent translator cam shaft from settling back. Therefore, the clutch spring remains expanded. The clutch pulley continues to rotate while the translator cam shaft remains stationary (Figure 11).

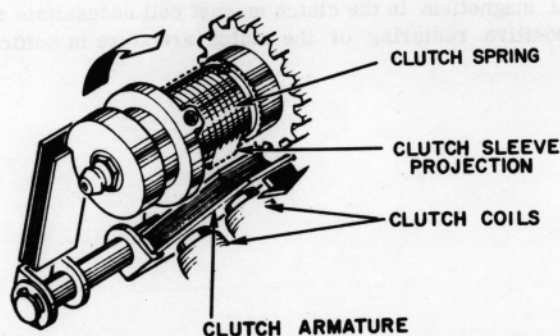


Figure 12.

Friden 2200/2300 SERIES MACHINES

Engagement of the clutch is accomplished when the clutch armature is attracted by the clutch magnet coils. The clutch magnet coils are energized by a voltage level generated within the machine. When the clutch magnet coils are energized, the clutch armature moves out from under the projection on the clutch sleeve. The clutch spring, attempting to rewind, pushes the projection of the clutch sleeve past the latching surface of the clutch armature. The clutch spring then contracts and tightly grips the hub of the rotating clutch pulley. The clutch pulley now rotates the clutch spring, the clutch collar and the translator cam shaft (Figure 12).

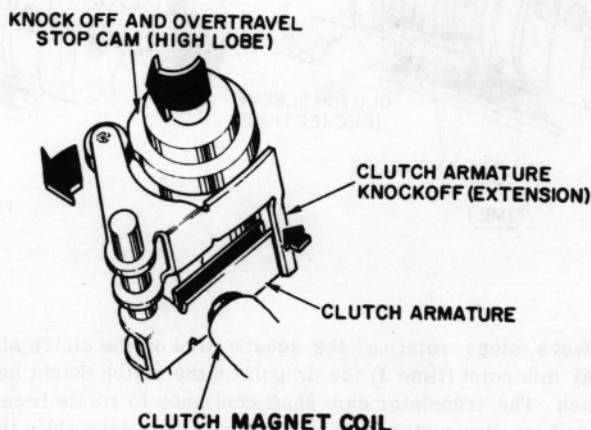


Figure 13.

The knockoff and overtravel stop cam has a high lobe on its circumference. This high lobe actuates the clutch armature knockoff in the third quarter of the clutch cycle. An extension of the clutch armature knockoff then moves the clutch armature toward the clutch sleeve. The speed of the translator cam shaft and the residual magnetism in the clutch magnet coil necessitate this knockoff action. The knockoff action insures positive restoring of the clutch armature in sufficient time to restrict the clutch sleeve (Figure 13).

Friden 2200/2300 SERIES MACHINES

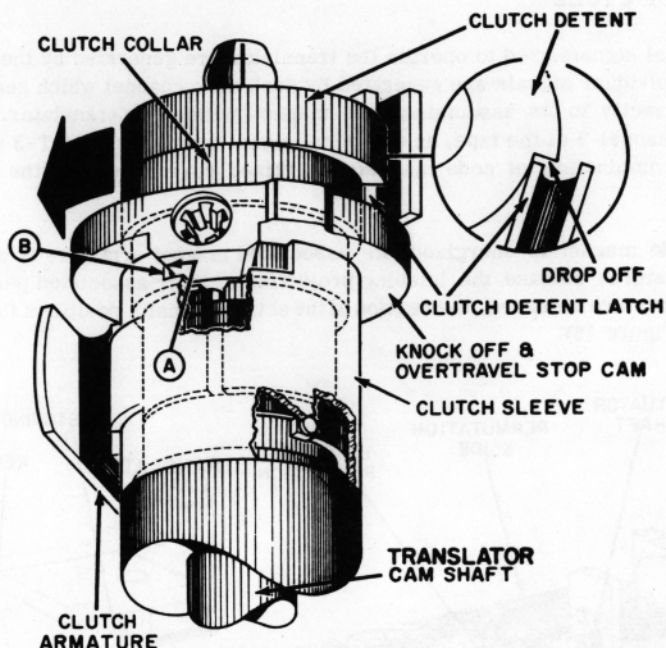


Figure 14.

The knockoff and overtravel stop cam also prevents excessive overtravel of the translator cam shaft in home position. The knockoff and overtravel stop cam is securely fastened to the clutch collar. The clutch collar, as mentioned, is fastened to the translator cam shaft. Overtravel of the translator cam shaft occurs when the dropoff on the clutch detent travels beyond the clutch detent latch. Overtravel of the translator cam shaft causes surface A on the knockoff and overtravel stop cam to limit against surface B on the clutch sleeve. When Surface A limits, the translator cam shaft then settles back to home position. Backward rotation of the translator cam shaft is then limited by the clutch detent and clutch detent latch (Figure 14).

Friden 2200/2300 SERIES MACHINES

TRANSLATOR CYCLE

The electrical signals used to operate the translator are generated by the reader. As the reader scans the tape, individual signals are generated by each code channel which senses a code hole. Each signal is routed directly to its associated code magnet within the translator. For example, when a hole is sensed in channel 3 of the tape, an electrical signal energizes the LT-3 magnet in the translator. The particular combination of code magnets energized corresponds to the structure of the code sensed.

As each code magnet is energized, its associated magnet armature is attracted. When attracted, the magnet armatures release the latching projection of their associated permutation slides. As the permutation slides are released, the tension of the actuator shafts positions the permutation slides slightly to the left (Figure 15).

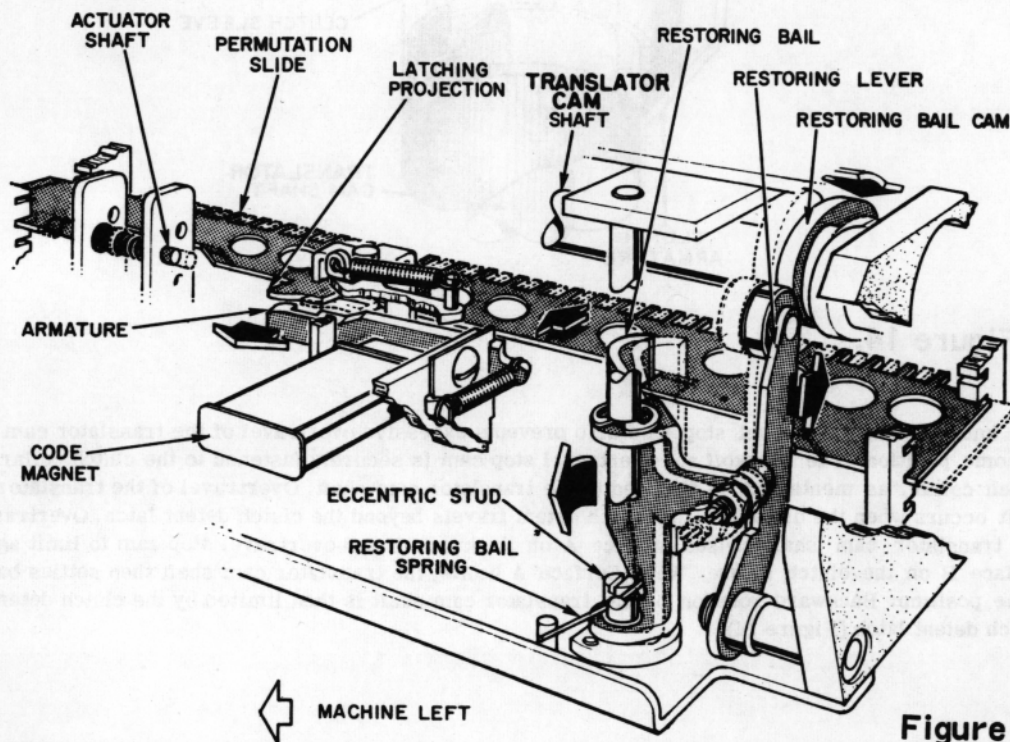


Figure 15.

When released to the left, the permutation slides strike the restoring bail. The premature limiting of the permutation slides by the restoring bail prevents the permutation slides from bouncing. The position of the restoring bail is maintained by the restoring lever. The restoring lever is supported by the medium dwell of the restoring bail cam.

The translator clutch coils are energized at the same time the code magnets are energized. When

Friden 2200/2300 SERIES MACHINES

energized, the clutch coil attracts the clutch armature. The attraction of the clutch armature results in the engagement of the clutch and rotation of the translator cam shaft. The clutch armature is not attracted as quickly as the magnet armature, causing a delay in the engagement of the clutch. This delay insures that the selected permutation slides are fully released before the translator cam shaft rotates.

As the translator cam shaft rotates, the medium dwell of the restoring bail cam rotates away from the restoring lever. The tension of the restoring bail spring then pivots the rear of the restoring bail to the left. The unlatched permutation slides, which are against the restoring bail at this time, follow the restoring bail to the left. This movement of the restoring bail is then limited by the restoring bail eccentric stud.

The unlatched permutation slides are now in position to restrict the seeker tabs which are formed to the left. The latched permutation slides are in position to restrict the seeker tabs which are formed to the right. Each permutation slide restricts only those tabs which lie on the same level.

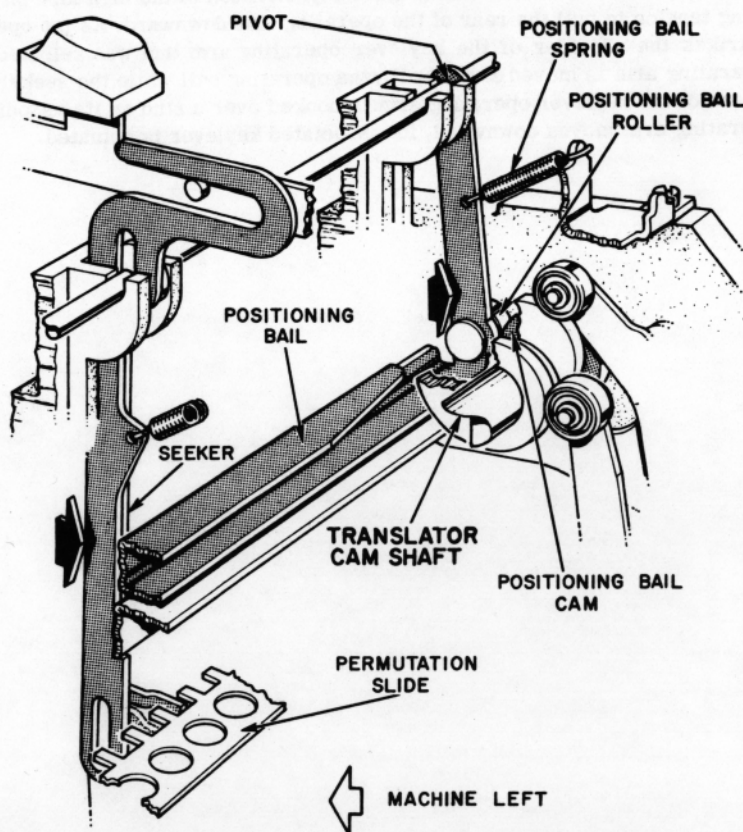


Figure 16.

Friden 2200/2300 SERIES MACHINES

At this time, the seekers are not in contact with the permutation slides. The seekers are held to the rear to allow the unlatched permutation slides to move to the left. The positioning bail holds the seekers away from the permutation slides. The positioning bail is supported by the same shaft on which the seekers pivot. The high lobes of the positioning bail cams prevent the positioning bail and seekers from moving forward at the beginning of the cycle. As the translator cam shaft rotates, the high lobes of the positioning bail cams rotate away from the positioning bail rollers. As the positioning bail cams rotate, the positioning bail spring pulls the positioning bail forward. The seekers follow the positioning bail forward until they are limited by the projections on the permutation slides.

Only one seeker, whose code structure corresponds to the permutation slides selected, moves completely forward under the edge of the operating bail. The seekers which are restricted by the permutation slides do not permit their keylever operating arms to move under the edge of the operating bail (Figure 16).

Continued rotation of the translator cam shaft causes the high lobe of the operating bail cams to rotate away from the rollers on the operating bail (Figure 17). Rotation of the high lobe on the operating bail cam allows spring tension to pull the rear of the operating bail downward. As the operating bail moves downward, it strikes the shoulder of the keylever operating arm that was selected to pivot forward. The keylever operating arm is moved downward by the operating bail while the seeker remains stationary. The upper end of the keylever operating arm is hooked over a stud on its associated keylever. As the keylever operating arm moves downward, its associated keylever is actuated.

Friden 2200/2300 SERIES MACHINES

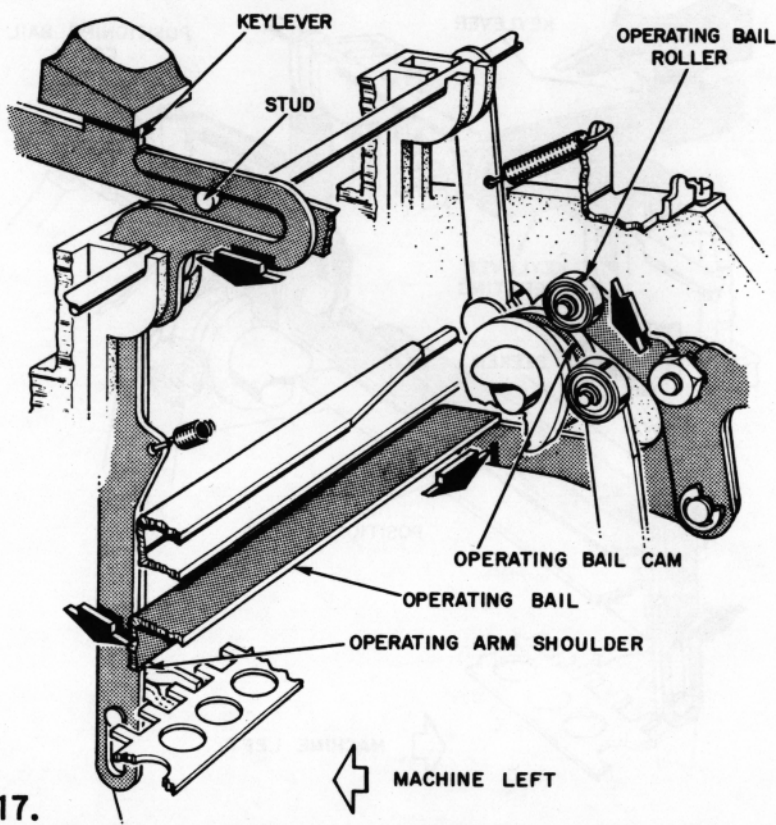


Figure 17.

At this time, the main function of the translator has been accomplished. The remainder of the cycle involves the restoring of the various parts.

As the translator cam shaft continues to rotate, the positioning bail cam moves the positioning bail to the rear (Figure 18). As the positioning bail moves to the rear it moves all the seekers to the rear, including the seeker previously selected. By moving the seeker just selected to the rear, it is moved from beneath the operating bail. The seeker and its keylever operating arm now move upward and release the associated keylever.

Further restoration of parts is accomplished by continued rotation of the translator cam shaft. At this point of rotation, the translator cam shaft causes the restoring bail cam to move the restoring lever forward (Figure 19). The forward movement of the restoring lever pivots the rear of the restoring bail to the right. As the restoring bail moves to the right, it pushes the unlatched permutation slides to the right. As mentioned previously, when the permutation slides were unlatched initially they contacted the restoring bail to prevent a bouncing action. When the permutation slides are moved to the right to home position, they must be latched by their respective magnet armatures.

Friden 2200/2300 SERIES MACHINES

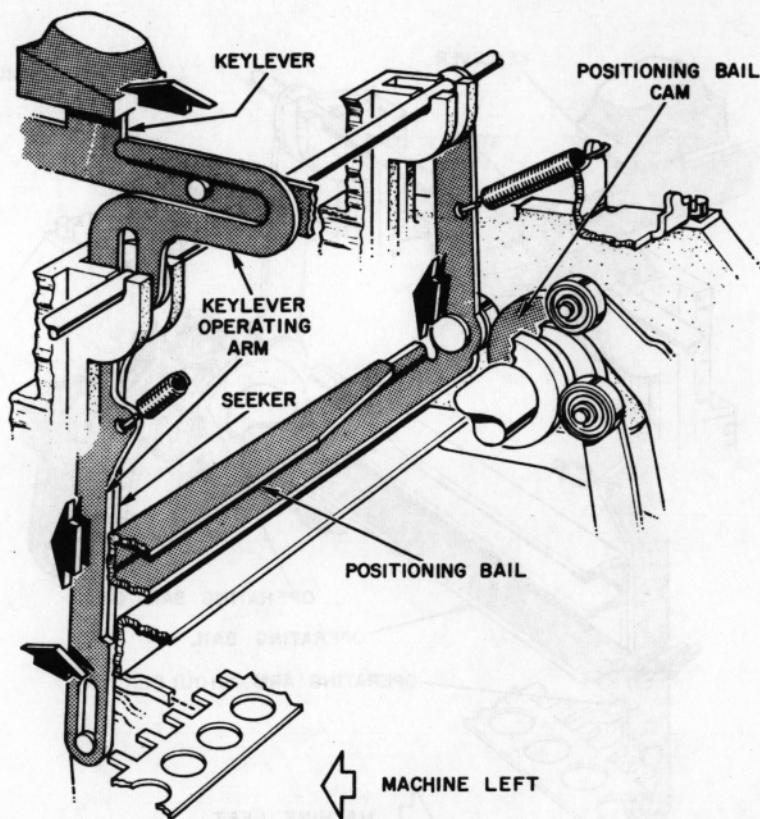


Figure 18.

The magnet armatures at this time must be moved to the rear to engage the latching projections on the permutation slides. The magnet armatures are still attracted to their respective magnet coils. Because of the speed of the machine and the residual magnetism in the coils, the armatures have not yet been released.

Friden 2200/2300 SERIES MACHINES

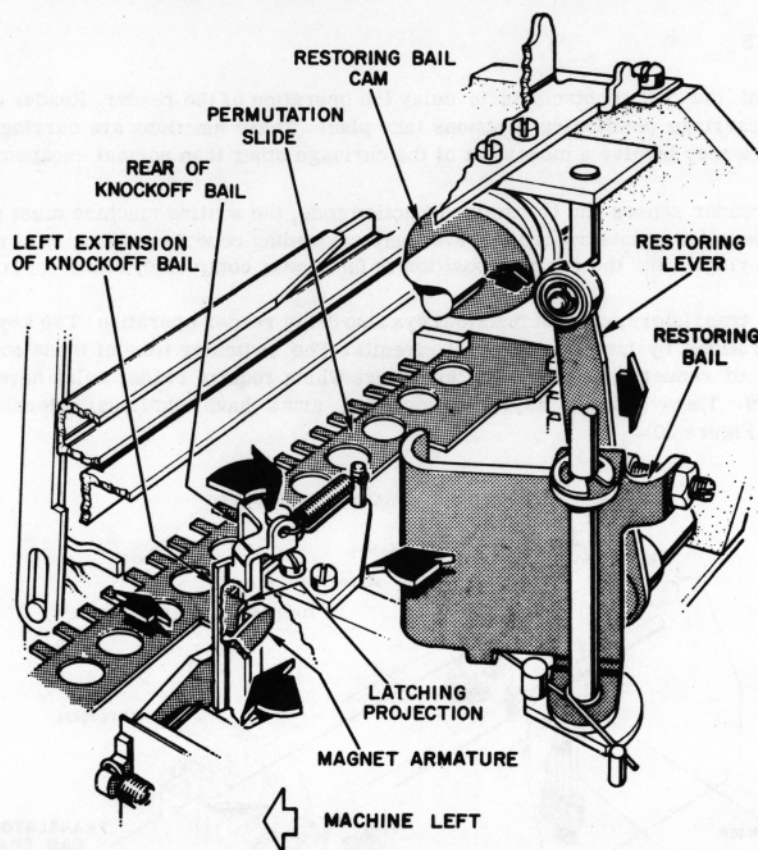


Figure 19.

As the permutation slides move to the right, their latching projections strike the rear parts of the knockoff bails. The rear parts of the knock off bails pivot to the right and their left extensions pivot to the rear. As the left extensions of the knock off bails pivot to the rear, they strike the magnet armatures. The magnet armatures are knocked away from their respective magnet coils and are positioned to engage the latching projections on the permutation slides.

When the magnet armatures have been moved from their respective magnet coils, the restoring bail returns slightly to the left. The permutation slides, which are being pushed by the restoring bail, also return slightly to the left until their latching projections are restricted by the magnet armatures.

Near the end of the translator cycle the operating bail is also restored upward. The operating bail is restored upward when the high lobes of the operating bail cams cause the operating arms to rise. When the operating arms rise, the operating bail pivots upward.

The operating bail is not fully restored at the end of a translator cycle. The operating bail restores fully during the start of the next cycle. In the fully restored position, the edge of the operating bail is just above the shoulder of the keylever operating arm. During the next cycle, the selected keylever operating arm can be positioned under the operating bail.

Friden 2200/2300 SERIES MACHINES

SDC CONTACTS

The function of the SDC contacts is to delay the operation of the reader. Reader operation must be delayed when carriage positioning functions take place. These functions are carriage return, tab, and backspace, since they involve a movement of the carriage other than normal escapement.

Whenever the reader senses and transmits a function code, the writing machine must perform the function. Reader operation is interrupted to prevent any succeeding code from being read while the carriage assembly is moving. After the carriage positioning function is completed, reader operation is resumed.

On 2200 series translators, certain function keys also delay reader operation. The keys initiate various automatic operations by means of control circuits. The switching time of these control circuits requires a delay of reader operation. The keylevers which require reader delay have special keylever operating arms. These special keylever operating arms have additional extensions which operate the delay bail (Figure 20).

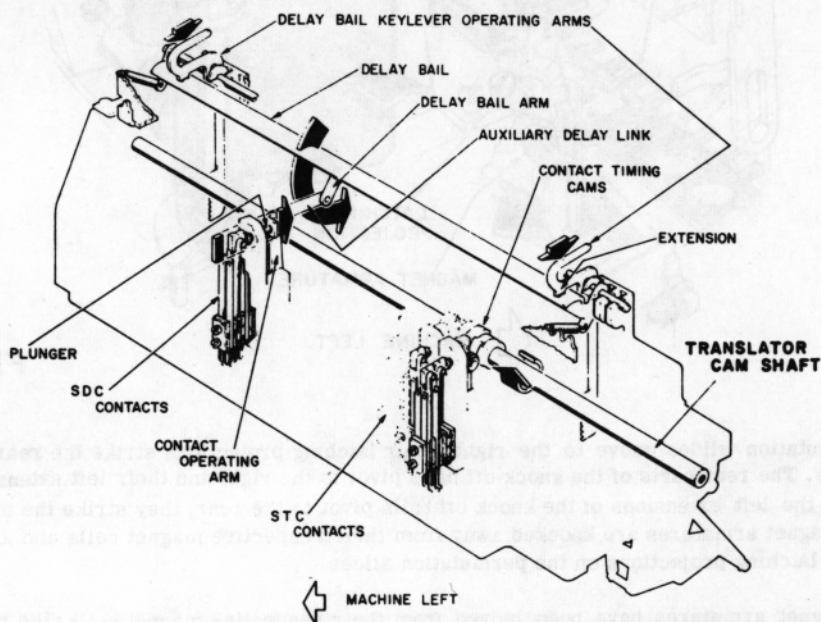


Figure 20.

The downward movement of the delay bail keylever operating arms actuate the delay bail. When actuated, the delay bail rotates down and to the rear. As the delay bail rotates, the delay bail arm moves to the rear. This movement of the delay bail arm pulls the auxiliary delay link and the contact operating arm to the rear. The contact operating arm, when pulled to the rear, pulls the moveable contact spring to the rear. The movement of the moveable contact spring transfers the SDC contacts. The circuit between the front contact spring and the moveable contact spring is momentarily opened. The moveable contact spring, when moved to the rear, makes contact with the rear contact spring.

Friden 2200/2300 SERIES MACHINES

This circuit transfer from the front contact spring to the rear contact spring initiates the reader delay operation. As soon as the keylever operating arm restores, the delay mechanism and SDC contacts also restore. The reader delay is effective until the carriage assembly is fully positioned, although the delay mechanism and contacts may be restored. Since the SDC contacts only initiate the delay operation, the actual delay time is sustained until the special control circuits have timed out.

Friden 2200/2300 SERIES MACHINES

STC CONTACTS

The function of the STC contacts is to synchronize the operation of the translator and various data input devices. The STC contacts are operated by contact timing cams on the translator cam shaft (Figure 20).

The high lobes of the contact timing cams push the contact levers and contact plungers forward. When the contact levers and plungers are moved forward, the moveable contact springs also move forward. When the contact timing cams rotate to the low dwell of the cams, the moveable contact springs then return to the rear. The number of contact stackups vary depending on the particular machine model. The maximum number of stackups is four, and are numbered from right to left beginning with STC-1.

The contact timing cams are attached to the translator cam shaft in a specific rotational position. The high lobes of the cams operate the STC contacts at a specific time during each cycle. The duration of contact operation depends on the design of the contact timing cam. The cams are designed to keep the contacts operated for a specific amount of translator cam shaft rotation.

Friden 2200/2300 SERIES MACHINES

THE CODE SELECTOR

The code selector converts the mechanical actions of the cam assemblies into coded electrical impulses. These impulses are transmitted to the punch and as a result, appropriate code holes are punched in a tape or in edge cards.

There are 51 selector slides in the 2300 series code selector. Twenty-six of the slides are operated toward the front of the machine. These slides are operated by the cam assemblies located at the front of the power roll. The remaining twenty-five slides operate toward the rear of the machine. These slides are operated by the cam assemblies located behind the power roll. The slides are connected to the contact bails by means of contact bail operators. (In the 2200 series code selector there are 65 selector slides arranged in two groups. Thirty-three of the selector slides are operated toward the front of the code selector; the remaining 32 selector slides are operated toward the rear.) The slides are connected to the contact bails by means of contact bail operators.

There are two colors of contact bail operators used in the code selector - black operators and green operators. The standard black operators are used for all the contact that are operated by low rise cam assemblies. The green operators are used for all the contacts that are operated by high rise, single lobe cams. The high rise, single lobe cams are used to decrease the closure time of the contacts used during the following operations:

1. Carriage return.
2. Tabulation.
3. Back space.

The number of and the placement of operators on a selector slide determine which contacts will be operated.

Friden 2200/2300 SERIES MACHINES

2300 SERIES MACHINES

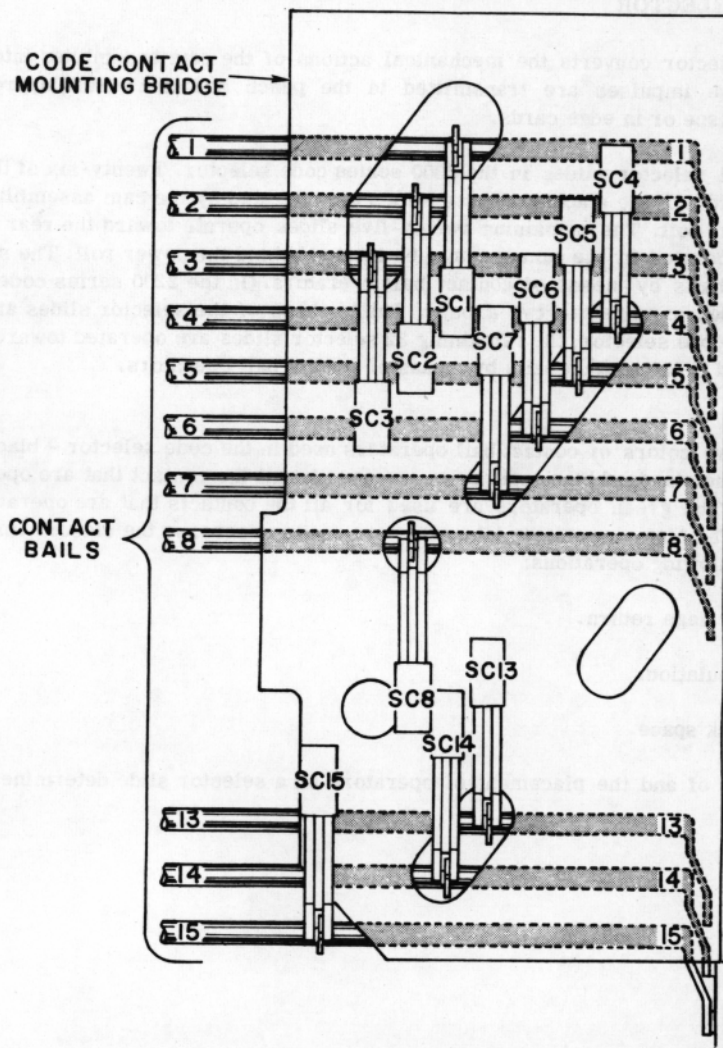


Figure 1.

There are 14 standard contact positions on the 2300 series code selector bridge (Figure 1). These positions include both the selector code contacts and the selector common contacts. The selector code contacts are SC1 through SC8 and auxiliary code contacts SC9 through SC11. Selector code contacts SC1 through SC8 correspond with their respective code channels in a tape or in an edge card. The auxiliary code contacts SC9 through SC11 (not shown) are used for functions ON1, ON2, and OFF.

The selector common contacts are used to signal the presence of a code in the code selector. Because the selector common contacts close after the selector code contacts, they insure the relay of a complete code to the punch.

Friden 2200/2300 SERIES MACHINES

2200 SERIES MACHINES

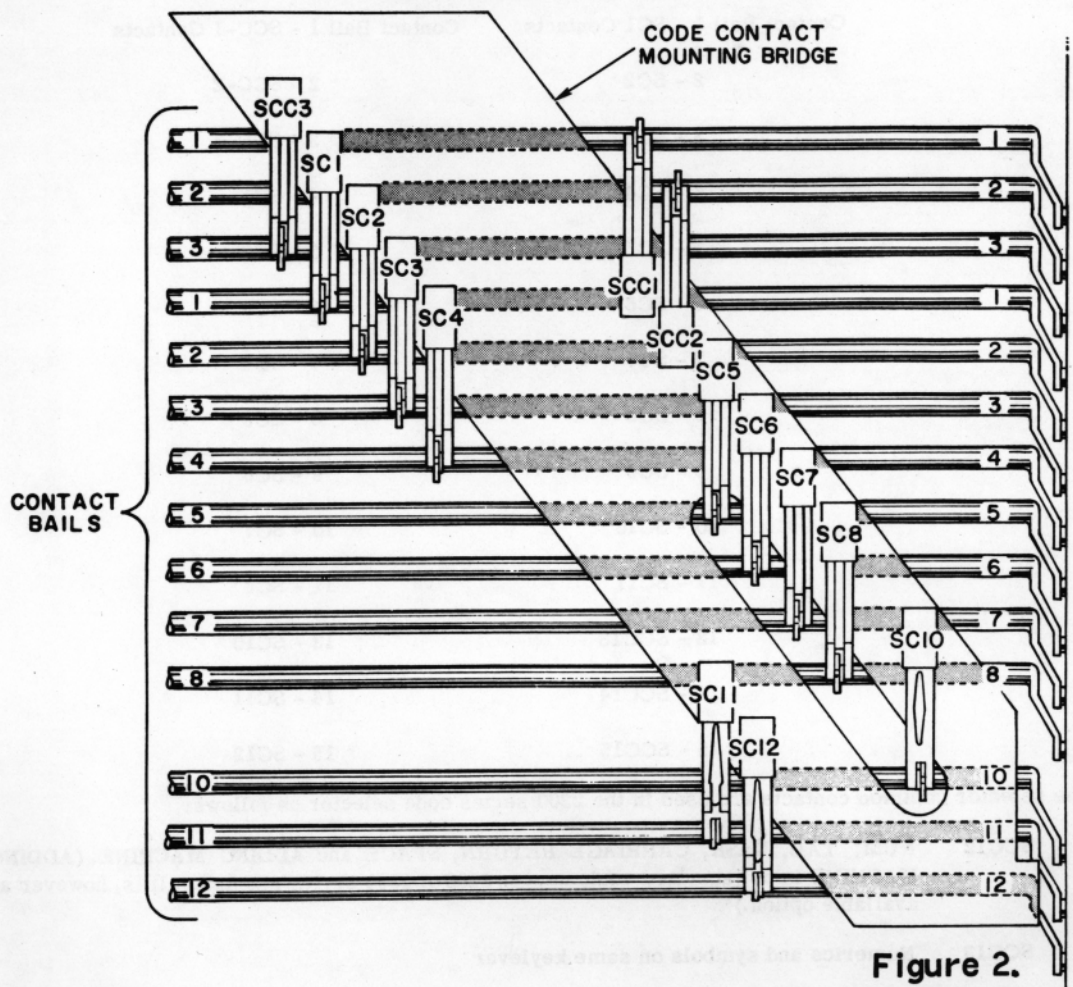


Figure 2.

There are fifteen possible contact bail positions in the code selector. The bails on the code selector for the 2300 series machines are numbered from 1 to 15 starting at the rear. The 2200 series machines are different (Figure 2). A table showing the difference in the arrangement of contact bails in the two models is shown on the following page:

Friden 2200/2300 SERIES MACHINES

2300 Series Machines

Contact Bail 1 - SC1 Contacts

2 - SC2
3 - SC3
4 - SC4
5 - SC5
6 - SC6
7 - SC7
8 - SC8
9 - SC9
10 - SC10
11 - SC11
13 - SCC13
14 - SCC14
15 - SCC15

2200 Series Machines

Contact Bail 1 - SCC-1 Contacts

2 - SCC-2
3 - SCC-3
4 - SC1
5 - SC2
6 - SC3
7 - SC4
8 - SC5
9 - SC6
10 - SC7
11 - SC8
13 - SC10
14 - SC11
15 - SC12

The selector common contacts are used in the 2300 series code selector as follows:

- SCC12 NUM, TAB, DASH, CARRIAGE RETURN, SPACE and ADDING MACHINE. (ADDING MACHINE is not standard equipment on 2200 or 2300 series machines. It is, however an available option.)
- SCC13 Numerics and symbols on same keylever
- SCC14 Punch control codes.
- SCC15 Alpha and certain symbols.

The common contacts for the 2200 series machine are as follows:

- SCC1 ALPHA, COMMA and PERIOD
- SCC2 AUX KEYBOARD, NUM, UPPER CASE, LOWER CASE, SPACE, BACK SPACE, TAB and symbols except COMMA and PERIOD.
- SCC3 NUMERICS and symbols except COMMA.

Friden 2200/2300 SERIES MACHINES

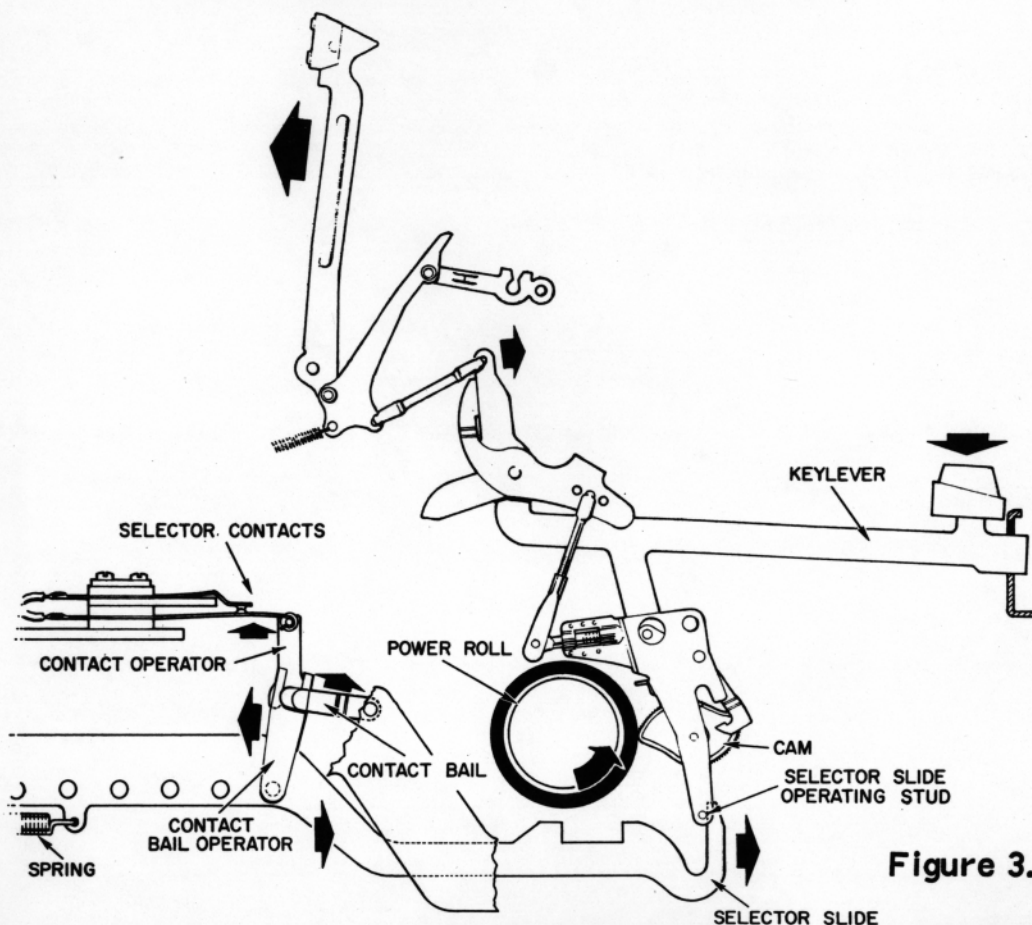


Figure 3.

As a keylever is activated, its associated cam is released against the power roll (Figure 3). The cam assembly then pivots away from the power roll. The movement of the cam assembly causes the selector slide operating stud on the bottom of the cam assembly to limit against the end of the selector slide. As the cam moves toward the high dwell, the selector slide operating stud forces the selector slide forward. As the selector slide moves forward, it causes those contact bails to rise that are necessary for the code structure of the particular keylever. The contact bails are connected to the slides by means of the contact operators.

If the keylever depressed was the "A" keylever, then the 1, 6, 7, and 15 contact bails would be raised. The code structure for an "A" is channels 1, 6, and 7 accompanied by selector common contacts SCC15.

As the cam passes the high dwell, the cam assembly restores. This allows the selector slide to restore under spring tension. As the slide restores, the contact bails lower and open the code circuits to the punch.



Figure 3.

As a selector is activated, its associated cam is released against the power roll (Figure 3). The cam assembly then pivots away from the power roll. The movement of the cam assembly causes the selector switch operating lever to pivot on the power roll. As the cam moves toward the right, the selector switch operating lever pivots toward the right. As the selector switch moves toward the right, it causes the selector switch to pivot on the power roll. The contact roll is connected to the selector switch by means of the contact operator.

If the selector depressed was the "A" selector, then the 1, 2, 3, and 4 contact rolls would be raised. The code electric for an "A" selector is 1, 2, 3, and 4 accompanied by selector contact contacts 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

As the cam passes the high dwell, the cam rest spring releases. The selector switch slide is released under spring tension. As the slide releases, the contact roll pivots and the code electric is the power.

Friden 2200/2300 SERIES MACHINES

THE PUNCH

The punch is a magnetically controlled perforating mechanism. It converts pulses received from the code selector into punched code holes in tape or in edge cards. The electrical signals energized punch magnets necessary for punching the code holes.

The punch magnets control the operation of the punch pins which perforate the tape or edge card. The punch operates when rotation of punch cams drives the punch pins through the tape. The punch cams rotate when mechanical energy from the motor in the writing machine reaches the punch power shaft. Mechanical power is delivered to the power shaft by means of the punch drive belt, the punch pulley and the punch clutch.

The constant rotation of the punch clutch pulley is transmitted to the punch power shaft only when the punch clutch is in its operated condition. The clutch, then, controls the rotation of the power shaft and therefore controls punch operation.

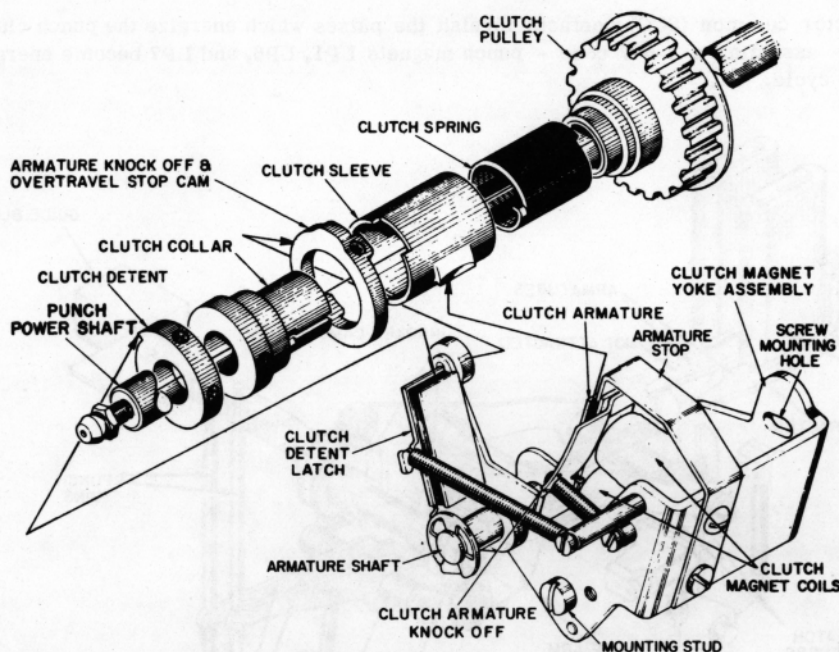


Figure 1.

The punch clutch mechanism (Figure 1) includes the clutch detent, clutch collar, clutch spring, knock off and overtravel cam, clutch sleeve and punch clutch pulley. The punch is in operation when the clutch spring grips the hub of the constantly rotating clutch pulley hub. When the clutch is in its unoperated condition, the clutch spring is held expanded to a diameter which exceeds the diameter of the clutch pulley hub. The spring is held expanded by the interaction of the clutch sleeve and the clutch detent.

Friden 2200/2300 SERIES MACHINES

Expansion of the spring is maintained by preventing rotation of the clutch spring which would tend to restore the spring to normal. The engagement of the clutch detent and the clutch detent latch keeps one end of the spring from rotating. The other end of the spring is kept from rotating by the engagement of the clutch armature with the external projection on the clutch sleeve.

When the clutch armature and the external sleeve projection disengage, the clutch sleeve is permitted to rotate. Rotation of the clutch sleeve allows the clutch spring to restore to its normal, unexpanded diameter. When the clutch spring is restored to normal, it grips the hub of the clutch pulley and transmits the rotation of the clutch pulley to the punch power shaft. The punch operates.

The disengagement of the clutch armature from the clutch sleeve causes the punch to cycle. The clutch armature becomes disengaged from the external projection on the clutch sleeve when the punch clutch (LPC) magnet becomes energized. When the LPC becomes energized, it sets up a magnetic field which attracts the clutch armature out of engagement with the external clutch sleeve projection. The clutch spring connects the clutch pulley hub to the power shaft initiating a punch cycle. A detailed description of the clutch appears in the General Section on pp

The code selector common (SCC) contacts furnish the pulses which energize the punch clutch (LPC) magnets and - assuming a 1-6-7 code - punch magnets LP1, LP6, and LP7 become energized. The punch begins to cycle.

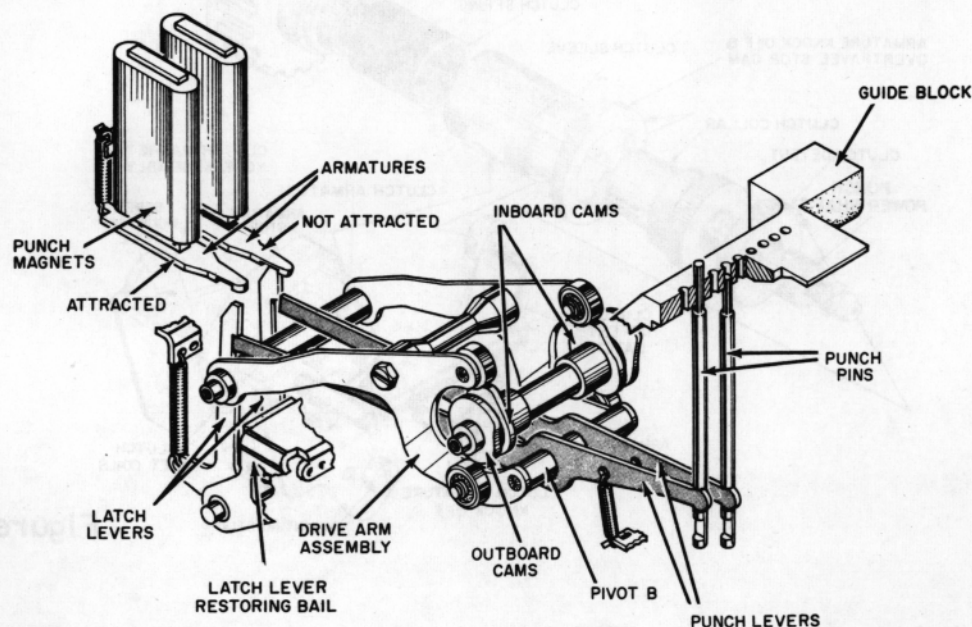


Figure 2.

Friden 2200/2300 SERIES MACHINES

The energizing of the punch clutch (LPC) magnets and the punch (LP) magnets are the events which start the punching mechanism. The sole function of the punching mechanism is to punch coded holes in a tape or in an edge card. The coding of the tape or of the edge card depends upon which punch magnets have been energized. The punching of the tape or of the edge card occurs when the punch pins (Figure 2) move upward through the guide block, through the tape or the edge card, and into the die block.

The force which motivates the punch pin is applied by the punch lever, the front end of which connects to the base of the punch pin. When the front end of the punch lever rises, the punch pin must also rise.

The punch levers are mounted between the drive arms of the drive arm assembly. They are pivot-mounted on a shaft (designated "Pivot B") which connects the front ends of the drive arms. Movement of the drive arms causes a corresponding movement of the punch levers at pivot B.

Movement of the drive arms is by cam action. There are two sets of punch cams mounted on the punch power shaft. Each set is comprised of an inboard cam and an outboard cam. The inboard cams cause an upward movement of the drive arms; the outboard cams cause a downward movement.

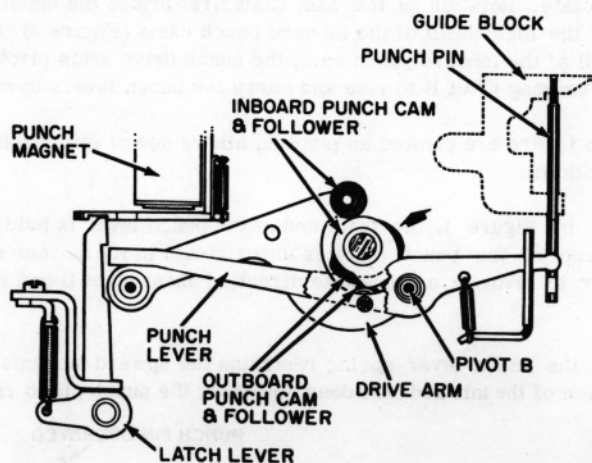


Figure 3.

In home position (Figure 3), the punch is at rest. Power has not been transmitted from the clutch pulley to the punch power shaft. The inboard rollers of the punch drive arms are on the low dwell of the inboard cams.

Friden 2200/2300 SERIES MACHINES

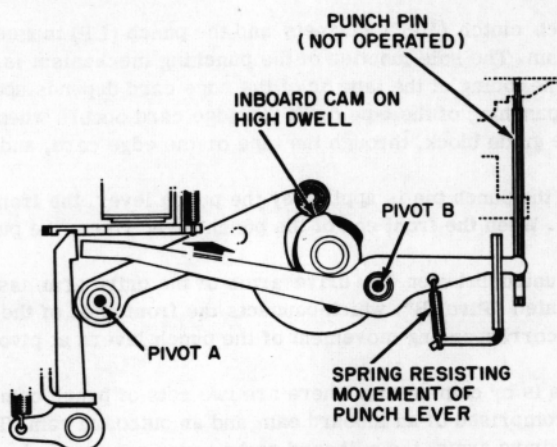


Figure 4.

When the punch clutch (LPC) magnet becomes energized, mechanical power is applied to the power shaft, causing it to rotate. Rotation of the cam shaft first brings the upper (inboard) rollers of the punch drive arms onto the high dwell of the inboard punch cams (Figure 4). As these inboard rollers move onto the high dwell of the inboard punch cam, the punch drive arms pivot on their mounting shaft (designated "Pivot A"), causing pivot B to rise and carry the punch levers upward.

The fact that the punch levers are pivoted as pivot B, allows one of two possible actions to take place when pivot B rises as follows:

1. When, as is shown in Figure 4, the front end of the punch lever is held down by the punch lever spring and the rear end of the punch lever is unrestricted in its movement, the raising of pivot B causes the punch lever to pivot in a clockwise direction about pivot B and the rear end of the punch lever to rise.

Under these conditions the punch lever spring restrains the upward movement of the front end of the punch lever and the action of the inboard cam does not cause the punch pin to rise. No punching occurs.

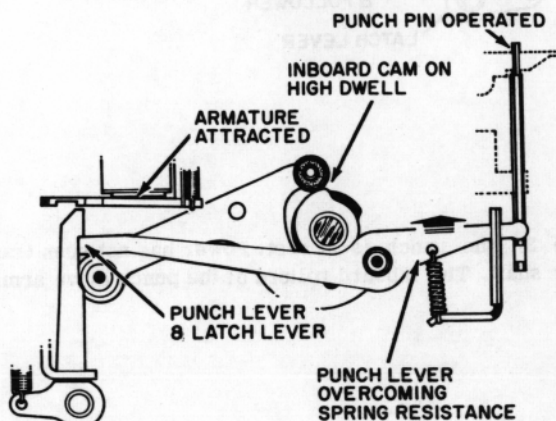


Figure 5.

Friden 2200/2300 SERIES MACHINES

2. When, as is shown in Figure 5, the rear end of the punch lever is held down by the latch lever, the raising of pivot B causes the punch lever to pivot in a counterclockwise direction about pivot B. The punch lever spring stretches, the front end of the punch lever rises; the punch pin is forced up through the guide block, through the tape, and into the die block. A code hole is punched in the tape.

It is evident from the preceding discussion that whether or not a punch pin is operated during the punch cycle depends on whether or not the punch lever associated with the pin has been engaged by its latch lever. The latch lever springs are under constant tension. The tension of the latch lever spring applies a torque which tends to pivot the upper end of the latch lever forward and into engagement with the punch lever. Torsion is prevented by the engagement of the latch lever with the punch magnet armature (Figure 3 and Figure 4). When the punch (LP) magnet is in a de-energized condition, the tip of the latch lever fits into a slot in the armature and so is prevented from moving forward.

When a punch (LP) magnet becomes energized, the punch magnet armature is attracted to the magnet core and moves out of engagement with the latch lever. The tension of the latch lever spring causes the upper end of the latch lever to pivot forward and engage the rear end of the punch lever. When motion of the rear end of the punch lever thus is prevented by the latch lever, the inboard cams' raising of the punch lever at pivot B causes the punch lever to pivot in a counterclockwise direction. This raises the front end of the punch lever and forces the punch pin upward through the tape.

During any punch cycle, then, only those punch levers associated with energized punch magnets will cause their punch pins to operate. For example, when LP's 1, 6, 7 and LPC are energized, latch levers 1, 6 and 7 are released to engage the punch levers. When the punch power shaft cycles and the punch drive arms move pivot B upward, punch levers 1, 6 and 7 pivot in a counterclockwise direction and drive their punch pins through the tape. Because latch levers 2, 3, 4, 5 and 8 are not released and therefore do not engage the punch levers, punch levers 2, 3, 4, 5 and 8 pivot in a clockwise direction, and punch pins 2, 3, 4, 5 and 8 remain motionless. A 1-6-7 code is punched into the tape.

After punching has occurred, the power shaft continues to rotate. The upper rollers on the drive arms return to the low dwell of the inboard punch cams (Figure 3), and the lower (outboard) rollers move onto the high dwell of the outboard cams. As the lower rollers move onto the high dwell of the outboard cams, pivot B between the drive arms moves downward. When pivot B moves downward, those punch levers which are engaged with their latch levers pivot in a clockwise direction, and the punch pins are retracted to their non-operated position in the guide block.

Friden 2200/2300 SERIES MACHINES

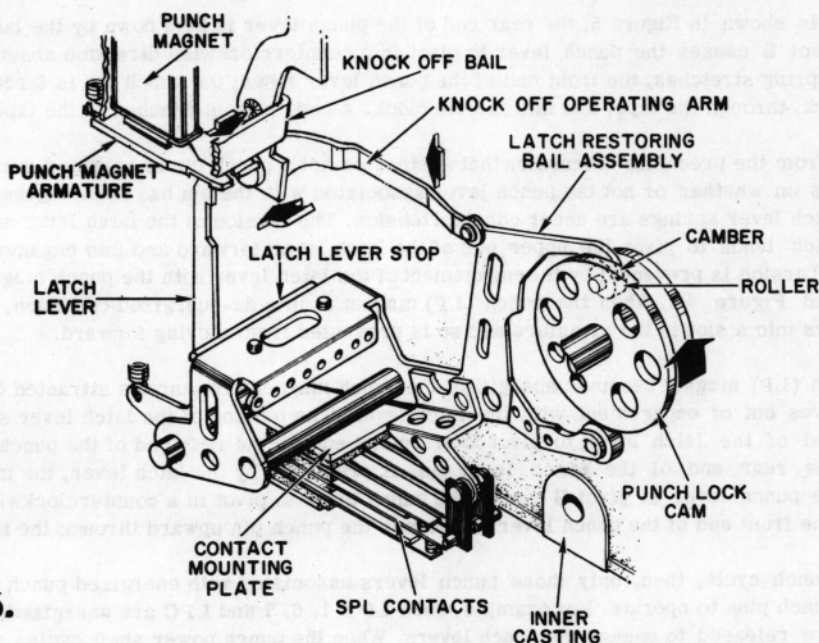


Figure 6.

As the drive arm assembly is moved downward, the latch levers are restored to a latched position with the punch magnet armatures (Figure 6). The latch levers are restored when the roller between the punch lock cam and the feed cam pivots the restore bail by contracting the camber on the restore lever. The roller moving to the high point of the camber pivots the latch lever restore bail in a counter-clockwise direction. The latch lever stop on the restore bail makes contact with the latch levers and forces them back under the slots in the punch magnet armatures.

At the same time that the latch levers are restored to engagement with the magnet armatures, the movement of the latch lever restore bail causes the knock off operating arm to pivot the knock off bail against the upper surfaces of the armatures.

It is possible for an armature to become temporarily magnetized and remain attracted to the core after the punch magnet is de-energized. In order to safeguard against this condition's interfering with the proper operation of the punch, the action of the knock off bail insures that all of the armatures are returned to their correct non-operated positions. Note that because the knock off operating arm is activated by the latch lever restore bail, the two operations occur in a synchronized movement.

Each time the punch cycles, the latch levers pivot past the armature latching surfaces and the armature knock off bail pivots to restore any "stuck" armatures. When the armatures are attracted, they contact the channel in the magnet yoke assembly and do not actually touch the armature cores.

Friden 2200/2300 SERIES MACHINES

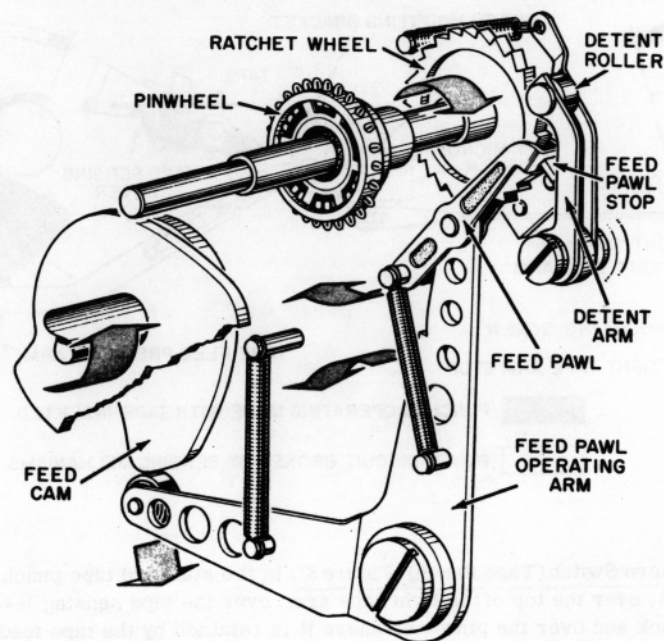


Figure 7.

The punch pins move below the surface of the guide block and out of engagement with the tape. The tape feed arm (Figure 7), due to the rotation of the feed cam, pivots. This moves the feed pawl into the ratchet wheel. A tooth is engaged and, by the time the feed cam has rotated to its high point, the ratchet wheel and the pinwheel and the rear (the front pinwheels in the tape/edge card punch) are indexed 15 degrees. The position of the feed pawl stop determines how far the feed pawl is allowed to index the ratchet wheel. The front and the rear pinwheels on the tape/edge card punch rotate simultaneously by means of the front and rear pinwheel gears. These gears are in mesh with an idler gear assembly mounted on the outer end of the punch power shaft.

As the feed cam continues to rotate, the feed pawl operating arm restores. When the feed pawl operating arm restores, it moves the feed pawl out of engagement with the ratchet wheel. The detent roller on the detent arm holds the ratchet wheel in its detented position. The detent arm spring keeps the detent roller in contact with the ratchet wheel and thereby stabilizes the operation of the tape feed mechanism.

Friden 2200/2300 SERIES MACHINES

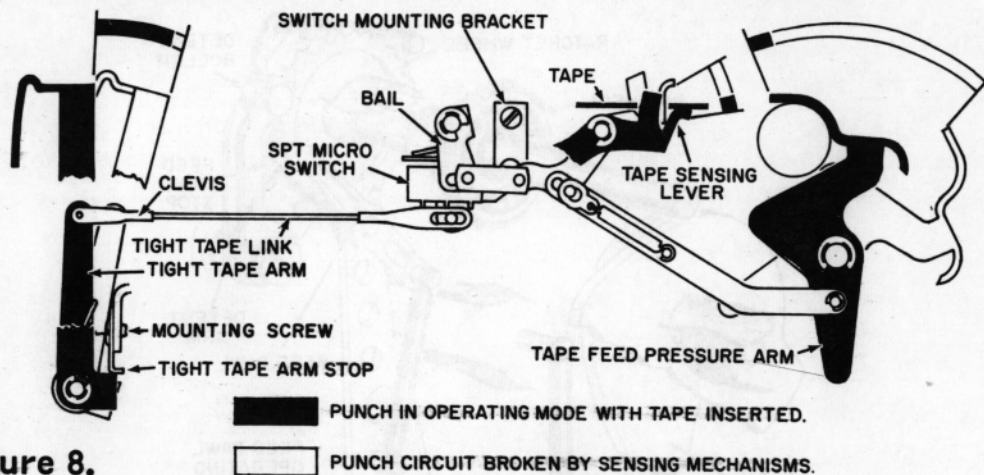


Figure 8.

Tight Tape (SPT) Micro Switch (Tape Punch) (Figure 8). In the standard tape punch, the tape is fed from the tape supply drum, over the top of the tight tape arm, over the tape sensing lever, between the guide block and the die block and over the pinwheel where it is retained by the tape feed pressure arm.

Tape must be installed over the tape sensing lever. The tape feed pressure arm must be closed and the tape must not have enough tension to operate the tight tape arm. If these conditions are not met while the punch is on, the SPT micro switch will be operated, breaking the punching circuit.

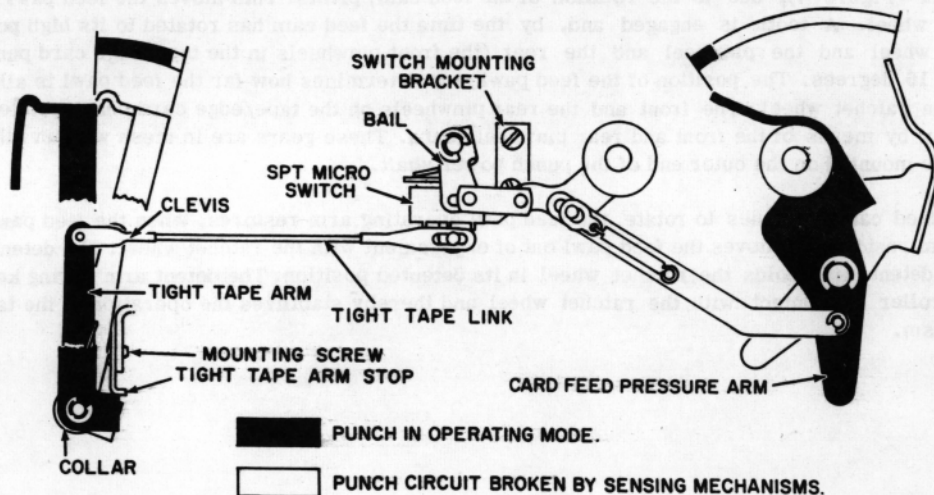


Figure 9.

Friden 2200/2300 SERIES MACHINES

Tight Tape (SPT) Micro Switch (Tape/Edge Card Punch) (Figure 9). In the tape/edge card punch the tape is fed from the tape supply drum, over the top of the tight tape arm, through the inner and outer tape guides on the card guide assembly, between the guide block and the die block and over the front pinwheel where it is retained by the tape feed pressure arm. The tape feed pressure arm must be closed and the tape must not have enough tension to operate the tight tape arm. If these conditions are not met while the punch is on, the SPT micro switch will be operated, breaking the punching circuit.

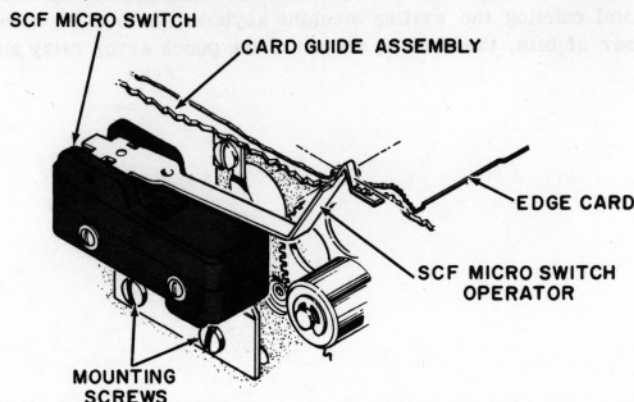


Figure 10.

Card Feed (SCF) Micro Switch (Tape/Edge Card Punch) (Figure 10). In the tape/edge card punch, the edge cards are fed from a supply box, between the upper and lower levels of the card guide assembly, under the card hold down spring and over the front pinwheel. The pre-perforated feed holes in the edge cards are retained over the pins of the rear pinwheel by the card hold down spring. The feed holes are retained over the pins of the front pinwheel by the tape feed pressure arm. If the tape feed pressure arm is not closed, the SPT micro switch will be operated, breaking the punching circuit.

When the Tape Feed keybutton on the writing machine is depressed, the initial edge card advances until the SCF micro switch operator protrudes through the 1/4 inch pre-perforated hole in the second edge card. This causes the SCF micro switch to restore, simultaneously positioning the second edge card in the punching station in preparation for the first group of code holes. Subsequent edge cards are positioned in the punching station each time their 1/4 inch holes pass over the SCF micro switch operator.

Punch Lock (SPL 1 and SPL 2) Contacts (Figure 6). The punch lock (SPL1 and SPL2) contacts insure that the punching cycles are separate, individually correct and complete. They are operated by the latch restoring bail which is, in turn, operated by the punch lock cam. During a punching cycle the SPL contacts, when in the closed position, complete the circuit to the punch clutch and the code magnets. Once a signal has been received by the punch and the punch cycles, the SPL contacts operate and break the punching circuit.

When the SPL's open, they break the circuit to the punch clutch and the code magnets. None of the code magnets can be re-energized during that part of the cycle in which the contacts are open, hence the term "Punch Lock". After the punch lock contacts have resumed the closed positions, the code magnets again can be energized during the latter part of the cycle. This allows the punch to cycle again immediately.

Parity Check. The parity check is an electromechanical device incorporated to safeguard against inaccuracies in the punching operation. The parity check used in the 2200 and 2300 series Flexowriters

Friden 2200/2300 SERIES MACHINES

is for "odd parity" because the coding system is composed of odd codes.

The parity code check assembly is mounted in the punch so that its operators engage the punch pins. When the punch pins move up to punch a code, the corresponding contacts in the parity check assembly transfer; either completing or not completing a circuit to the KPE (K3) punch error relay. If an even code is punched, a circuit is completed to the punch error relay, the relay is energized, breaking the circuit to the punch and causing the writing machine keyboard to lock. If, however, the code punched contains an odd number of bits, there is no circuit to the punch error relay and the code is assumed to be correct.