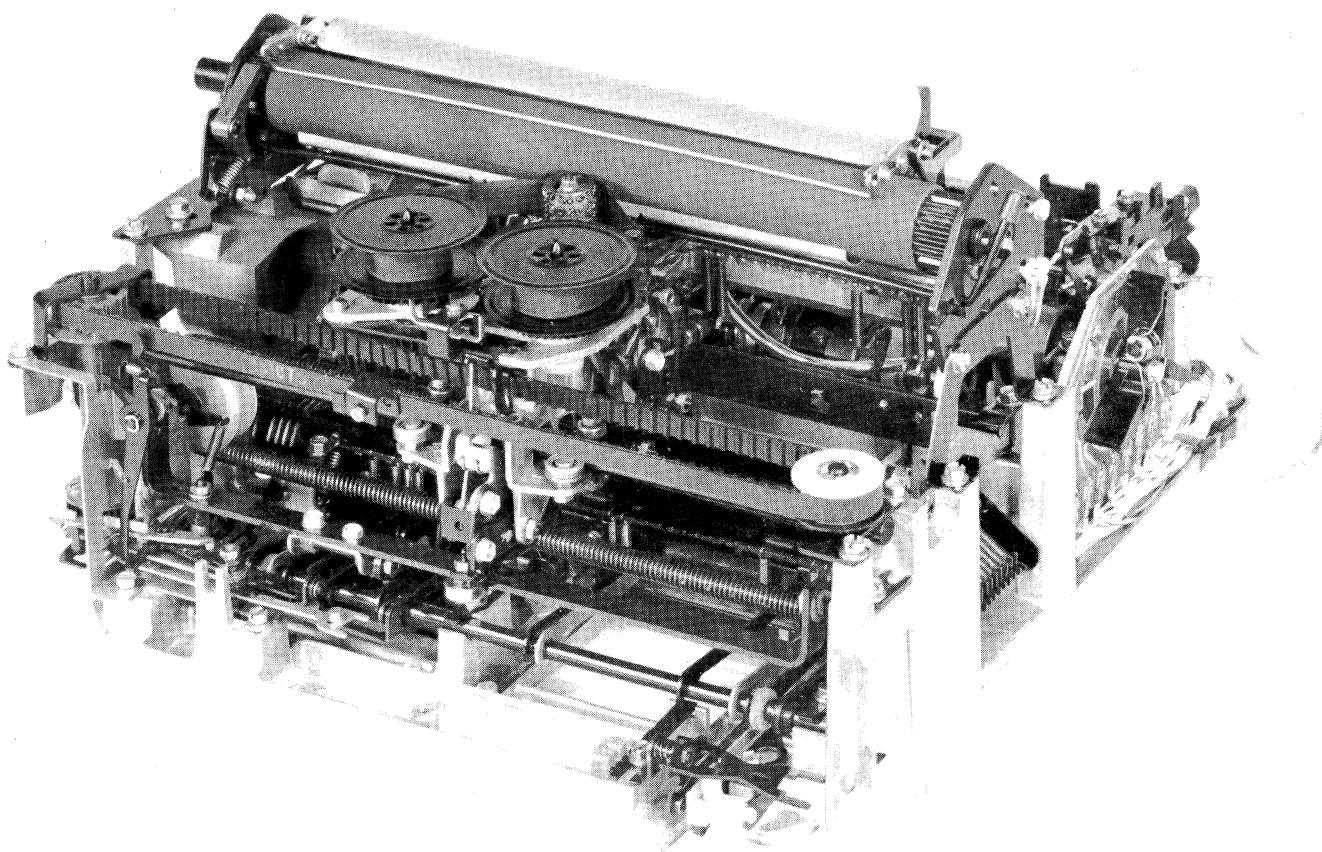


## 33 TYPING UNIT

### GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS	PAGE	1. GENERAL
1. GENERAL .....	1	1.01 This section provides a general description and the principles of operation for the 33 typing unit. It is reissued to make a few minor corrections, to add a description of the automatic carriage return-line feed for sprocket feed typing units, and to add description of two print nonprint mechanisms. Marginal arrows indicate the changes and additions.
2. DESCRIPTION.....	1	1.02 References to left, right, front, or rear consider the typing unit as viewed by the operator.
TECHNICAL DATA.....	1	1.03 In the illustrations fixed pivots are solid black, and floating pivots — those mounted on parts that move, are crosshatched.
3. TELETYPEWRITER SIGNALING CODE.....	3	1.04 The 33 typing unit is an electromechanical receiving device which prints graphics on a paper copy according to a code, and performs nonprinting functions.
4. PRINCIPLES OF OPERATION .....	3	2. DESCRIPTION
OUTLINE OF OPERATION.....	3	TECHNICAL DATA
DETAILED OPERATION .....	8	<p>Note: This equipment is intended to be operated in a room environment within the temperature range of 40°F to 110°F. Serious damage to it could result if this range is exceeded. In this connection, particular caution should be exercised in using acoustical or other enclosures.</p>
A. Motor.....	8	2.01 Speed ..... 100 words per minute
B. Main Shaft.....	8	2.02 Dimensions and Weight (Approximate)
C. Clutches.....	8	Width ..... 13 inches
D. Signal Reception.....	9	Depth ..... 14 inches
E. Distributor Mechanism .....	9	Height ..... 8 inches
F. Selector Mechanism .....	11	Weight ..... 40 pounds
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(Right Front View)

Figure 1 - 33 Typing Unit

#### 2.03 Signal Code Characteristics

8-Level  
11-Unit Transmission Pattern

#### 2.04 Electrical

Power requirements . . . 115 volts ac  $\pm 10\%$   
60 Hz  $\pm 0.45$  Hz, single phase  
Signal line current . . 0.020 or 0.060 ampere  
Nominal input to selector . . . 0.500 ampere  
at 20 volts dc

Operating margins — all signal contacts  
and distributor:

Long telegraph loops . . . 0.015 to 0.070  
ampere at 48 to 240 volts dc  
inductive

Short telegraph loops . . . . 0.58 to 0.72  
ampere at 16 to 22 volts dc  
resistive

#### 2.05 Printing and Paper or Form Handling

##### Feed

Friction or Sprocket: Six lines per inch,  
adjustable for single  
or double line feed

##### Paper or Form

Friction Feed: 8-1/2 inches wide, max  
5-inch diameter roll.

Sprocket Feed: 8-1/2 inches wide; 7-,  
8-1/2-, 9-, 10-, 11-, and  
12-inch form lengths  
or multiples of 1/3 or  
1/2 thereof.

##### Characters and Line

Friction Feed: 10 character per inch,  
max 74 character line

Sprocket Feed: 10 characters per inch,  
max 72 characters line

**Legible Copies**

**Friction Feed:** Original and one copy; when pressure sensitive paper is used, one original and two copies

**Sprocket Feed:** Original and two copies

**2.06 Motor TP181870**

Type ..... Synchronous, capacitor start  
 Input ..... 115 v ac  $\pm 10\%$ , 60 Hz,  
                          single phase  
 Input Current ..... 2 amperes  
 Output ..... 33 millihorsepower  
 Speed ..... 3600 rpm  
 Temperature Rating ..... 130°C  
 Power Factor ..... 40%

**2.07 Motor TP182241**

Type ..... Synchronous, capacitor start and run  
 Input ..... 115 v ac  $\pm 10\%$ , 60 Hz,  
                          single phase  
 Input Current ..... 1.6 ampere  
 Output ..... 33 millihorsepower  
 Speed ..... 3600 rpm  
 Temperature Rating ..... 130°C  
 Power Factor ..... 40%

**2.08 Motor TP182267**

Type ..... Synchronous, capacitor start and run  
 Input ..... 115 v ac  $\pm 10\%$ , 50 Hz,  
                          single phase  
 Input Current ..... 1.7 ampere  
 Output ..... 35 millihorsepower  
 Speed ..... 3000 rpm  
 Temperature Rating ..... 130°C  
 Power Factor ..... 40%

**3. TELETYPEWRITER SIGNALING CODE**

**3.01** The 33 Teletypewriter transmits and receives messages in the form of a start-stop signaling code. In this code each character or function is represented by current and no current time intervals. Current flowing in the signal line is referred to as marking; no current flowing in the signal line is referred to as spacing.

**3.02** To represent a character or a function eleven pulses are used. The first pulse, which is always spacing, is the start pulse.

The next eight pulses are the intelligence pulses. The tenth and eleventh pulses, which are always marking, are the stop pulses. The start and stop pulses are used to synchronize sending and receiving equipment.

**3.03** The code used by the 33 typing unit is known as ASCII (American National Standard Code for Information Interchange) and is illustrated in Figure 2. Since it has eight intelligence pulses and three synchronizing pulses it is an 8-level code with an 11-unit transmission pattern.

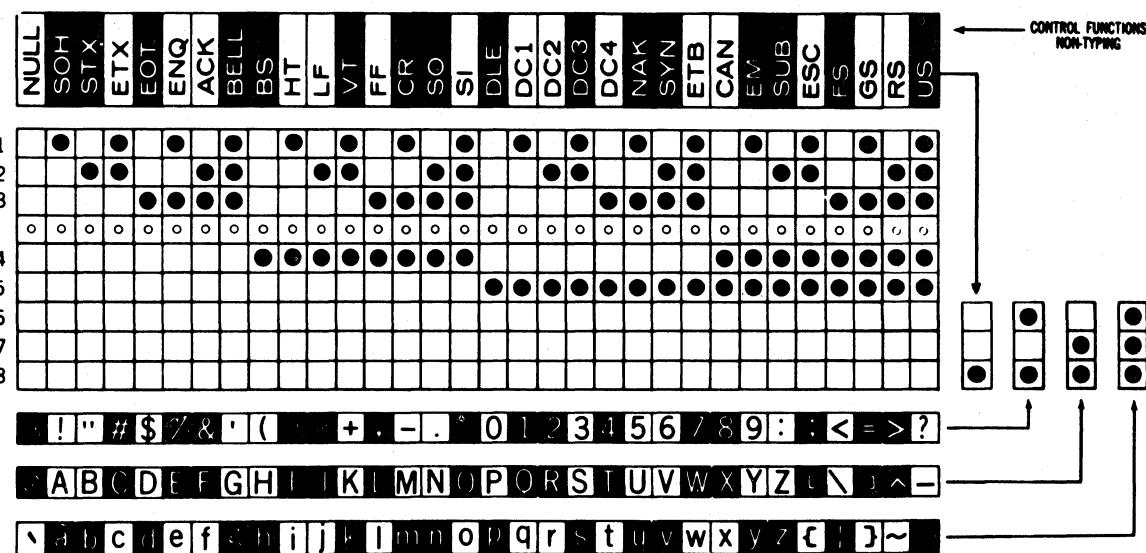
Start pulse	1 unit of time
Intelligence pulses	8 units of time
Stop pulses	2 units of time
	11-unit code

**3.04** The ASCII utilizes only the first seven intelligence pulses, the eighth being used to provide an error detection feature called "even parity." When "even parity" is not provided, the eighth intelligence pulse is always transmitted as a marking pulse. With seven intelligence pulses available, ASCII can accommodate  $2^7$  or 128 permutations. Of these 64 are assigned to printing characters. The rest are devoted to nonprinting characters, or are unassigned.

**3.05** The character arrangement for ASCII is shown in Figure 2. The black circles represent marking pulses, the blank squares spacing pulses. The main block gives the arrangements of pulses 1 through 5. The four smaller blocks at the right give the arrangements of pulses 6 and 7 for the four rows of characters as indicated by the arrows. When "even parity" is provided, characters and functions which have white backgrounds in the character arrangement illustration have the eighth intelligence pulse spacing — dark backgrounds have the eighth intelligence pulse marking. For keyboard transmission, two SHIFT keys and a CTRL key are used as described in the keyboard section.

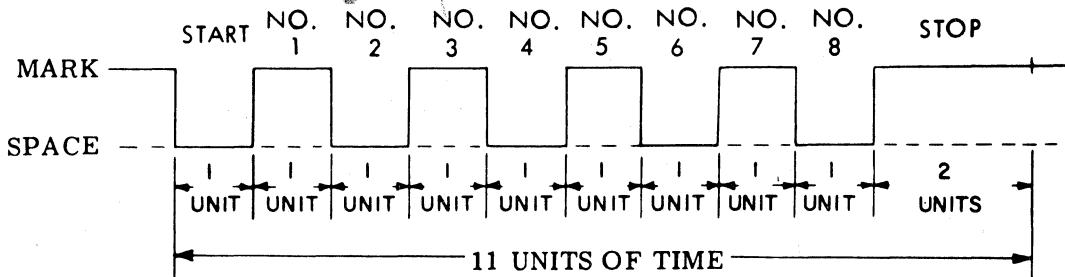
**4. PRINCIPLES OF OPERATION****OUTLINE OF OPERATION (Figure 3)****Power Distribution**

**4.01** Operation of the motor switch supplies ac power to the motor. By means of intermediate drive parts the rotary motion of the



AMERICAN NATIONAL STANDARD CODE FOR INFORMATION  
INTERCHANGE (ASCII) X3.4-1968

DC1 = X-OFF 021<sub>8</sub> LXID | DC4 = TAPE 024<sub>8</sub> INRD  
DC2 = TAPE 022<sub>8</sub> SAXD  
DC3 = X-ON 023<sub>8</sub> INXD



CURRENT WAVE FORM FOR LETTER "U" (WITH "EVEN PARITY")

Figure 2 - Teletypewriter Code (8-Level)

motor is transferred to a distributor shaft. The distributor shaft drives the main shaft and, by means of a clutch, provides motion for the distributor mechanism.

#### Transmission

**4.02** The distributor receives a parallel output from the keyboard and converts it into a serial start-stop code combination. A selector magnet driver receives the distributor serial output and converts it into a form suitable to operate the selector mechanism. The selector mechanism in turn receives the signal and positions the codebar mechanism.

#### Function Mechanism

**4.03** Controlled by the codebar mechanism, the function mechanism enables the typing unit to perform functions supplementary to printing. The standard functions are "space," "carriage return," "line feed," "blank," and "bell."

#### Spacing Mechanism

**4.04** The spacing mechanism positions the carriage so that the characters are properly located horizontally on the paper. It spaces the carriage each time printing occurs and when

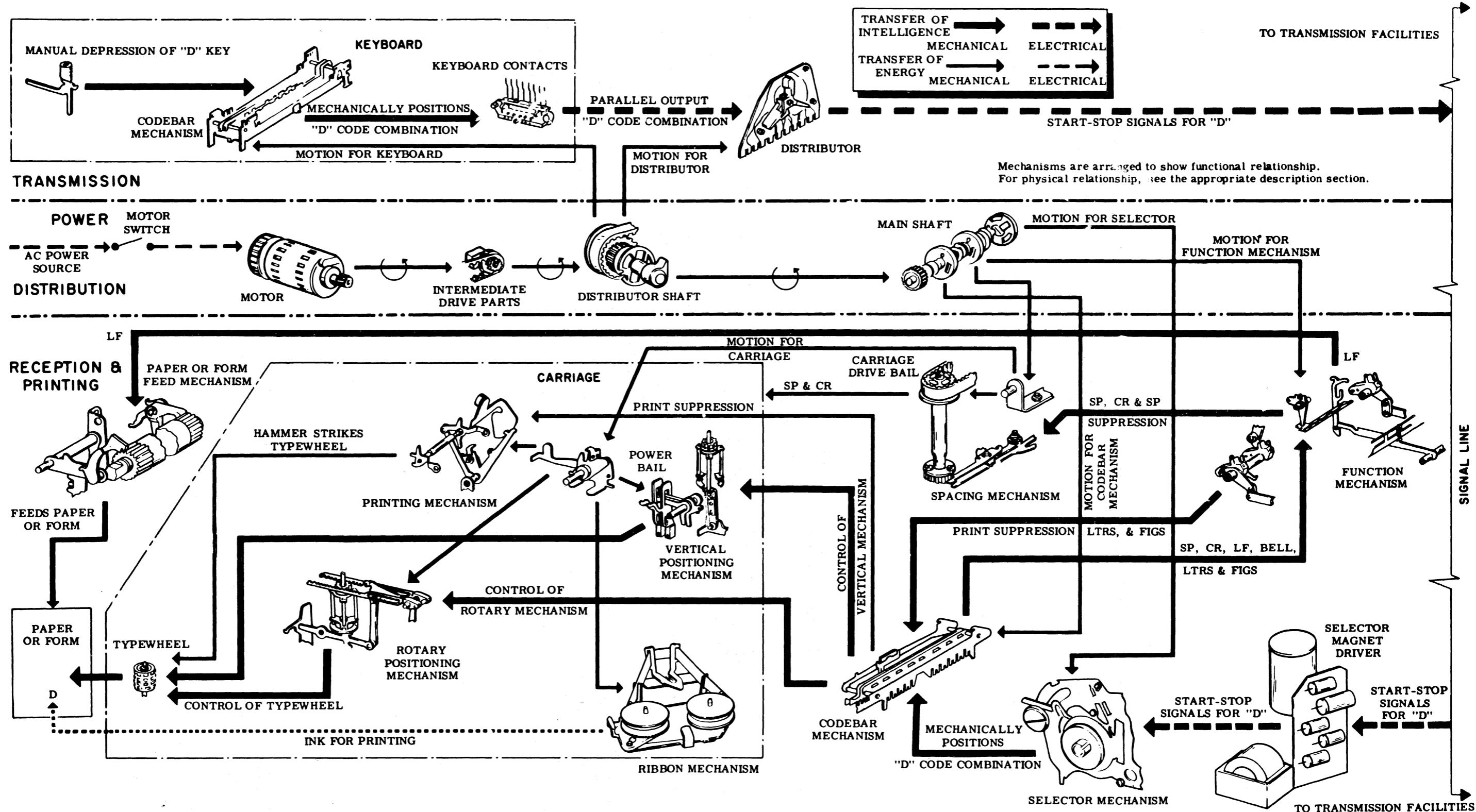


Figure 3 - Schematic Diagram — Typing Unit Operation

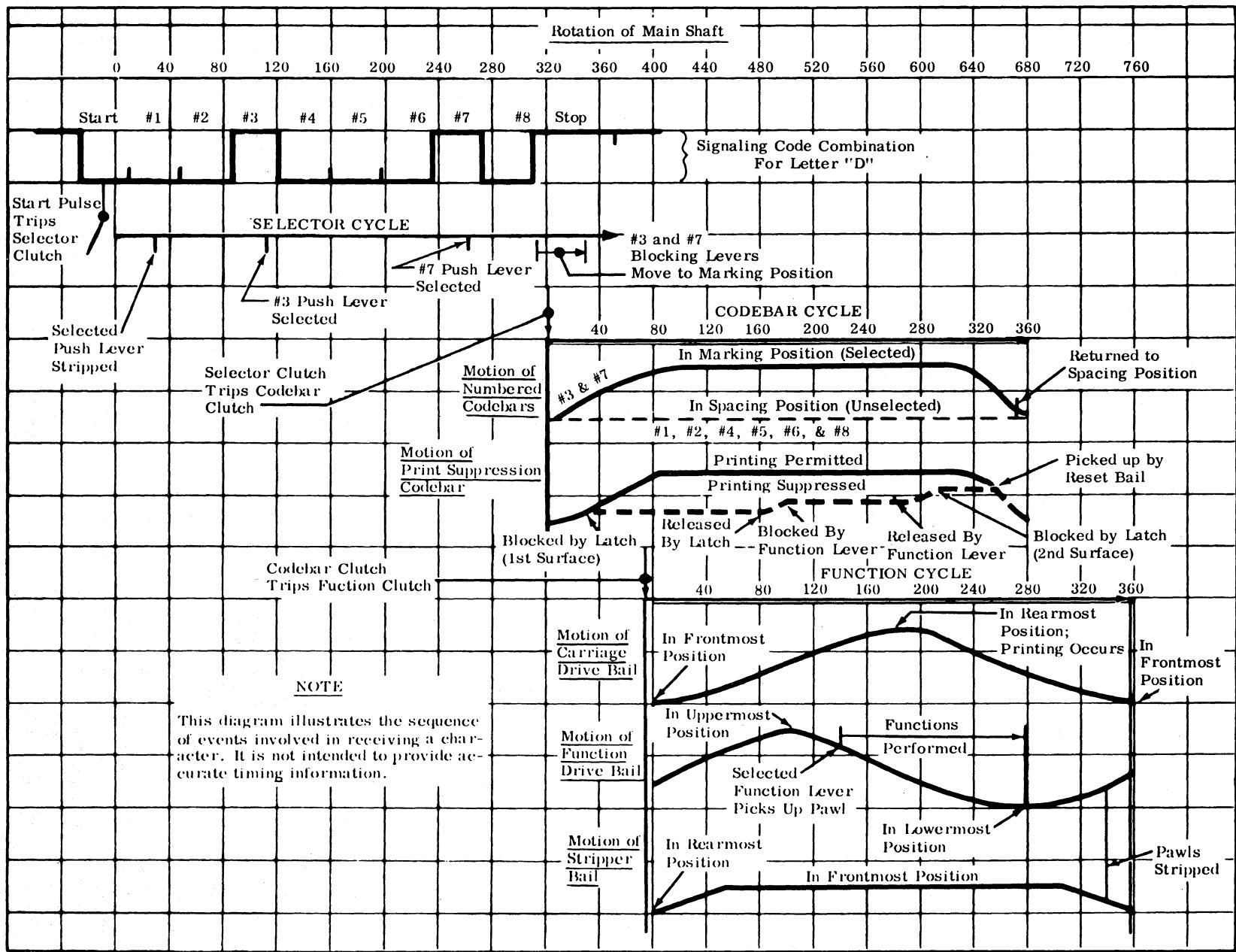


Figure 4 - Sequence Diagram — 33 Typing Unit Operation

the "space" code combination is received. The function mechanism suppresses spacing on the receipt of all functions except "space." At the receipt of "carriage return" code combination, the function mechanism causes the spacing mechanism to return the carriage to the left margin, so that a new printing line can be started.

#### Paper Feed Mechanism — Friction Feed Typing Units

4.05 The paper feed mechanism positions the paper vertically so that the characters are properly located in lines on the paper. At the receipt of the "line feed" code combination, the function mechanism causes the line feed mechanism to raise the paper to the next printing line.

#### Form-Feed Mechanism — Sprocket Feed Typing Units

4.06 The form-out mechanism positions the form vertically so that the characters are properly located in lines on the form. At the receipt of the "line feed" or "form out" code combination, the main shaft, through a line feed clutch, causes the platen to raise the form to either the next printing line or one form length, depending upon which function ("line feed" or "form out") is used.

### DETAILED OPERATION

#### A. Motor

4.07 The motor used on the 33 typing unit has a run winding and a start winding connected in parallel. (See the appropriate schematic wiring diagram.) The start winding is in series with an electrolytic capacitor and the contacts of a current-sensitive start relay. The run winding is connected to a run capacitor. When the motor circuit is closed, the initial surge of current energizes the relay coil, closing the relay contacts. The magnetic flux produced by the operating and start windings starts the motor turning. As the rotor accelerates, the current, through the windings, capacitor, and relay decreases. When it drops to a predetermined level, the relay coil opens the contacts and removes the start coil from the circuit. Using the operating coil alone, the motor continues to accelerate until it reaches synchronous speed.

4.08 The rotary motion produced by the motor is transferred through a motor pinion, an intermediate gear pulley, and a motor belt to a distributor gear pulley. The latter drives a main shaft gear and also a distributor clutch, which provides motion for the keyboard and distributor mechanism (Figure 5).

#### B. Main Shaft

4.09 The main shaft illustrated in Figure 6 receives motion from the motor, and by means of clutches distributes it to drive all the mechanisms in the typing unit except the distributor mechanism. The distributor mechanism is driven by the motor directly as explained in 4.08. In friction feed typing units the main shaft drives three clutches: the selector clutch, the function clutch, and the codebar clutch. In sprocket feed typing units the main shaft drives an additional clutch — the form feed clutch.

#### C. Clutches

4.10 The clutches used on the 33 typing unit are all metal internal expansion clutches. A clutch is illustrated in Figure 7. This type of clutch functions like brakes. When the clutch is tripped (engaged) two shoes expand against a notched drum. The force of the expanded shoes against the clutch drum is enough to engage the drum. As the drum rotates, the whole clutch and any mechanism attached to it will rotate.

4.11 The clutch drum is attached to and rotates with a shaft. In the stop (or disengaged) position, a trip lever and a latchlever hold the shoe lever, two shoes, a cam disc, and a cam sleeve stationary. When the trip lever moves away from the shoe lever, the shoe lever, under spring tension, moves away from the stop lug on the cam disc. By means of two lugs, the shoe lever expands the shoes until they contact the notched surface of the drum. The drum causes the shoes to rotate. By means of a lug on the cam disc the shoes rotate the disc and the sleeve attached to it. The clutch is now engaged, and the cam sleeve rotates in unison with the shaft.

4.12 When the trip lever moves to its stop position, it is struck by the shoe lever. The cam disc continues to rotate until the latchlever seats in its notch, and the shoe lever and stop lug are pressed together by the trip lever and latchlever. A spring holds the shoes together, away from the drum. The clutch is now disengaged.

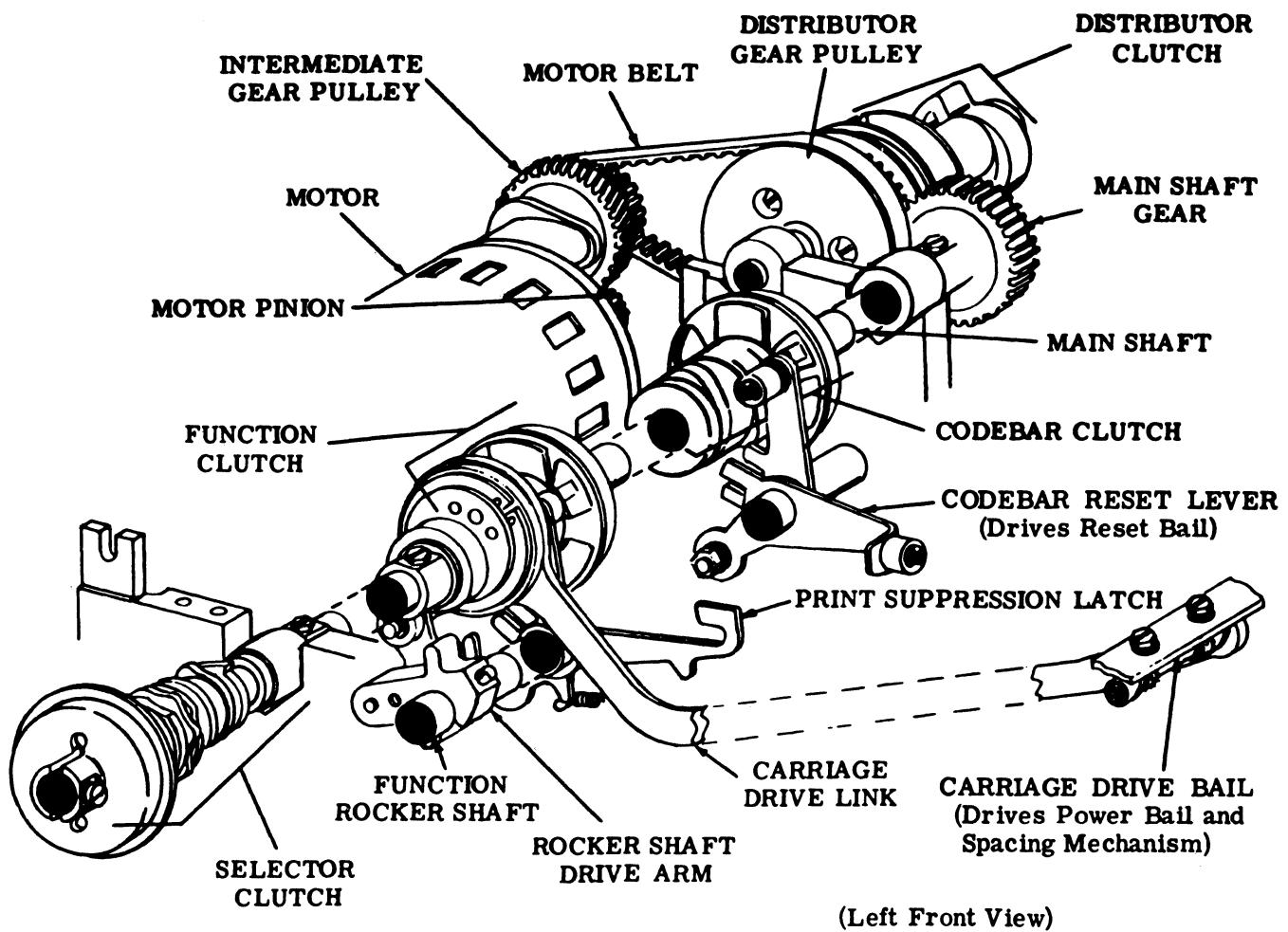


Figure 5 - Motor and Drive Mechanism

#### D. Signal Reception

4.13 The signal received by the typing unit may originate either remotely or locally. Locally the signal may originate either in the keyboard or the tape reader. In either case, the incoming signal is received as a parallel output to the distributor. The distributor changes the parallel signal into a serial start-stop output to the selector magnet driver for current rectification. The signal goes from the selector magnet driver to the selector. The following paragraphs will consider the signal as originating in the keyboard. Refer to Section 574-121-100TC for the description of keyboard operation.

#### E. Distributor Mechanism

4.14 The distributor mechanism is illustrated in Figures 8 and 9. When a keytop is depressed, the corresponding code combination is set up in the keyboard contacts. Simultaneously the universal lever moves up. An H-plate connects the universal lever of the keyboard to the distributor clutch trip linkage in the typing unit. As the universal lever moves up, the H-plate pivots the distributor trip linkage. The distributor trip linkage is connected to the clutch trip lever. As the linkage moves rearward the trip lever is moved away from the shoe lever and the distributor clutch engages.

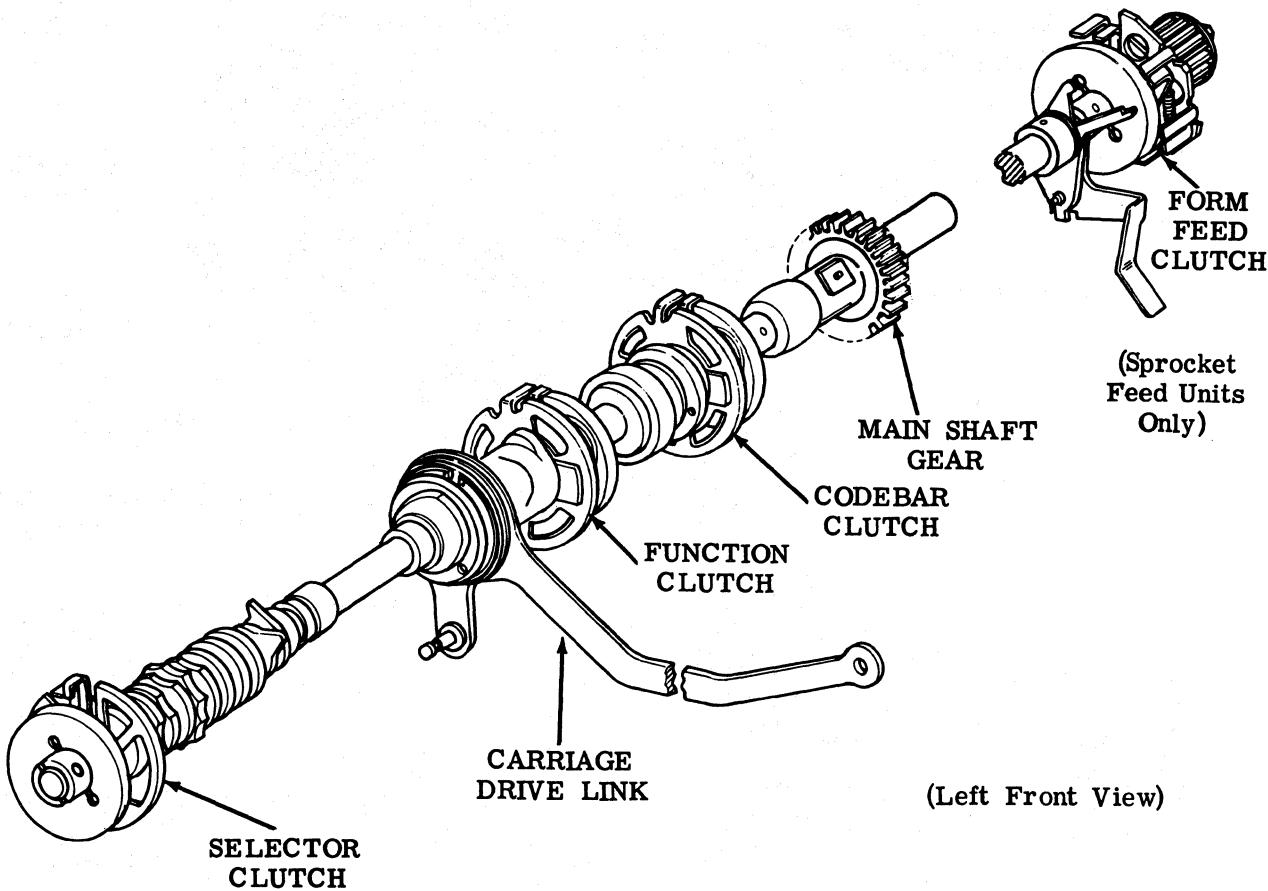


Figure 6 - Main Shaft

4.15 The clutch disc is attached to the distributor shaft. A brush holder mounted at the end of the distributor shaft rotates two carbon brushes over the segments of the distributor disc. A spring fastened to the brush holder serves two purposes: it holds the carbon brushes firmly against the segments, and serves to close the current loop between the outer and inner rings of the distributor disc.

4.16 The distributor disc has two rings. The inner ring is solid. The outer ring is broken into ten segments corresponding to the start, stop, and the eight intelligence pulses.

(a) In the stop position, the outer brush rests on the stop segment, and the current flows in the signal circuit which is closed. (The signal path is from one side of the line through the start segment, the inner ring, the brushes, the stop segment, the common terminal, and the break contact to the other side of the line.) Thus a marking condition exists. Assume that the D key is depressed. The (---7-) code combination is set up in the keyboard contacts.

(b) The distributor clutch is tripped, and the brush holder begins its revolution. While the brush is on the start segment, the

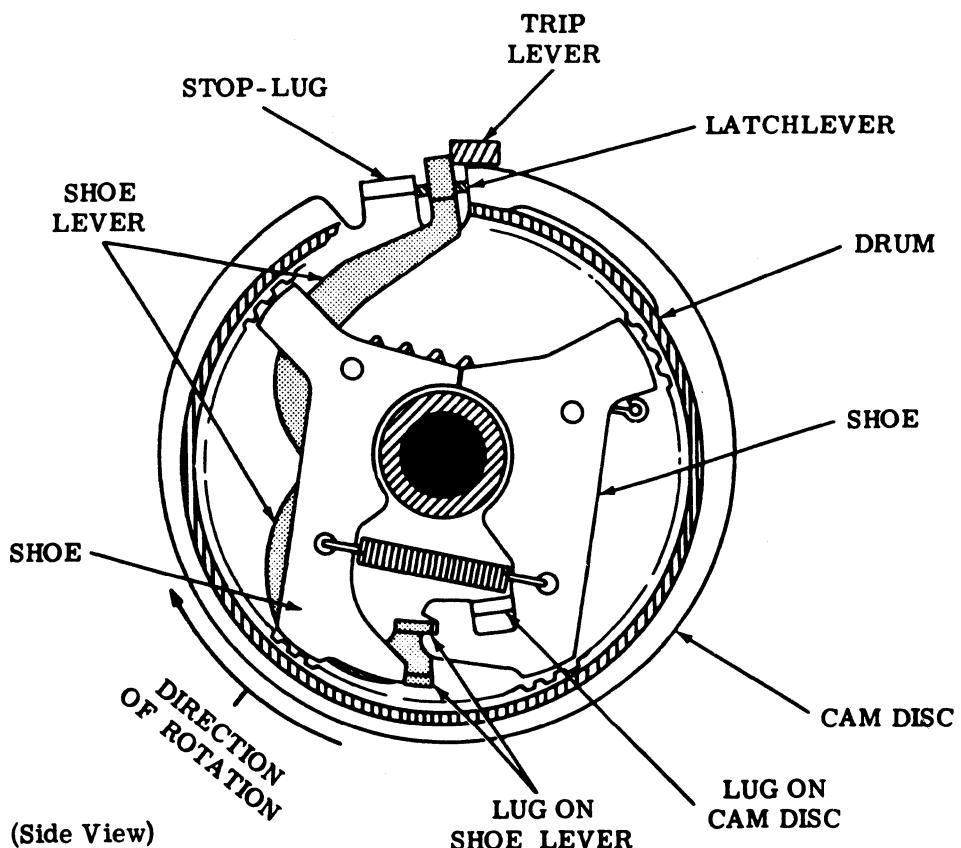


Figure 7 - Internal Expansion Clutch

circuit is open, no current flows, and a spacing element is transmitted. While it is on the no. 1 segment, the circuit is again open. Likewise the circuit is open for the no. 2 pulse. On the no. 3 segment the circuit is closed, current flows and a marking element is transmitted. For the nos. 4, 5, and 6 segments the circuit is open, transmitting spacing elements. The circuit closes for the no. 7 element and opens for the no. 8. When the brush reaches the stop segment, the distributor clutch is disengaged, and the line again becomes marking.

#### F. Selector Mechanism

4.17 The selector mechanism illustrated in Figures 10 and 13 receives the code combinations from the selector magnet driver and converts them to mechanical arrangements that control the codebar mechanism.

4.18 A magnet coil is wired by two leads to the output of the selector magnet driver. In the stop condition the output of the selector magnet driver is marking. This keeps the coil energized and the armature attracted to the magnet core. In this attracted position the armature blocks the start lever.

4.19 When a code combination is received the start pulse (spacing) de-energizes the coil, and the armature drops away from the magnet. No longer blocked, the spring biased start lever overtravels the armature, causing two things to happen:

- (a) The start cam follower associated with the start lever falls into the indent of the start cam.
- (b) As the start cam follower falls into the indent, the trip lever associated with it moves away from the clutch shoe lever, allowing the selector clutch to engage.

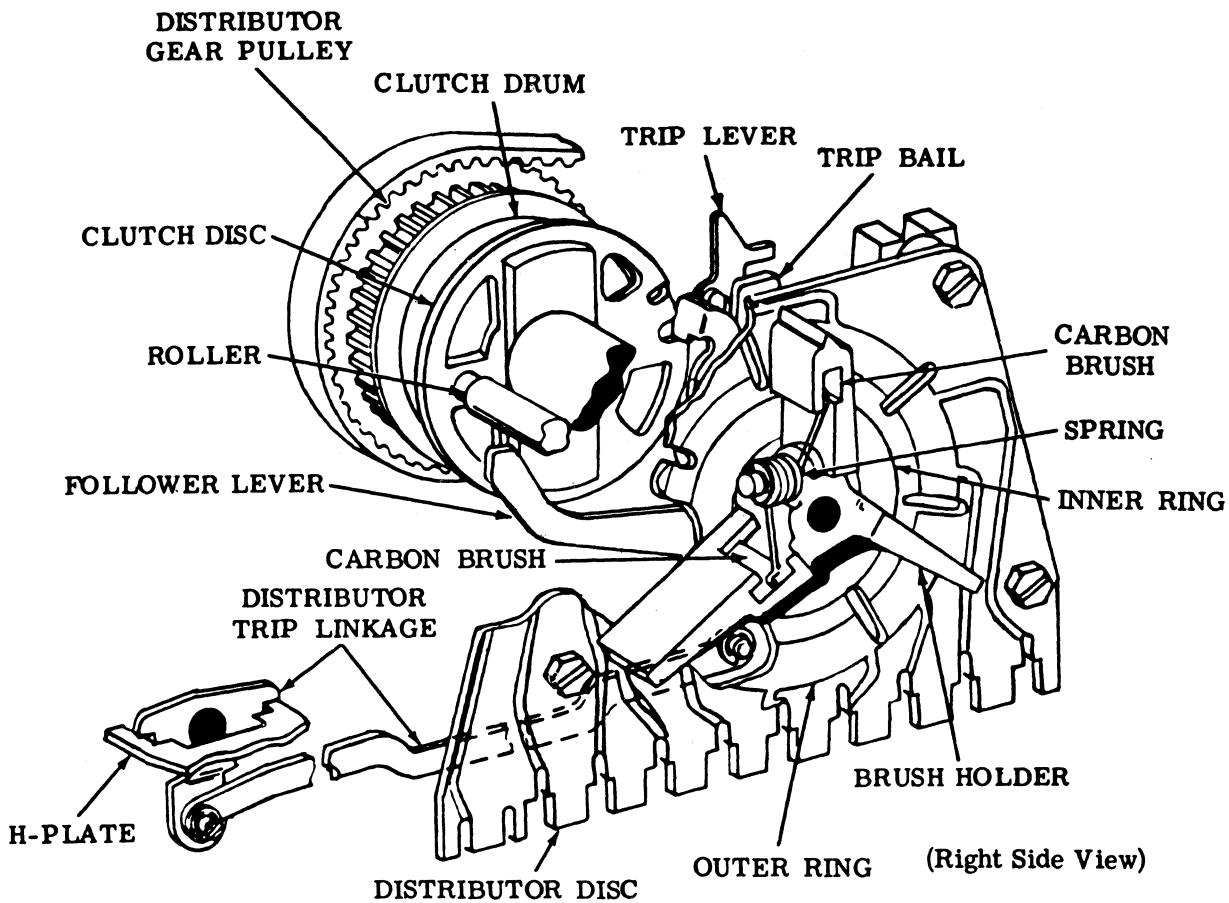


Figure 8 - Distributor Mechanism

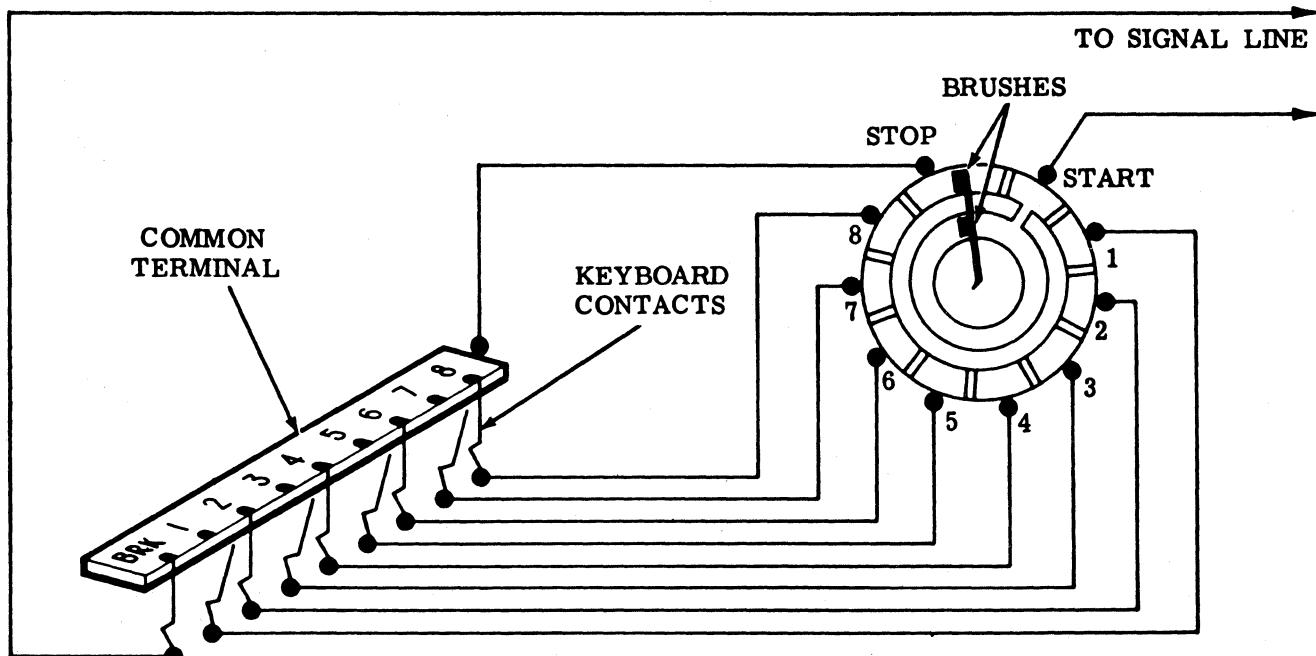
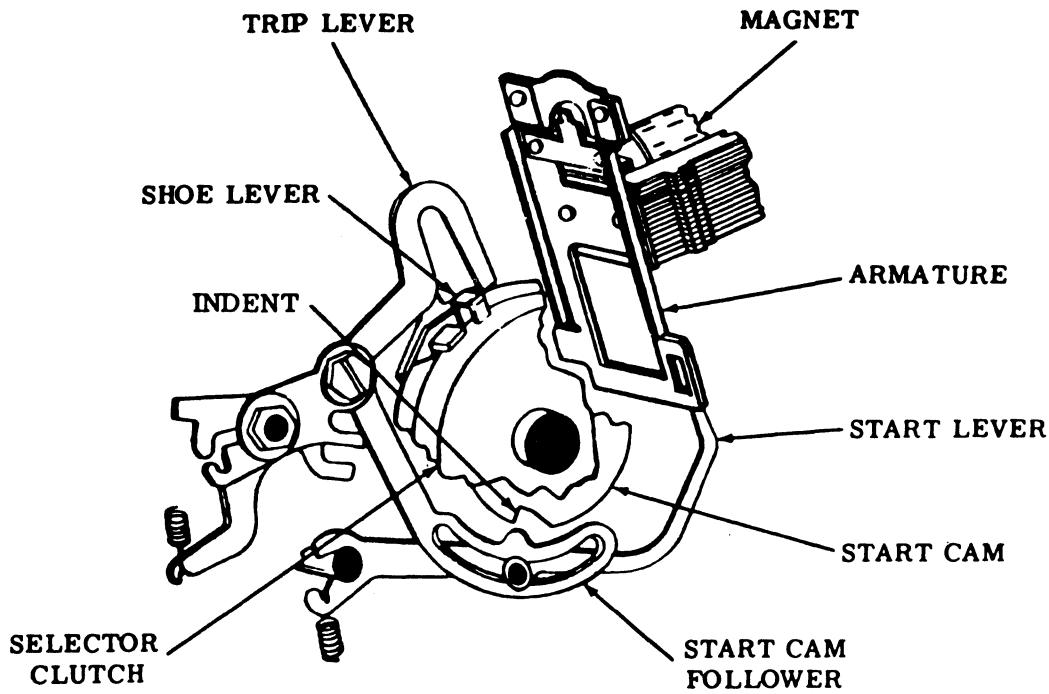


Figure 9 - Signal Wiring for 33 Typing Unit Distributor



(Left Rear View)

Figure 10 - Selector Trip Mechanism

4.20 Once engaged the selector clutch makes one complete revolution. The start cam follower remains in the indent of the start cam just enough to trip the clutch. It then comes out of the indent and rides the cam. This keeps the start lever away from the armature which will now be attracted if the incoming pulses are marking and unattracted if the pulses are spacing.

4.21 As the selector clutch rotates, the spacing locklever, the push lever reset bail, the codebar clutch trip follower arm, and eight selector levers ride individual cams under spring tension.

4.22 Early in the codebar cycle the high part of the push lever reset cam pivots the push lever reset bail. In its motion the bail

resets all the spring biased push levers selected in the previous cycle. Once reset the push levers can be positioned either marking or spacing as the intelligence pulses are received.

4.23 The selector cam sleeve illustrated in Figure 11 has twelve cam surfaces. The cam surfaces are positioned in a staggered fashion so that a sampling sequence can take place. As mentioned in 4.19 and 4.20, the start cam performs its function, and soon after the push lever reset cam is operated. Following these the spacing locklever cam and the eight intelligence cams operate in sequence.

Note: The sampling sequence for the intelligence cams is as follows: no. 1, 2, 3, 4, 5, 6, 7, and 8. However, the physical arrangement of the cams is: 1, 2, 3, 4, 5, 7, 6, and 8 as viewed from left to right.

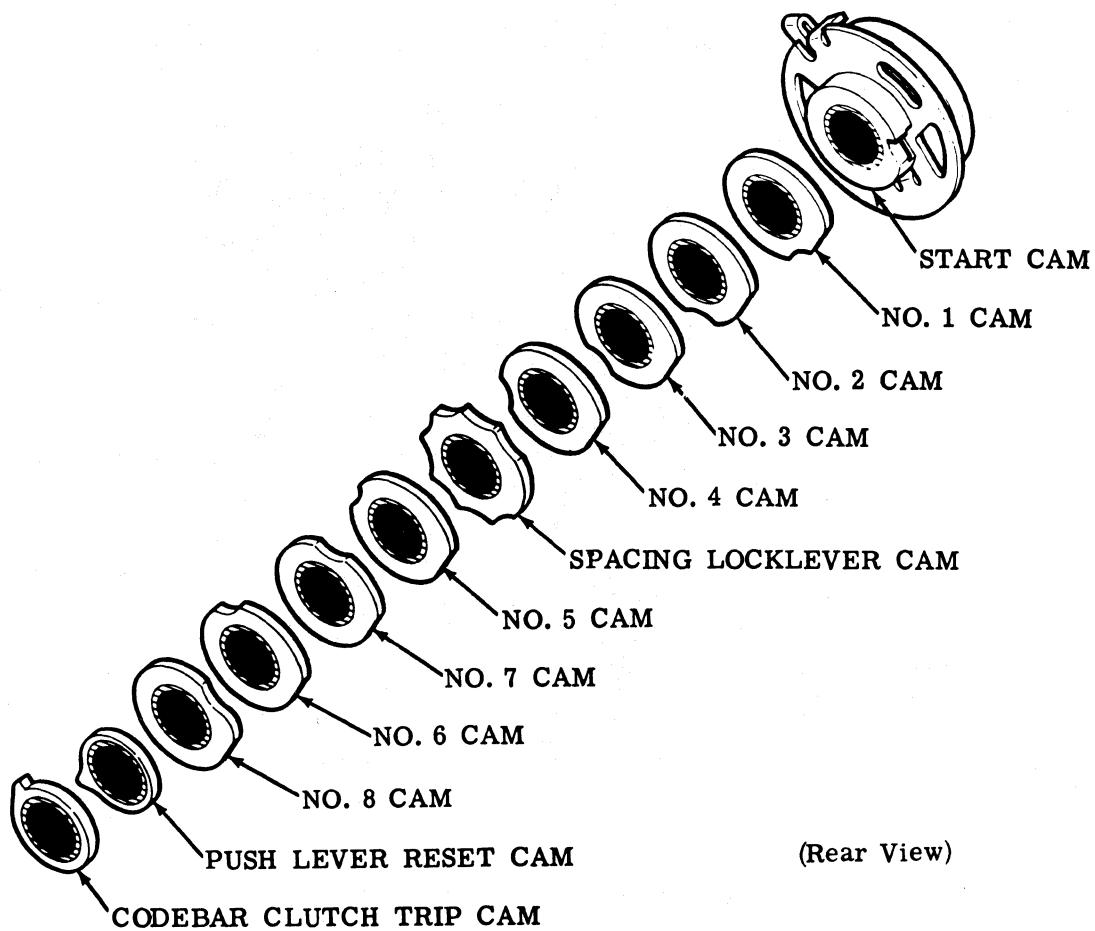


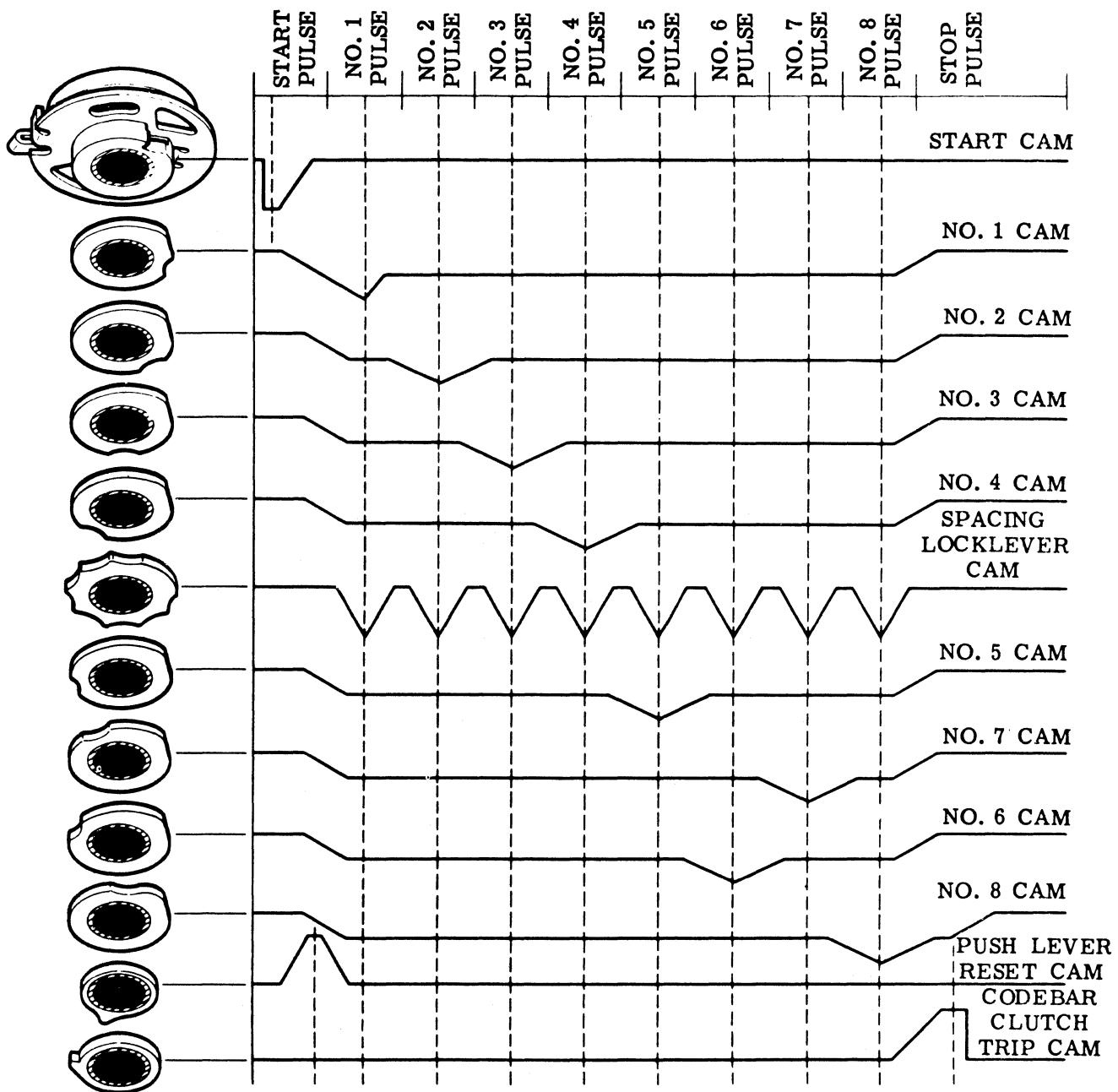
Figure 11 - Selector Cam Sleeve

4.24 If the intelligence pulse is spacing it de-energizes the magnet coil and the armature is in the unattracted position. The spacing lock lever moves up, holding the armature in this position during the sampling interval. The selector lever is prevented from moving up into the indent of its cam by the armature, and the push lever remains in its unselected (spacing) position in front of the selector lever (Figure 13).

4.25 If the intelligence pulse is marking the armature is attracted, moving out of the way of the selector lever, blocking the spacing locklever. The selector lever moves up into the indent of its cam, locking the armature in its marking position during the sampling interval. This permits the spring biased push lever to move rearward under the selector lever.

4.26 As the code combination is received, each intelligence pulse is sampled in turn, and the corresponding selector levers and push levers are positioned accordingly. The contours of the selector cams are such that near the end of the cycle they drive the selector levers and selected push levers towards the front of the typing unit to their marking position. In this position their slotted portions are up. The blocking levers associated with the unselected push levers remain in the spacing position in which their slotted portion is down (Figure 13).

4.27 Near the end of the cycle, the trip follower arm is moved rearward by its cam and trips the codebar clutch.



Note: This illustration is intended to show relationships of operations. It is not meant to be a timing chart.

Figure 12 - Sequence and Relationships of Selector Cams Operations

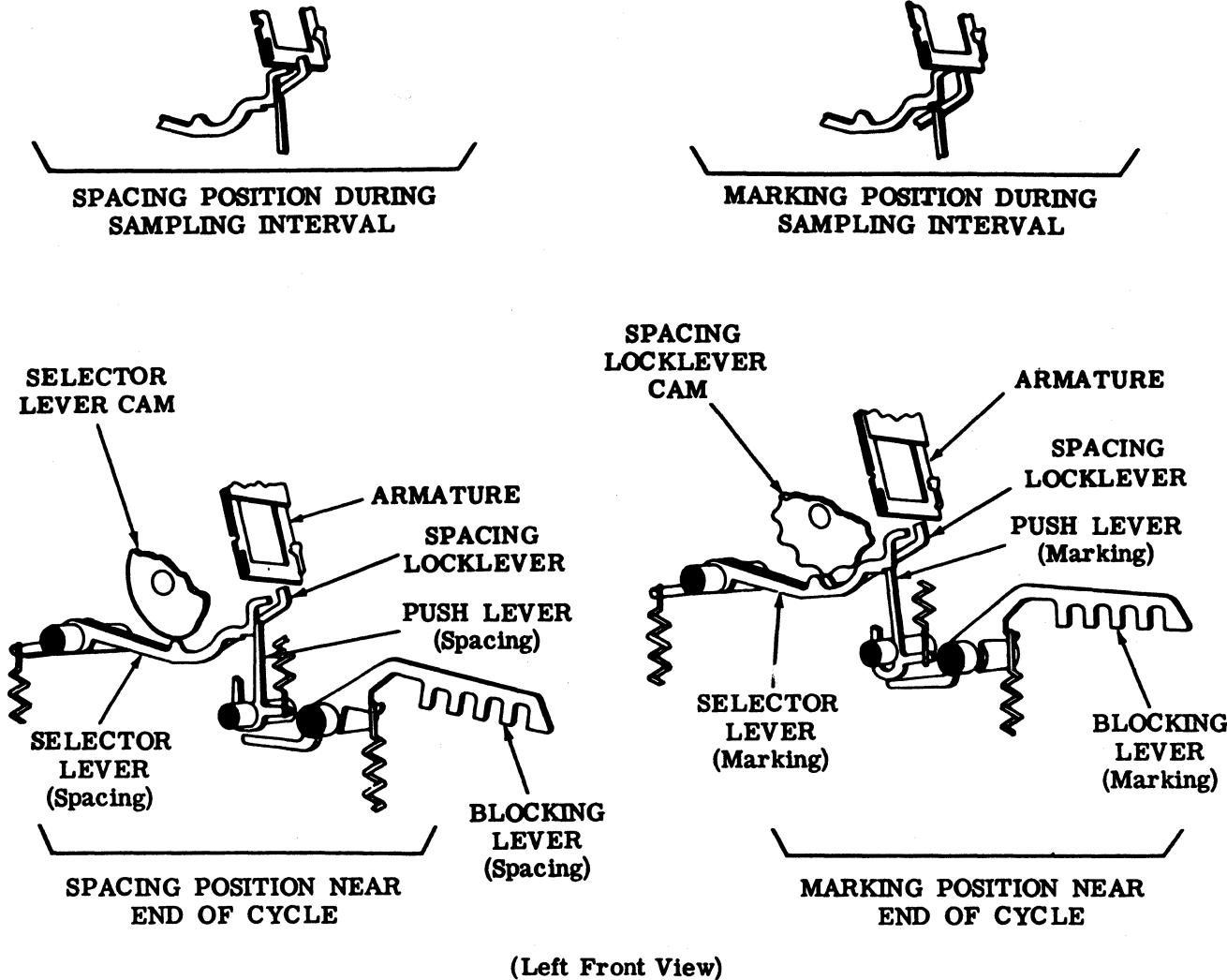


Figure 13 - Selector Mechanism

4.28 When the stop pulse (marking) is received at the end of the code combination, the armature moves to its marking position above the start lever, where it prevents the start cam follower from falling into the indent of its cam. In this position the follower holds the trip lever down so that, when the selector clutch completes its cycle, its shoe

lever strikes the trip lever, and the clutch is disengaged.

4.29 As an example, assume that the letter D (---3---7-) code combination is received by the typing unit. The start pulse (spacing) trips the selector clutch, which begins its cycle. The stripper bail strips all previ-

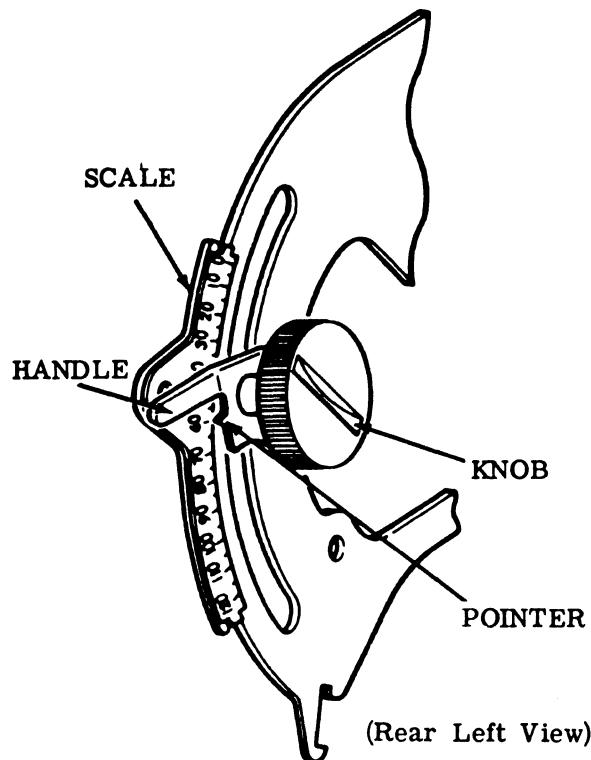


Figure 14 - Range Finder

ously selected push levers from the selector levers. The intelligence pulses are sampled in order, and the no. 3 and no. 7 push levers are selected. Near the end of the cycle the selector clutch cams the no. 3 and no. 7 push levers down, and they pivot the no. 3 and no. 7 blocking levers up to their marking position. The trip cam causes the trip follower arm to trip the codebar clutch. The stop pulse (marking) disengages the selector clutch, and the selector returns to its stop position.

#### G. Range Finder

4.30 For optimum operation of the typing unit, the selector must sample the code elements at the most favorable time. The range finder illustrated in Figure 14 provides a means of determining this time by establishing a range of operating margins.

4.31 When the range finder knob is loosened, a pointer may be moved along a range scale by a handle. This changes the angular position of the trip levers and latchlevers with respect to the main shaft, and thus changes the position where the selector clutch begins and

ends its cycle. The effect of this operation is to change the time in the cycle when the selector samples each code pulse.

4.32 Rotating the pointer counterclockwise from 60, the center of the scale, causes the selector to sample the trailing portion of the pulse. Rotating the pointer clockwise causes the selector to sample the leading edge. To establish the margins of the operating range, the pointer is moved first in one direction, then in the other, until errors in printing occur. The pointer is then set at the center of the range and the knob tightened.

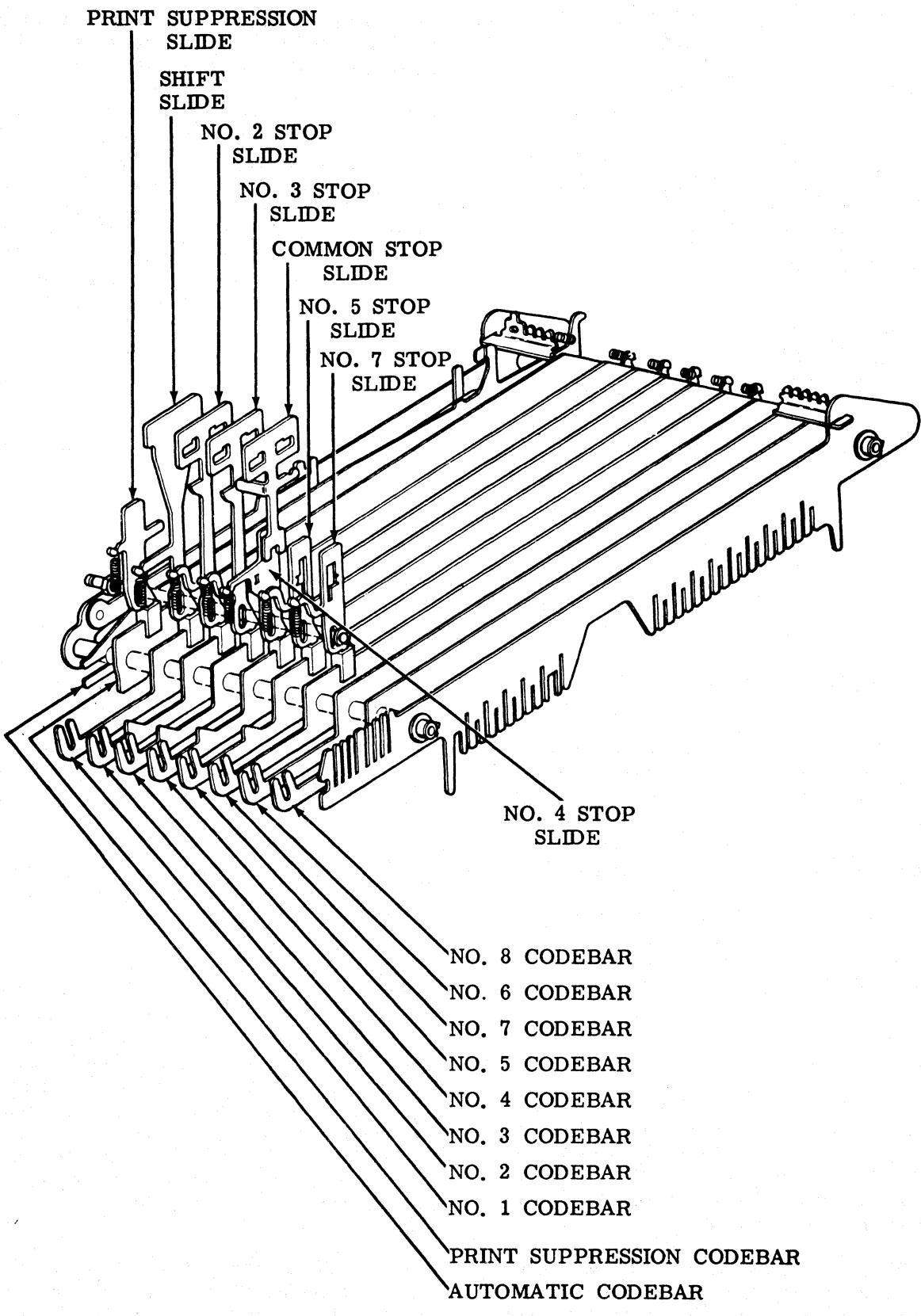
#### H. Codebar Mechanism

4.33 As mentioned in 4.27, near the end of the selector cycle (towards the end of the eighth pulse) the codebar clutch trip cam pivots the codebar clutch trip follower arm. The arm, through a trip shaft, pivots the trip lever out of the way of the shoe lever. The codebar clutch engages and makes one revolution.

4.34 As the codebar clutch rotates, the codebar reset lever follows its camming surface under the pressure of the codebar reset bail spring. The rotary motion of the cam is applied as an oscillating motion to the codebar reset lever. The codebar reset lever in turn applies its motion to the codebar reset bail which oscillates from right to left when viewed from the front of the unit.

4.35 There are ten codebars in the codebar mechanism illustrated in Figure 15. The function of the codebars is to sense the marking and spacing positions of the blocking levers. As the reset bail pivots, the codebars move up and to the left to sense the positions of the blocking levers. If a blocking lever is down (spacing) a projection on the blocking lever comes in contact with a projection on the codebar, keeping it in a down position. The operation of individual codebars will be described in succeeding paragraphs in conjunction with other mechanisms. Function levers positioned under the codebars and stop slides riding the top of the codebars will be described later.

4.36 Early in the codebar cycle a trip cam pivots a follower arm which trips the function clutch. Near the end of the cycle the cam, through the reset lever, pivots the reset bail to the left. This allows the codebars to return to their stop (down and right) position.



(Front Left View)

Figure 15 - Codebar Arrangement

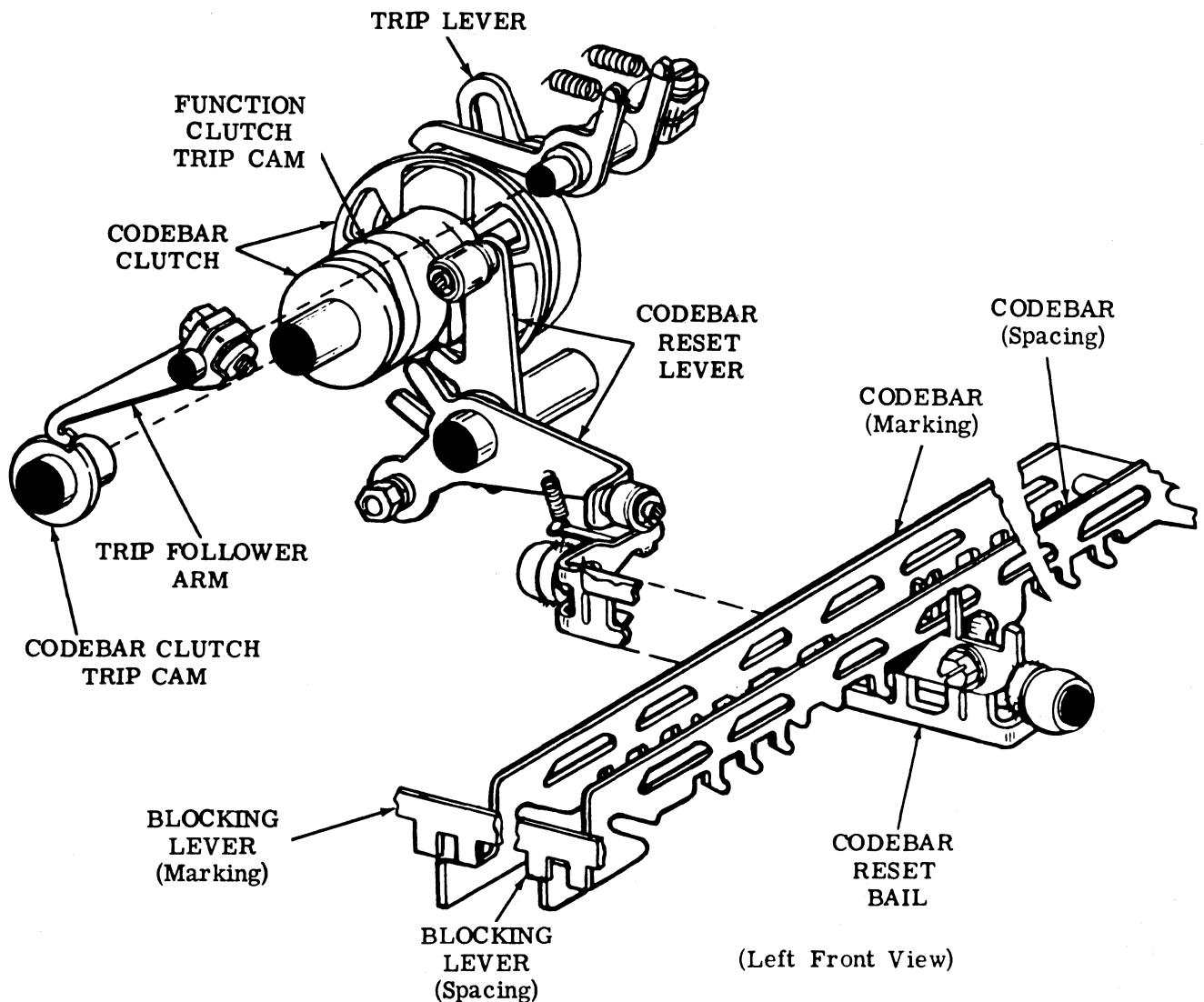


Figure 16 - Codebar Mechanism

## I. Function Mechanism

**4.37** The function mechanism illustrated in Figure 17 enables the typing unit to perform functions at the receipt of the proper code combinations. Functions are operations supplementary to printing the message, such as carriage return and line feed.

**4.38** Early in the codebar cycle a cam pivots the function trip follower arm, which moves the function trip lever out of engagement with its shoe lever. The function clutch engages and makes one complete revolution. The function drive cam, through a follower arm and drive arm, causes the function rocker shaft to rock. The function rocker shaft, through two

drive linkages, moves a function drive bail up during the first part of the cycle and down during the middle portion.

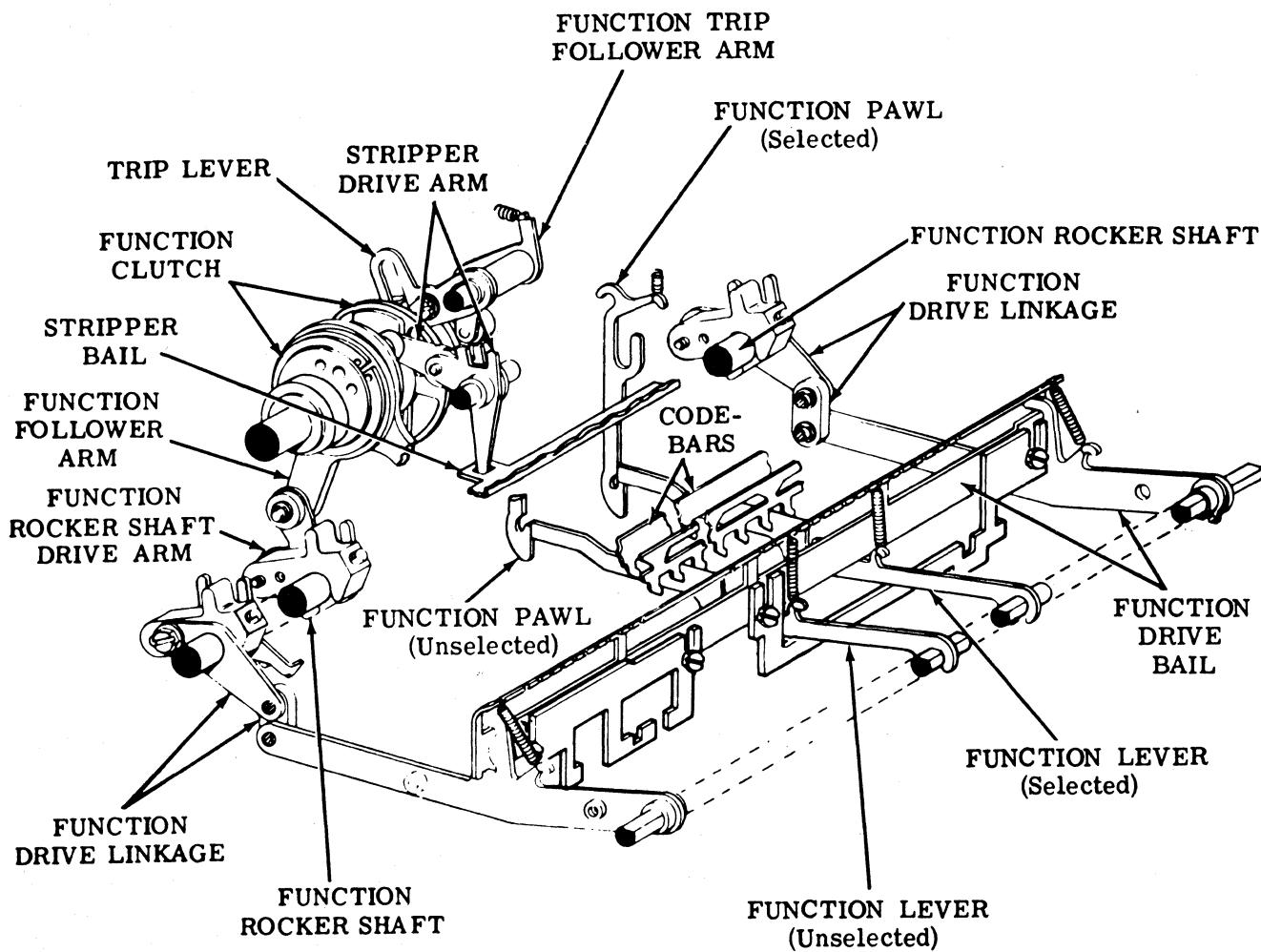
**4.39** The underside of the codebars are coded by a series of notches and projections. Under the codebars are a number of function levers which pivot on the same shaft as the function drive bail, and are connected to the bail by springs. As the bail moves up, the springs pull the function levers up so they sense the codebars. If a lever encounters one or more projections, it is retained in its down position against the tension of its spring. If the slots line up such that an opening is provided for a function lever, the lever moves all the way up to its selected position.

4.40 In most cases, when a function lever moves up to a certain level, it is latched by an associated function pawl. Then, when the function drive bail pulls the lever and latched pawl down during the middle portion of the cycle, the pawl provides the motion to effect the function.

4.41 Near the beginning of the function cycle, a cam pivots a drive arm which moves the function stripper bail frontward. Near the

end of the cycle the cam permits the drive arm, under spring tension, to move the stripper bail rearward and strip any latched function pawls from their selected function levers.

4.42 The operation of the individual function levers and pawls is covered under the individual functions.



(Left Front View)

Figure 17 - Function Mechanism

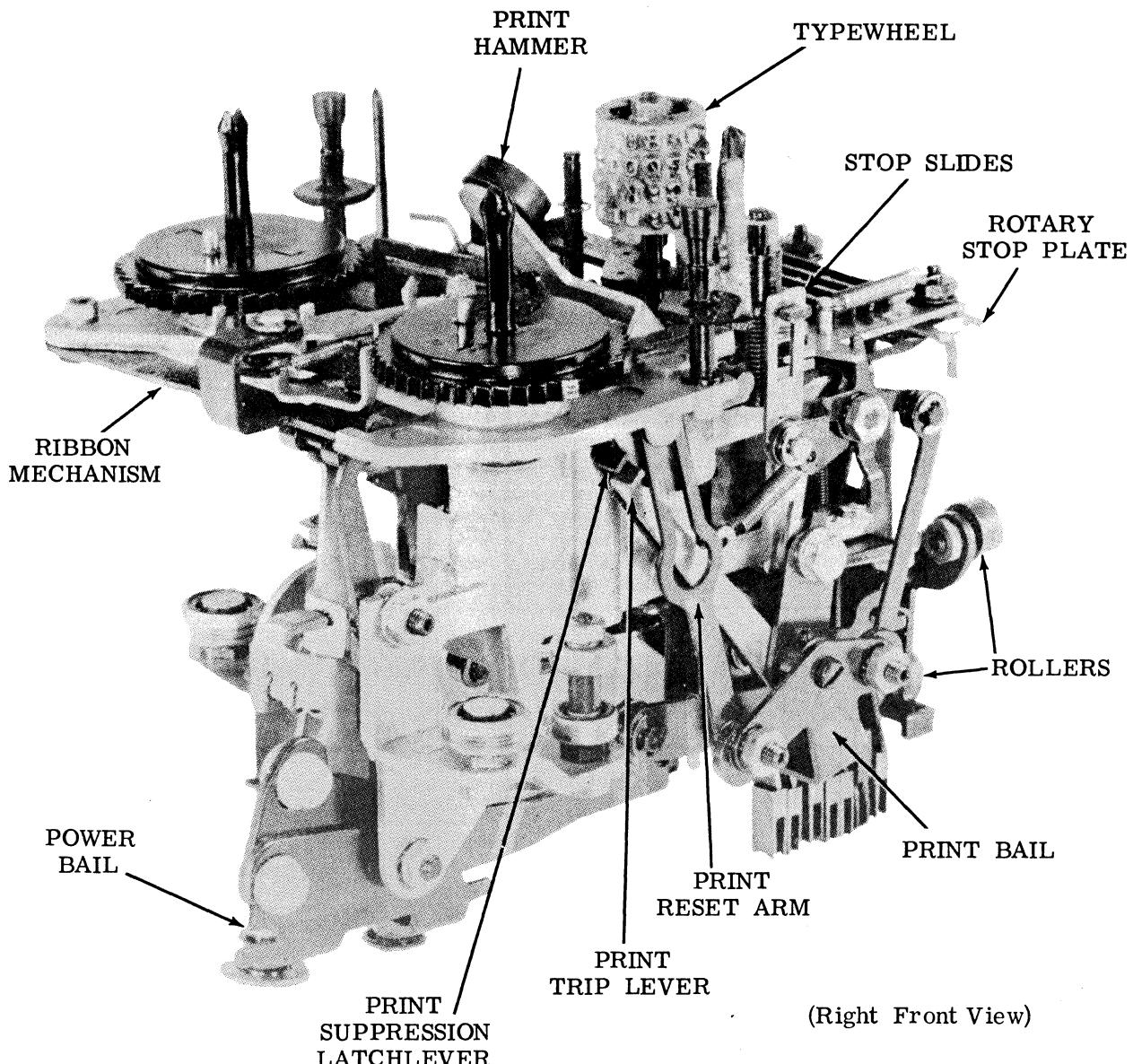


Figure 18 - Print Carriage

### J. Printing

#### General

**4.43** The printing of characters on paper is accomplished by the print carriage shown in Figure 18.

#### Typewheel

**4.44** The characters used in printing are embossed on the cylindrical surface of a typewheel. A typewheel character arrangement

is shown in Figure 19, in which the cylindrical surface is rolled out flat. The characters are arranged in 16 vertical rows of 4 characters each. For the sake of explanation, the typewheel is divided into clockwise and counter-clockwise fields to indicate in which direction the typewheel is rotated to select the rows. The rows are then numbered 1 through 8 in each direction from the borderline between the fields. The characters in each row are designated the "1st" through the "4th" from top to bottom.

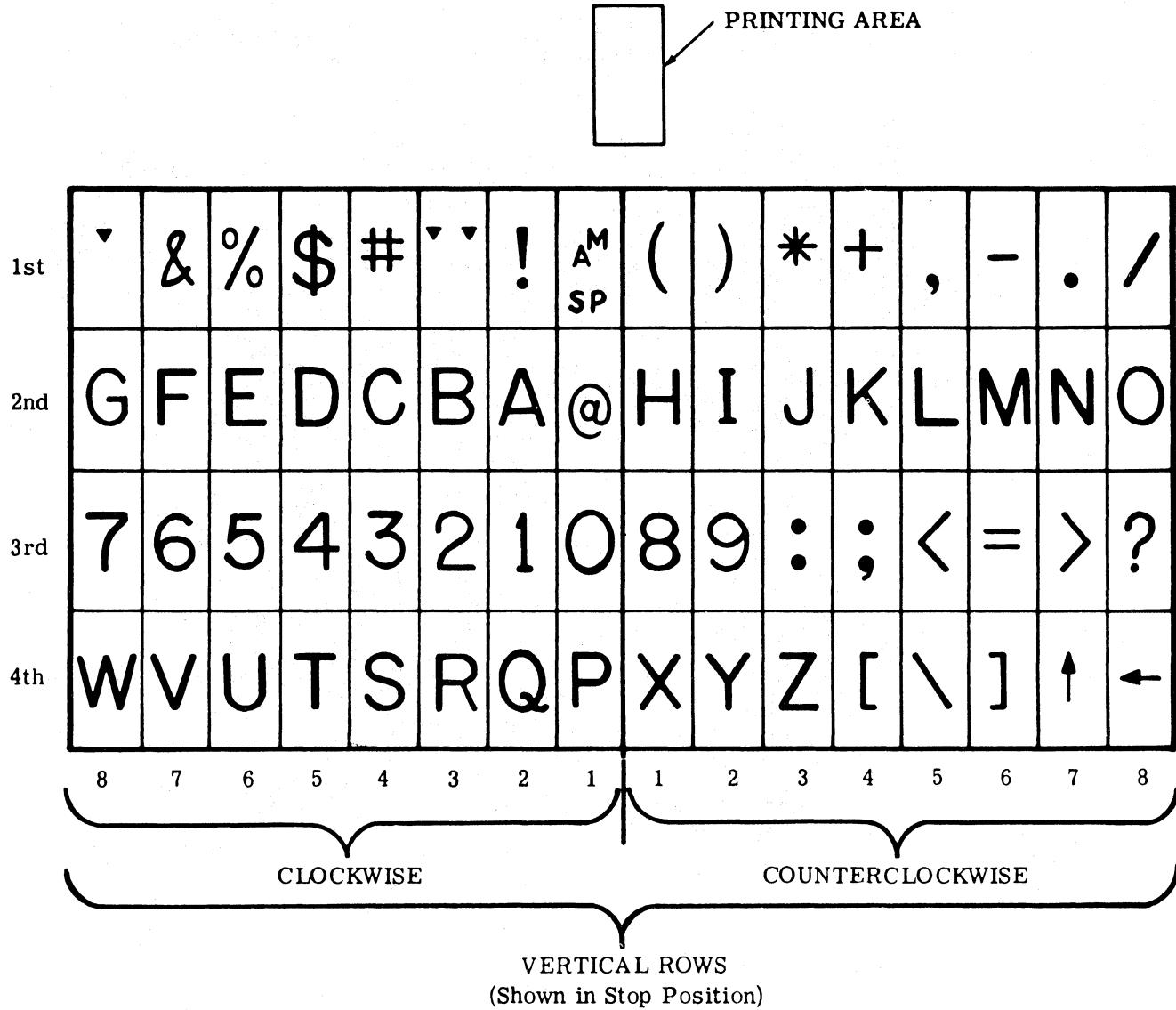


Figure 19 - Typical Typewheel Character Arrangement (As Printed)

4.45 Again for the sake of explanation, a printing area is indicated in Figure 19. This is the area the selected character must be in if it is to be printed when the print hammer strikes the typewheel against the platen. As shown in Figure 19 the borderline between the fields is under the printing area when the typing unit is in the stop condition. During the first part of each function cycle, vertical and rotary positioning mechanisms impart separate but simultaneous motions to the typewheel to select the proper character. The rotary mechanism rotates it either clockwise or counterclockwise to align the proper row with the printing area. The vertical mechanism raises it to place the proper character in the printing area. During

the latter part of the function cycle, the typewheel is returned to its stop position.

#### Power

4.46 As the function clutch rotates (4.36) an eccentric cam imparts oscillating motion through a carriage drive link to the carriage drive bail (Figure 5). The bail pivots rearward during the first part of the cycle and forward to its stop position during the latter part. In doing so, it causes a power bail on the carriage to pivot first clockwise (as viewed from the left), then counterclockwise (Figure 19). The power bail has two rollers that move along the drive bail and permit it to receive the motion regardless of the carriage position along the printing line.

### Rotary Positioning

4.47 The rotary positioning mechanism is illustrated in Figure 20. The direction in which the typewheel rotates from the stop position is determined by the no. 4 codebar. If the no. 4 codebar is marking the typewheel rotates counterclockwise. If it is spacing the typewheel rotates clockwise.

4.48 When a code combination is received in which the no. 4 intelligence pulse is marking, the no. 4 codebar moves up and to the left. A slide mounted on the codebar, through a linkage, pivots the rotary drive arm down. The rotary drive arm has alternate tabs at the end. With the no. 4 codebar marking and the arm pivoted down, the upper left tab engages the left rotary rack. If the no. 4 intelligence pulse is spacing, the no. 4 codebar is down, the rotary drive arm is pivoted up, and the lower right tab engages the right rack.

4.49 A rotary drive bail is held against the power bail by a spring. As these bails rock clockwise (as viewed from the left) during the first part of the function cycle, the drive arm, which is attached to the rotary drive bail, moves toward the front. If the rotary drive arm is down (marking), it pulls the left rack with it, causing a rotary pinion, a cage, a spider, a shaft, and the typewheel to rotate counterclockwise (as viewed from the top). If the rotary drive arm is up (spacing), it pulls the right rack, rotating the pinion, cage, spider, shaft, and typewheel clockwise. As the power bail and rotary drive bail rock back to their stop position during the latter part of the function cycle, two reset blocks on the drive bail return the racks and the typewheel to their stop position.

### Degree of Rotation

4.50 How far the typewheel rotates in either direction is determined by the no. 1, no. 2, and no. 3 codebars.

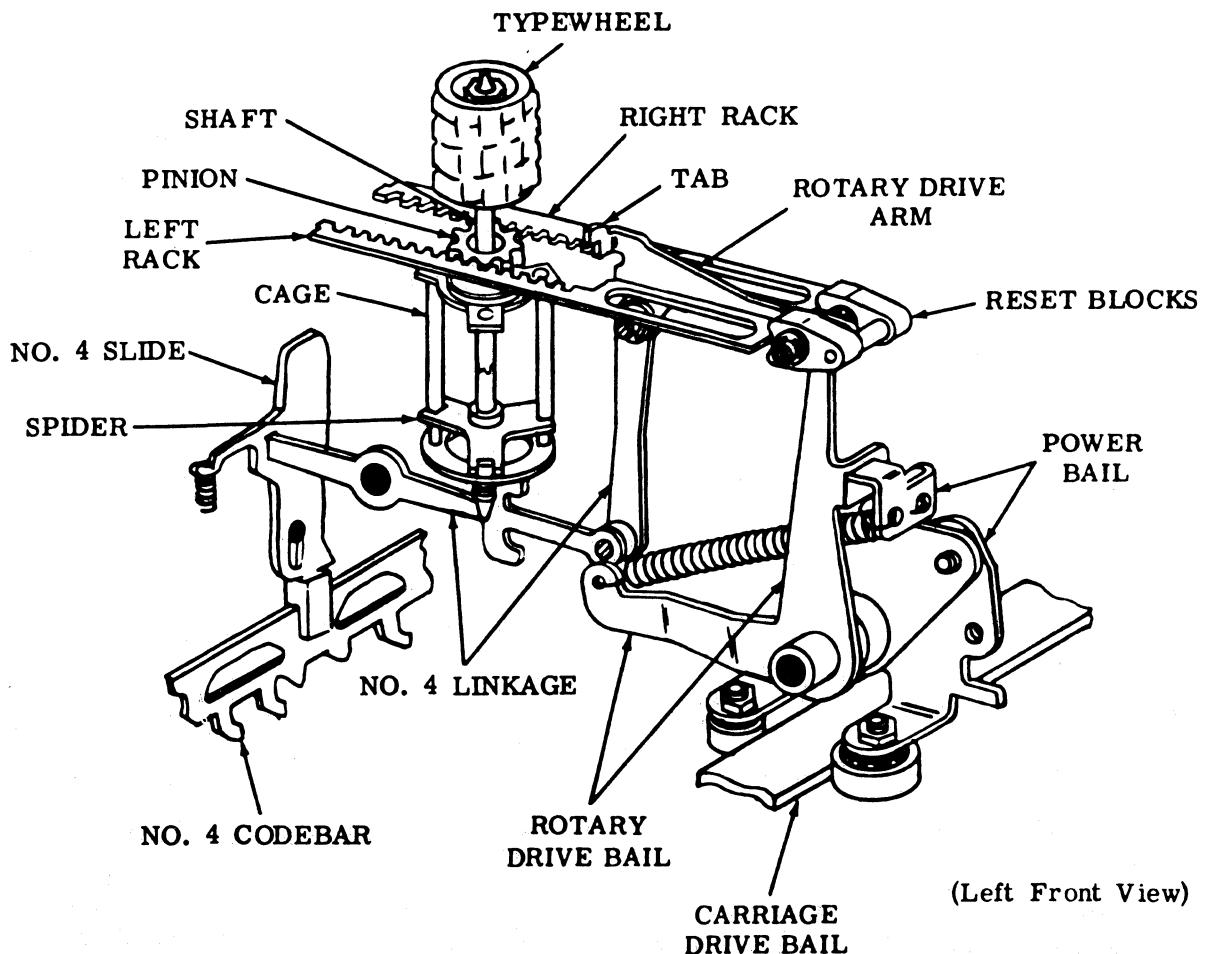


Figure 20 - Rotary Positioning Mechanism

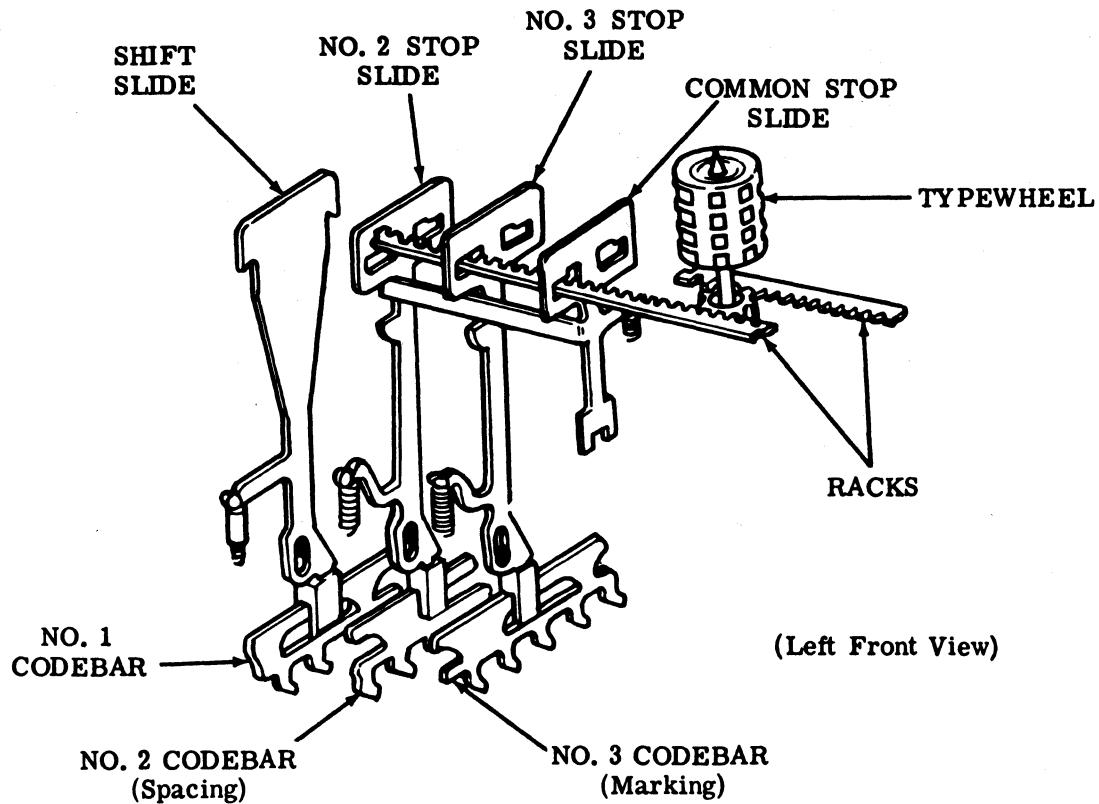


Figure 21 - Rotary Positioning Stop Slides

4.51 The no. 1 codebar controls the position of the shift slide. The no. 2 and no. 3 codebars control the positions of the no. 2, no. 3, and common stop slides. These stop slides ride the codebars and are up when the codebars are marking and down when the codebars are spacing (Figure 21).

4.52 The function of the stop slides is to stop either rack in its rearward travel. When a rack is stopped, the rotary drive bail stops, and the continuing motion of the power bail is dissipated by the spring.

4.53 The position of each stop slide determines how much the rack will travel before it is stopped. When a stop slide is down, it blocks the rack; when it is up, the rack will pass through a slot in the slide and continue to travel until blocked by another slide. The shift slide has no slot. It will block the rack whether it is up or down (Figure 21).

4.54 Depending on the position of the shift slide, the rack will travel to position either the odd or even rows of the typewheel. When the shift slide is up, the even rows are

selected; when it is down the odd rows are selected. As mentioned in 4.51, the shift slide is controlled by the no. 1 codebar.

4.55 When the no. 1 pulse is spacing, the no. 1 codebar and thus the shift slide are down. In this position the shift slide is blocked by the front stop surface of the rotary stop plate (Figure 22). The no. 2, no. 3, and common stop slides remain locked in the slots of the slide guideplate. The corresponding positions of the shift slide, the no. 2, no. 3, and common stop slide will effect 7, 5, 3, and 1 rows of typewheel rotation respectively.

4.56 When the no. 1 pulse is marking, the no. 1 codebar and thus the shift slide are up. In this position the shift slide is up, blocked by the rear stop surface of the rotary stop plate (Figure 22). The two slide guideplates, under spring tension, move to the rear. This positions all four stop slides to the rear enough to reflect one additional row of typewheel rotation. Thus the shift slide, the no. 2, no. 3, and common stop slides will effect 8, 6, 4, and 2 rows of typewheel rotation respectively.

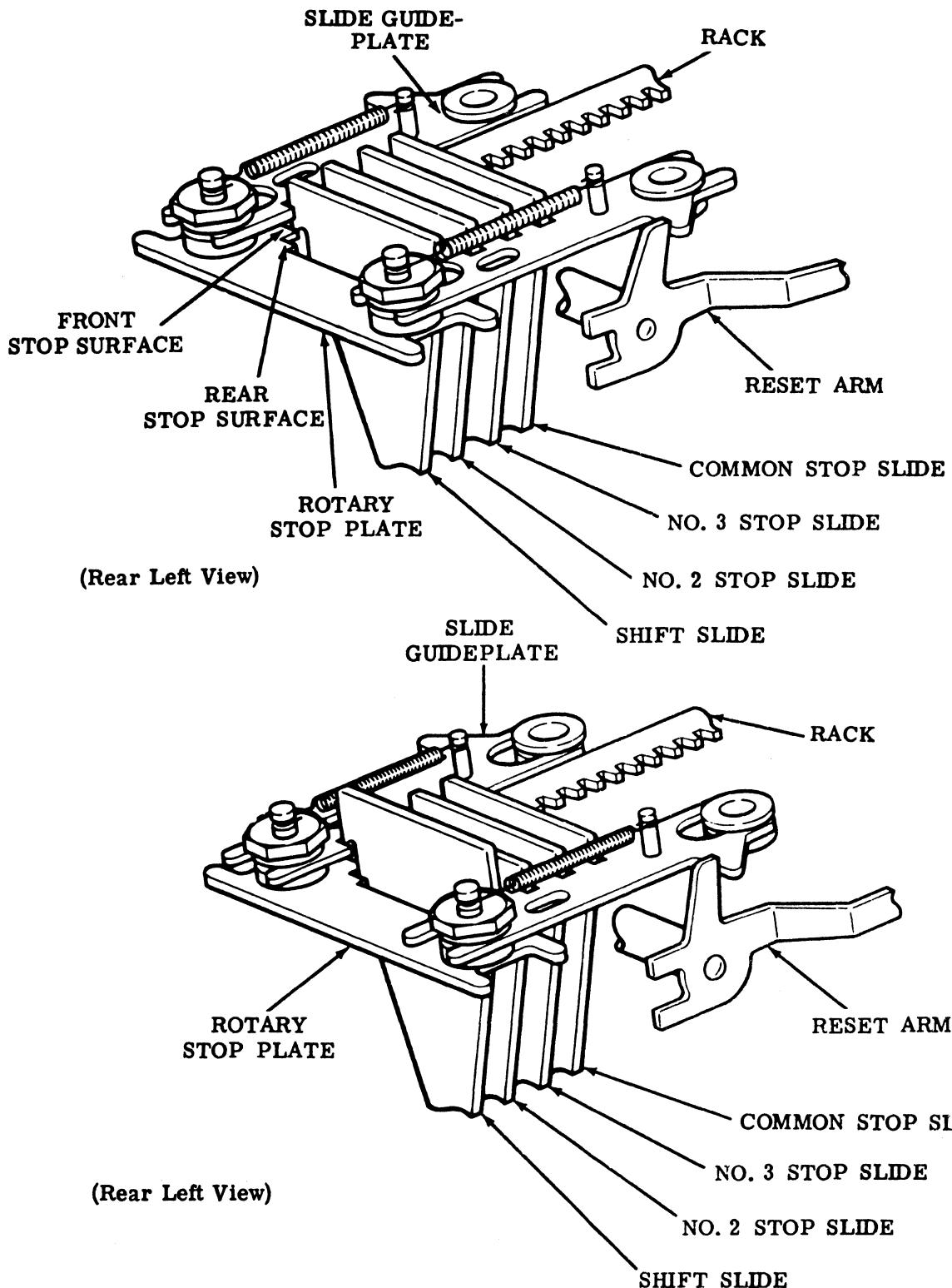


Figure 22 - Rotary Positioning Mechanism

4.57 Following is a summary of marking and spacing conditions for rotary positioning:

(a) Clockwise Field — No. 4 Pulse Spacing

Odd Rows - No. 1 Pulse Spacing

Row 1 — 2 spacing	3 spacing common spacing	{ stop slides
-------------------	-----------------------------	------------------

Row 3 — 2 marking	3 spacing common marking	
-------------------	-----------------------------	--

Row 5 — 2 spacing	3 marking common marking	
-------------------	-----------------------------	--

Row 7 — 2 marking	3 marking common marking	
-------------------	-----------------------------	--

Even Rows - No. 1 Pulse Marking

Row 2 — 2 spacing	3 spacing common spacing	
-------------------	-----------------------------	--

Row 4 — 2 marking	3 spacing common marking	
-------------------	-----------------------------	--

Row 6 — 2 spacing	3 marking common marking	
-------------------	-----------------------------	--

Row 8 — 2 marking	3 marking common marking	
-------------------	-----------------------------	--

(b) Counterclockwise Field — No. 4 Pulse Marking

The marking and spacing conditions of the stop slides are the same as for the clockwise field.

### Vertical Positioning

4.58 The vertical positioning mechanism illustrated in Figure 23 positions the typewheel so that the proper character in the selected row is in the printing area at the time of printing.

4.59 Vertical positioning is determined by the no. 5 and no. 7 codebars with their associated no. 5, no. 7, and common stop arms.

4.60 A vertical drive bail is held against the power bail by a spring. When these bails rock clockwise (as viewed from the left) during the first part of the function cycle, the vertical drive bail, through a drive arm, lifts the spider, typewheel shaft, and typewheel. How far the typewheel is raised is determined by three stop arms that are positioned in response to the no. 5 and no. 7 pulses. When the drive bail encounters an arm, it is stopped and its spring extends as the power bail continues to pivot. The spider moves up and down the bars of the cage, and thus permits rotary motion to be transferred to the typewheel regardless of its vertical position.

4.61 When a code combination is received in which the no. 5 and no. 7 pulses are spacing, the no. 5 and no. 7 codebars and their respective vertical slides remain down, spacing, and no motion is transferred to the stop arms. As the rear extension of the vertical drive bail rises, it strikes the common stop arm, which is the longest. This permits the typewheel to be raised to the point where the first character in the selected row is in the printing area at the time of printing.

4.62 When the no. 5 pulse is spacing and the no. 7 is marking, the no. 7 codebar moves its vertical slide up. The slide pivots the common and the no. 7 stop arm rearward, out of the way of the drive bail. The bail thus strikes the no. 5 arm (the second longest), and the second character in the selected row is placed in the printing area.

4.63 When the no. 5 pulse is marking and the no. 7 is spacing, the no. 5 slide pivots the no. 5 and common stop arms out of the way. The bail strikes the no. 7 stop arm (the shortest) and the third character is placed in the printing area.

4.64 When both the no. 5 and no. 7 pulses are marking, all three stop arms are pivoted out of the way. The bail moves up until it strikes the shoulder on the common stop arm, and the fourth character is placed in the printing area.

### Printing Mechanism

4.65 After the typewheel has been positioned during the first half of the function cycle, the printing mechanism illustrated in Figure 24 supplies the impact which drives the selected character against the ribbon and paper. Provisions are included whereby printing is suppressed during functions.

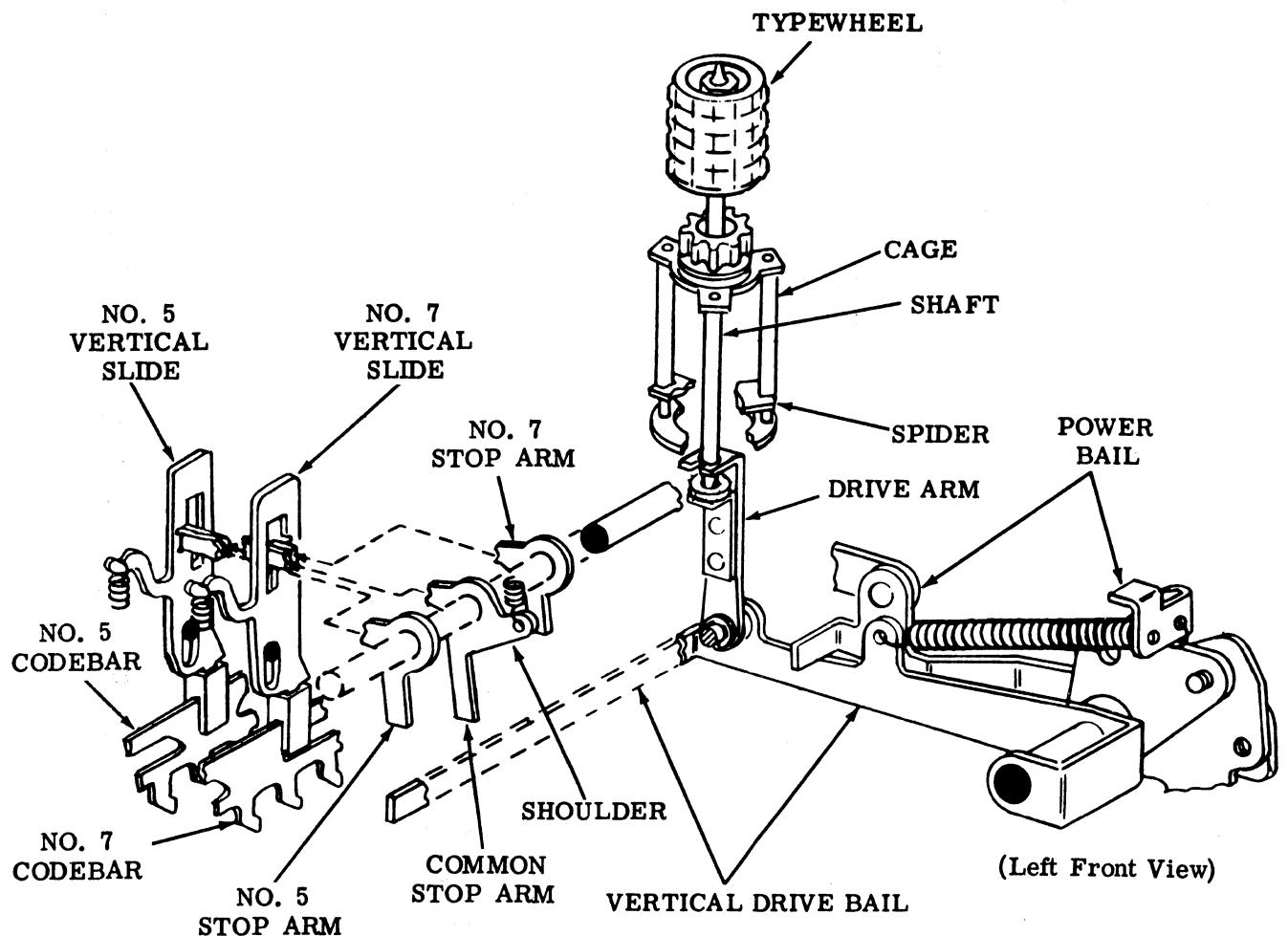


Figure 23 - Vertical Positioning Mechanism

4.66 As the power bail rocks during the first part of the function cycle, it imparts through a link clockwise motion (as viewed from the right) to a print bail. This bail, through a link and pivot shaft, pivots two reset arms. Midway in the cycle, the right arm moves a print trip lever out of engagement with a shoulder on the print hammer bail. A torsion spring snaps the hammer bail rearward, and the hammer drives the typewheel and ribbon against the paper. The lower end of the typewheel shaft pivots on the vertical drive arm and permits the wheel to be driven rearward. The hammer bail has a soft head which strikes the typewheel without damage.

4.67 During the last half of the cycle, the power bail returns the printing parts to their stop positions, and a print reset arm at-

tached to the print bail returns the print hammer bail to its stop position, where it is latched by the print trip lever.

#### K. Printing Suppressed

4.68 The print suppression mechanism (Figure 25) suppresses printing whenever a function code combination is received.

4.69 As the other codebars rise early in the codebar cycle, a print suppression codebar is held down by a print suppression latch. Early in the function cycle, after any of the function levers have been selected, the latch is pivoted away from the codebar by a print suppression cam on the function clutch.

4.70 If no function lever has been selected, the print suppression codebar moves up and to the left to its selected position. A print suppression slide follows the motion of this codebar and pivots a print suppression latch-lever out of the way of the shoulder on the print hammer bail. Thus, when the print trip lever releases the bail, its hammer is permitted to strike the typewheel and printing occurs.

4.71 If any function lever moves up to its selected position, it engages one of a series of notches in the print suppression codebar. When the latch releases the codebar, the selected function lever prevents it from moving all the way to its selected position. Thus, the print suppression latchlever is not pivoted and catches the shoulder when the hammer bail is

released by the trip lever. The hammer does not reach the typewheel, and printing is suppressed.

4.72 As the selected function lever moves down and withdraws from the notch in the print suppression codebar, the latch, which has been returned to its stop position, engages a second latching surface on the codebar. This prevents the codebar from rising when the function lever is withdrawn, thus causing printing to occur before the print hammer is completely reset in its stop position. The print suppression codebar is completely reset with the rest of the codebars at the end of the codebar cycle, and at that time the latch engages the first latching surface.

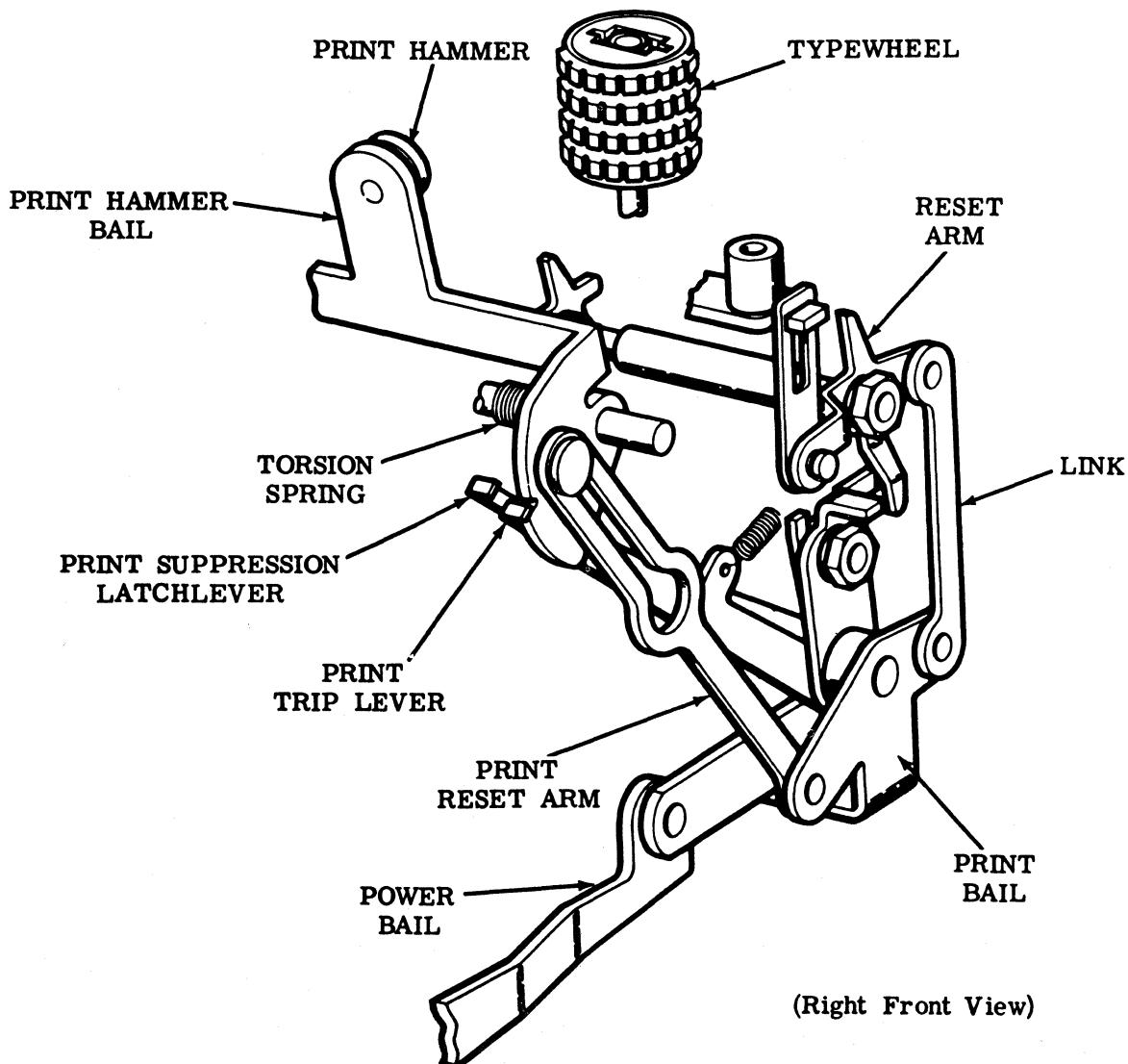


Figure 24 - Printing Mechanism

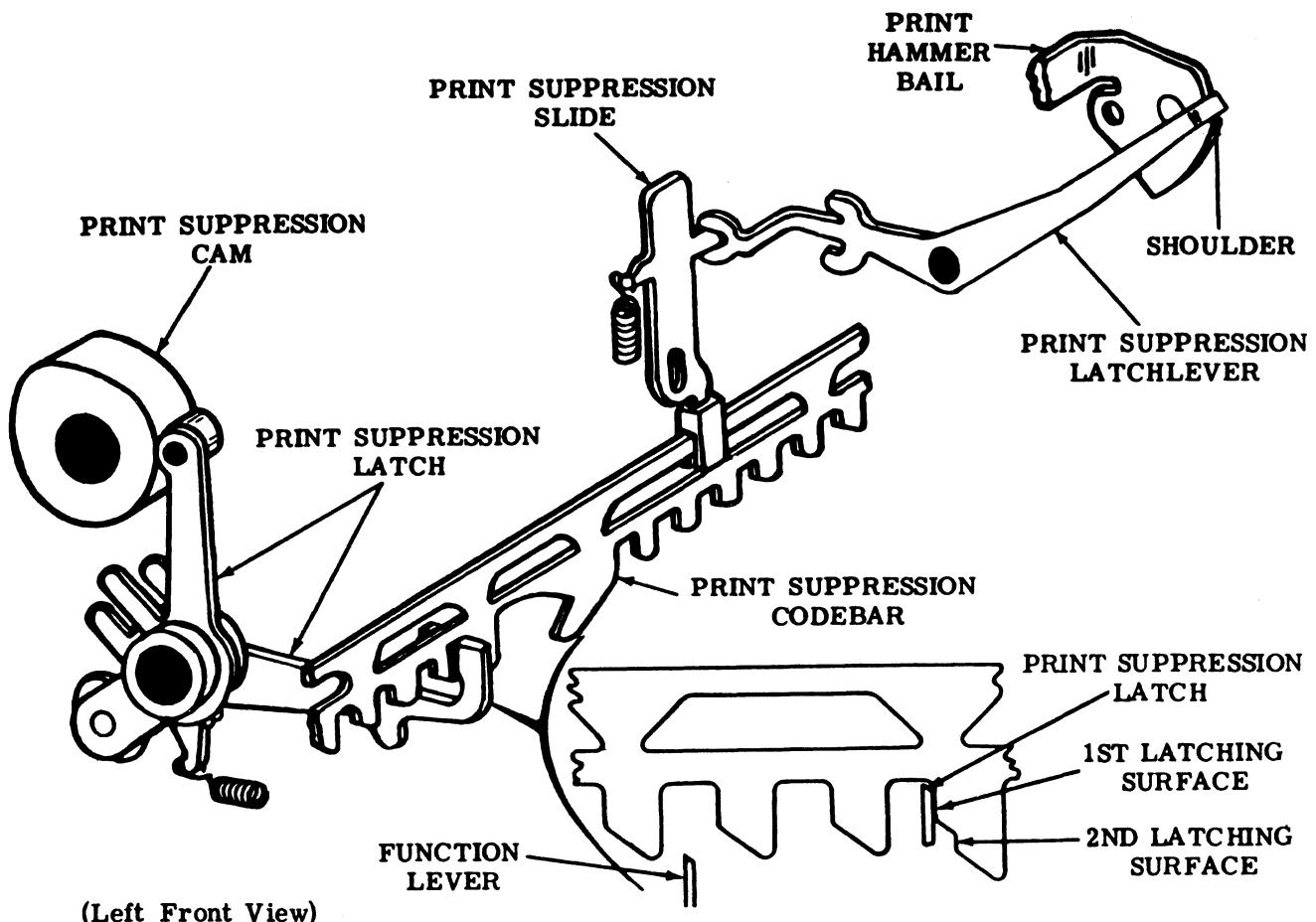


Figure 25 - Print Suppression Mechanism

## L. Ribbon Mechanism

4.73 The ribbon mechanism (Figure 26) supplies the ink for printing. As the typing unit operates, the mechanism feeds the ribbon from one spool to the other, and reverses the direction of feed when the spool is nearly depleted.

4.74 As the power bail rocks during the first part of the function cycle, it pivots a ribbon power lever which moves a ribbon drive lever rearward. A feed pawl rides on the drive lever and acts on a ratchet to rotate a ribbon spool. A check pawl drops into the succeeding tooth and detents the ratchet until it is again rotated during the next operation.

4.75 The mechanism continues to rotate one spool until the other is nearly depleted. An eyelet in the ribbon then engages the ribbon reversing arm. As the eyelet is pulled against the arm, the latter moves to a point where a detent spring shifts it to its alternate position,

where one of its reversing extensions falls ahead of an extension on the feed pawl. As the pawl moves forward during the last half of the cycle, it strikes the arm extension and is pivoted to its alternate position against the other ratchet. In doing so, it strikes an extension on the check pawl and pivots it to its alternate position against the other ratchet. The depleted spool is now rotated to take up the ribbon until the other spool is nearly depleted, when reversal again takes place.

4.76 The ribbon guide, which is spring biased upward is mounted so that it will slide up and down on posts. As the print pivot shaft turns during the first half of the cycle, the two pivot arms permit the guide to rise so that it is between the selected character and the paper midway in the cycle. At this time the print hammer drives the typewheel and the ribbon against the paper. During the last half of the cycle, the pivot arms retract the guide and ribbon to their stop position so that the printed characters are visible.

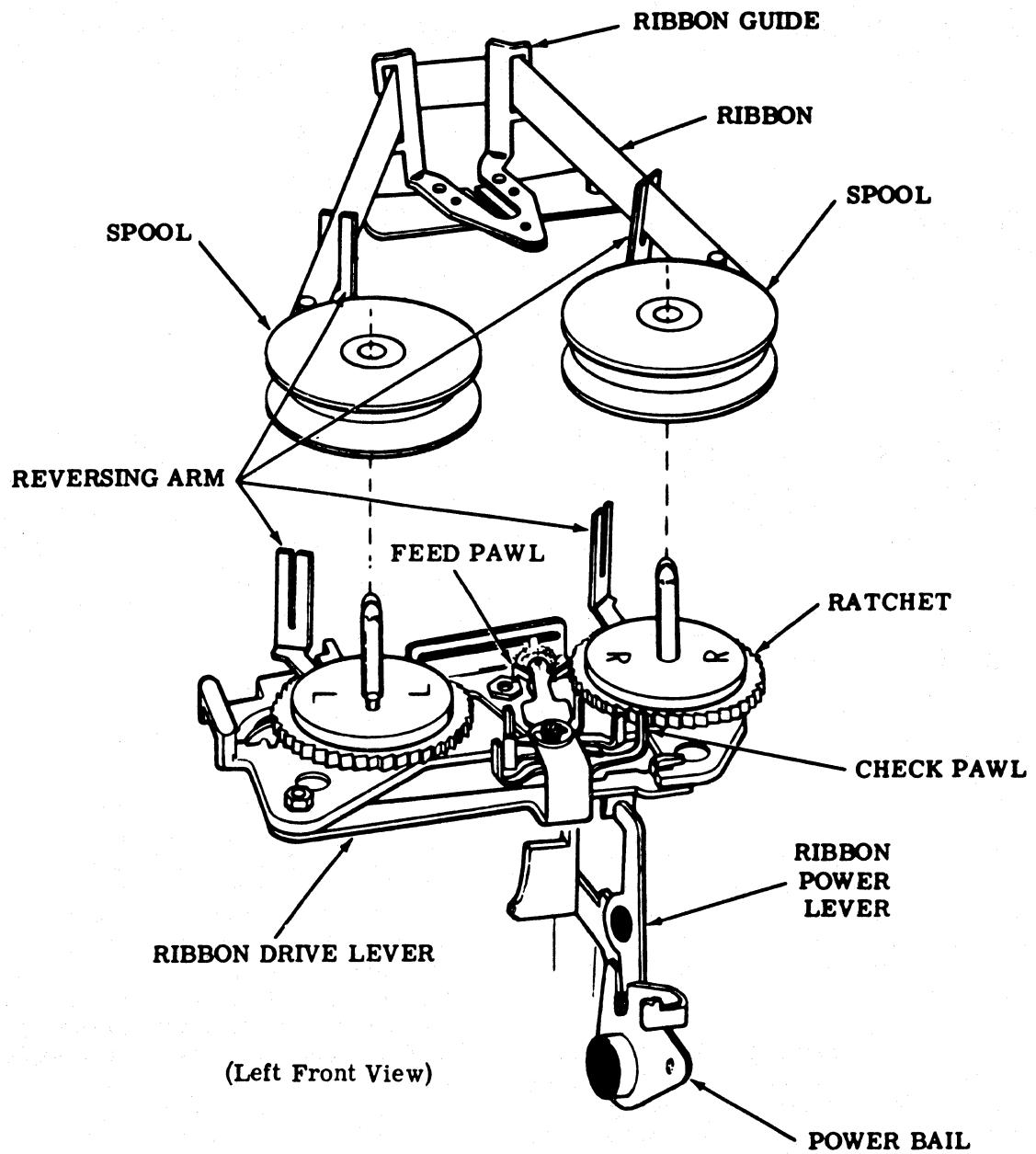


Figure 26 - Ribbon Mechanism

### M. Spacing Mechanism

**4.77** The spacing mechanism (Figure 27) positions the carriage so that the printed characters are horizontally in line on the paper. Each time a character is printed, the carriage is positioned one character to the right. Spacing is suppressed on all functions except "space" when spacing occurs and printing is suppressed. At the end of the printed line, spacing is sup-

pressed and the typing unit overprints. When the "carriage return" function is received, the carriage is returned to the left margin.

**Note:** With the automatic carriage return-line feed feature, spacing is not suppressed at the end of a line. Also, the typing unit does not overprint at the end of a line. The carriage is returned automatically to the left margin when it reaches a predetermined point.

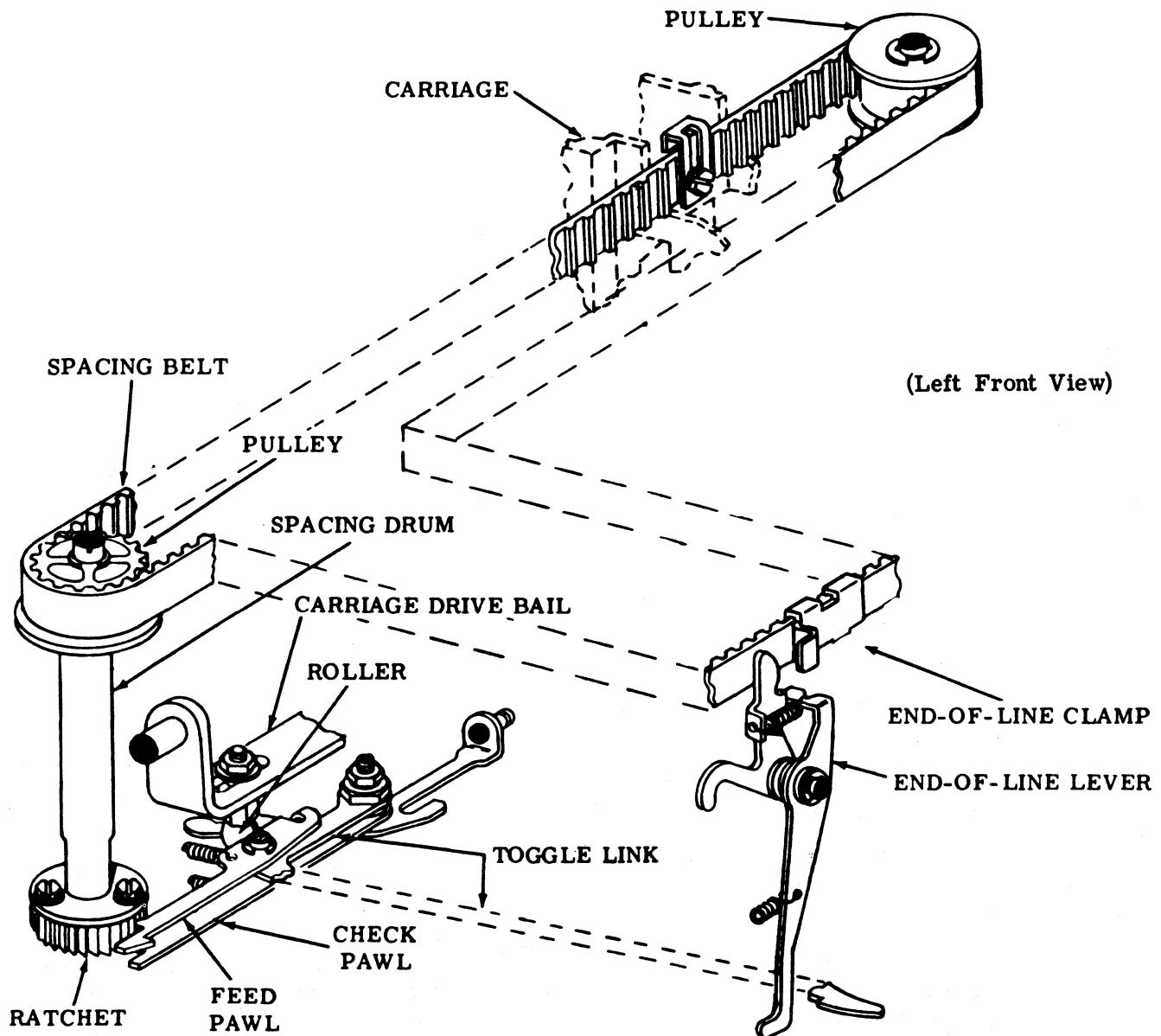


Figure 27 - Spacing Mechanism

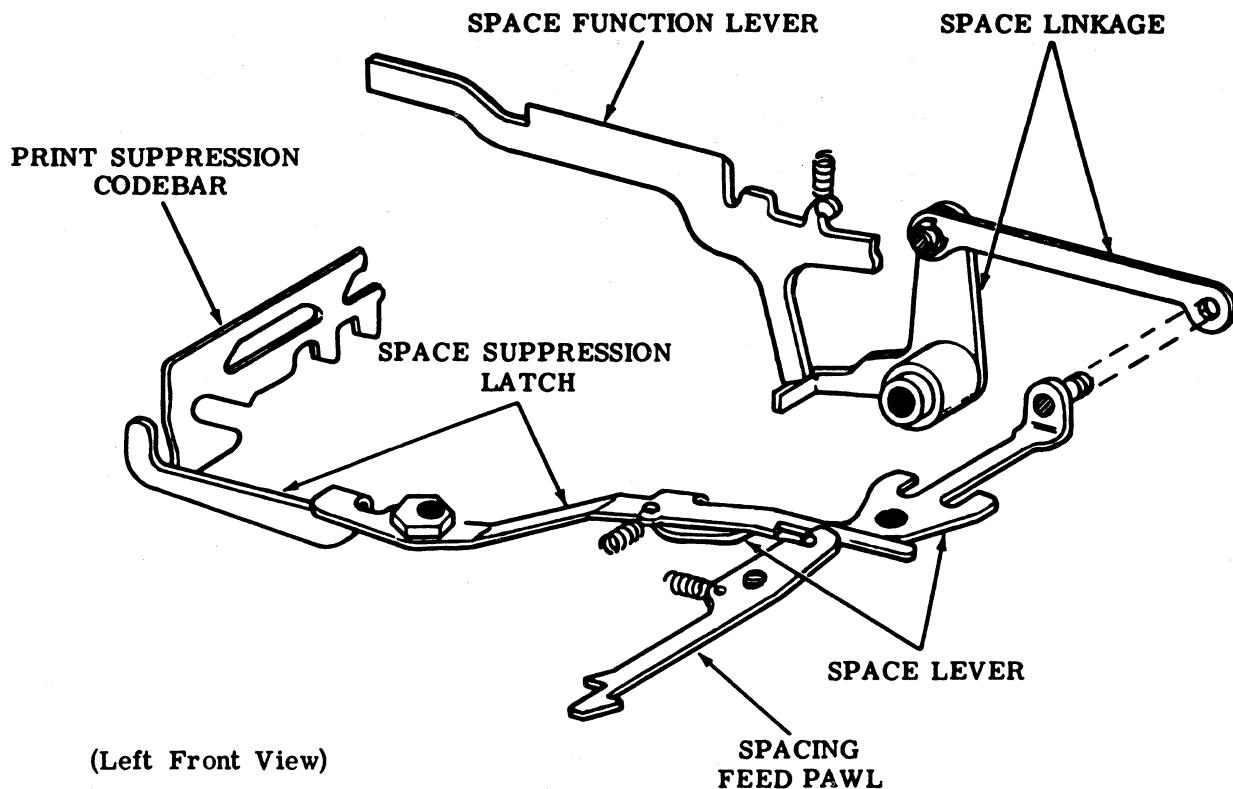


Figure 28 - Space Function and Space Suppression Mechanism

4.78 As the carriage drive bail moves rearward during the first part of the function cycle, a small roller mounted near the left end permits a toggle linkage consisting of a spacing feed pawl and toggle link to buckle rearward under spring tension. The feed pawl moves to the right and engages the next tooth on the ratchet. The ratchet is part of the spacing drum. When the roller moves towards the front during the other part of the cycle, it unbuckles the toggle linkage, and the pawl is moved to the left and rotates the drum one tooth. This motion is imparted by a pulley at the top of the drum to a spacing belt which is looped around a pulley on the right side of the typing unit. The spacing belt in turn moves the carriage to the right one space against the tension of a large carriage return spring. The carriage is held in this position by a check pawl, which engages the spacing drum ratchet.

4.79 When the "space" code combination is received, the codebars permit the space function lever to move up to its selected position early in the function cycle. This motion is transferred, through a space linkage, to a space lever which moves the print suppression latch

out of the way of the toggle linkage. The spacing linkage buckles completely and spacing takes place as described. Printing is suppressed as described in 4.68.

#### N. Space Suppression Mechanism

4.80 On Functions: On every function except "space," spacing as well as printing must be suppressed (Figure 28). When a character to be printed is received, the print suppression codebar moves up and to the left. In doing so it pivots a space suppression latch so that it is moved to the right, out of the way of the toggle linkage. This permits the linkage to buckle and effect spacing.

4.81 On the other hand, when a function is received, the print suppression codebar remains down and to the right, and does not pivot the space suppression latch. In this position, the space suppression latch engages the toggle linkage and prevents it from buckling all the way, and the feed pawl does not move far enough to engage the next tooth. Thus the spacing drum is not rotated, and the carriage is not spaced.

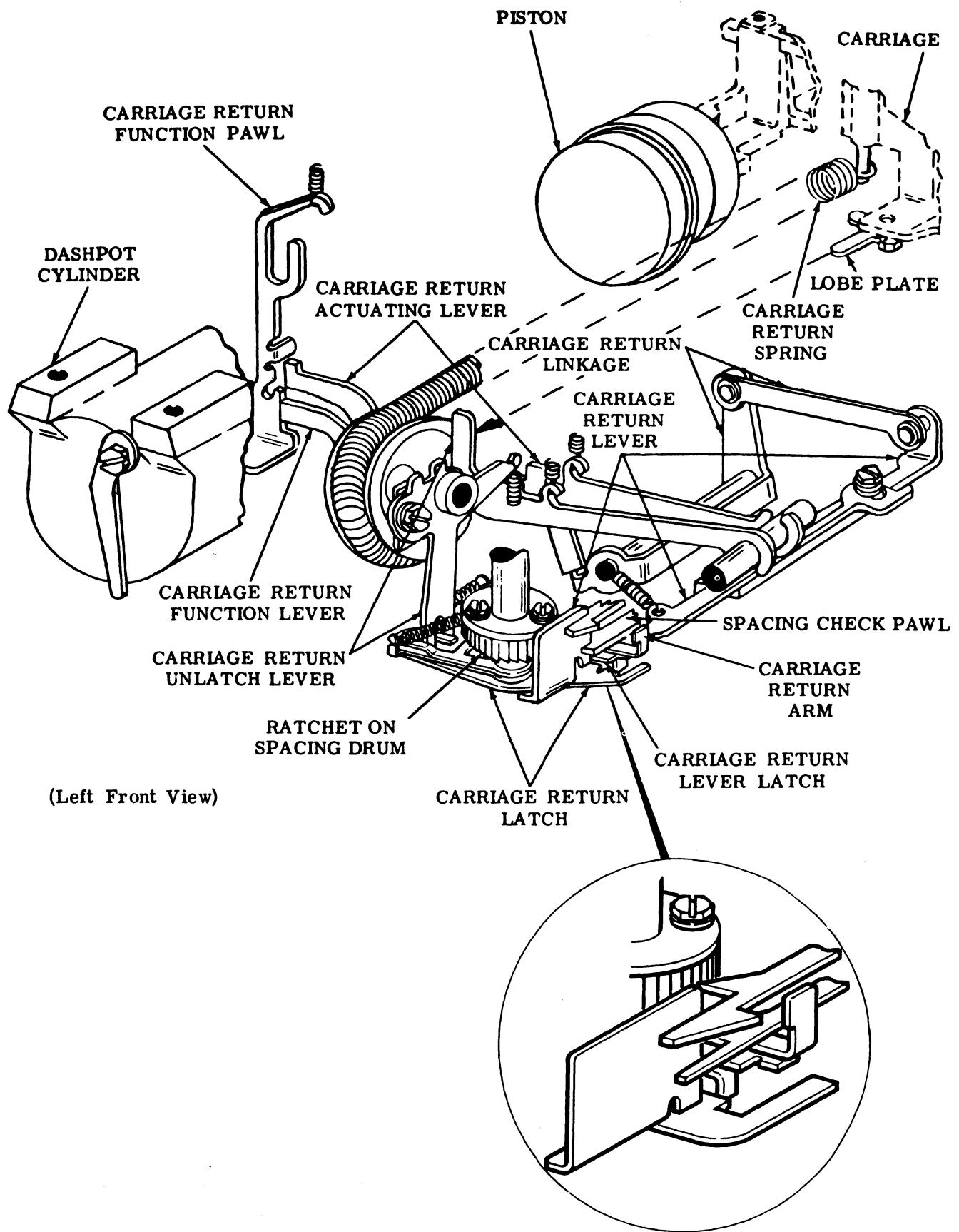


Figure 29 - Carriage Return Mechanism

4.82 At End-of-Line: When the carriage reaches the right margin, a clamp on the spacing belt pivots an end-of-line lever counterclockwise. In this position, a latching surface on the spacing toggle link engages the end-of-line lever and prevents the linkage from buckling and effecting spacing. Thus, spacing is suppressed, and the typing unit overprints at the right margin until the "carriage return" code combination is received.

Note: With the automatic carriage return-line feed feature, spacing is not suppressed at the end of a line. Also, the typing unit does not overprint at the end of a line. The carriage is returned automatically to the left margin when it reaches a predetermined point.

#### O. Carriage Return Mechanism

4.83 The carriage return mechanism is illustrated in Figure 29.

4.84 When the "carriage return" code combination is received, the carriage return function lever moves up to its selected position, and engages the carriage return function pawl. As the function bail moves the lever and pawl down during the middle portion of the cycle, an extension on the pawl drives the carriage return actuating lever down also. This motion is transferred by means of linkages to the carriage return lever. In moving forward the carriage return lever is latched by both the carriage return latchlever and carriage return latch.

4.85 In moving forward the carriage return lever also disengages the spacing pawl and check pawl from the spacing drum ratchet. The carriage return spring then pulls the carriage back to the left margin. As the carriage nears the left margin, a lobe plate on the carriage strikes the unlatch lever. This unlatches the carriage return lever and the carriage return latch. However the carriage return lever remains engaged by the latchlever and cannot move to the rear to allow the pawls to engage. When a code combination is received in which spacing is not suppressed, the carriage return lever allows the feed and check pawls to again engage the ratchet. This is accomplished by the feed pawl moving to the right and back to unlatch the carriage return arm and latchlever from the carriage return lever. The latter, under spring tension, moves toward the rear of

the unit allowing the pawls to engage the ratchet. Late in the function cycle the carriage return function pawl is stripped from its function lever by the stripper bail.

4.86 As the carriage approaches the left margin at relatively high speed, a piston on the carriage enters a dashpot cylinder and compresses the air ahead of it. The air forms a cushion which slows the carriage and then, as it escapes through a small, variable hole at the left end of the cylinder, permits the carriage to be stopped at the left margin without excessive shock.

#### P. Paper or Form Feeding

4.87 The paper feed mechanism used on friction feed typing units is illustrated in Figure 30.

4.88 The paper feed mechanism vertically positions the paper so that the printed characters are properly located in lines on the paper. It feeds the paper on receipt of the "line feed" code combination. It may be adjusted for either single or double line feed.

4.89 The paper feeds off a roll and is led around a platen that vertically positions it in front of the typewheel. A paper guideplate leads it down around the platen. A pressure roller, which sits in a cutout in the guide, holds the paper against the platen so that it feeds when the platen rotates. A curved wire shaft biases the pressure roller and the guideplate against the paper. The pressure is released by a lever on the right end of the shaft. The paper is held around the front of the platen by a wire guide and is led up out of the typing unit by a deflector guide. It can be manually fed by a knob on the left end of the platen.

4.90 When the "line feed" code combination is received, the codebars permit the line feed function lever to move up to its selected position early in the function cycle. The function lever, in turn, moves up a line feed blocking lever to engage the latching surface of a line feed drive link. As the left drive arm on the function rocker shaft moves down, a line feed arm engages the blocking lever and moves it down. This motion is transferred, through a line feed linkage, to a pawl which engages a ratchet on the left end of the platen. The pawl rotates the platen which feeds the paper up one or two lines depending on how the mechanism is adjusted.

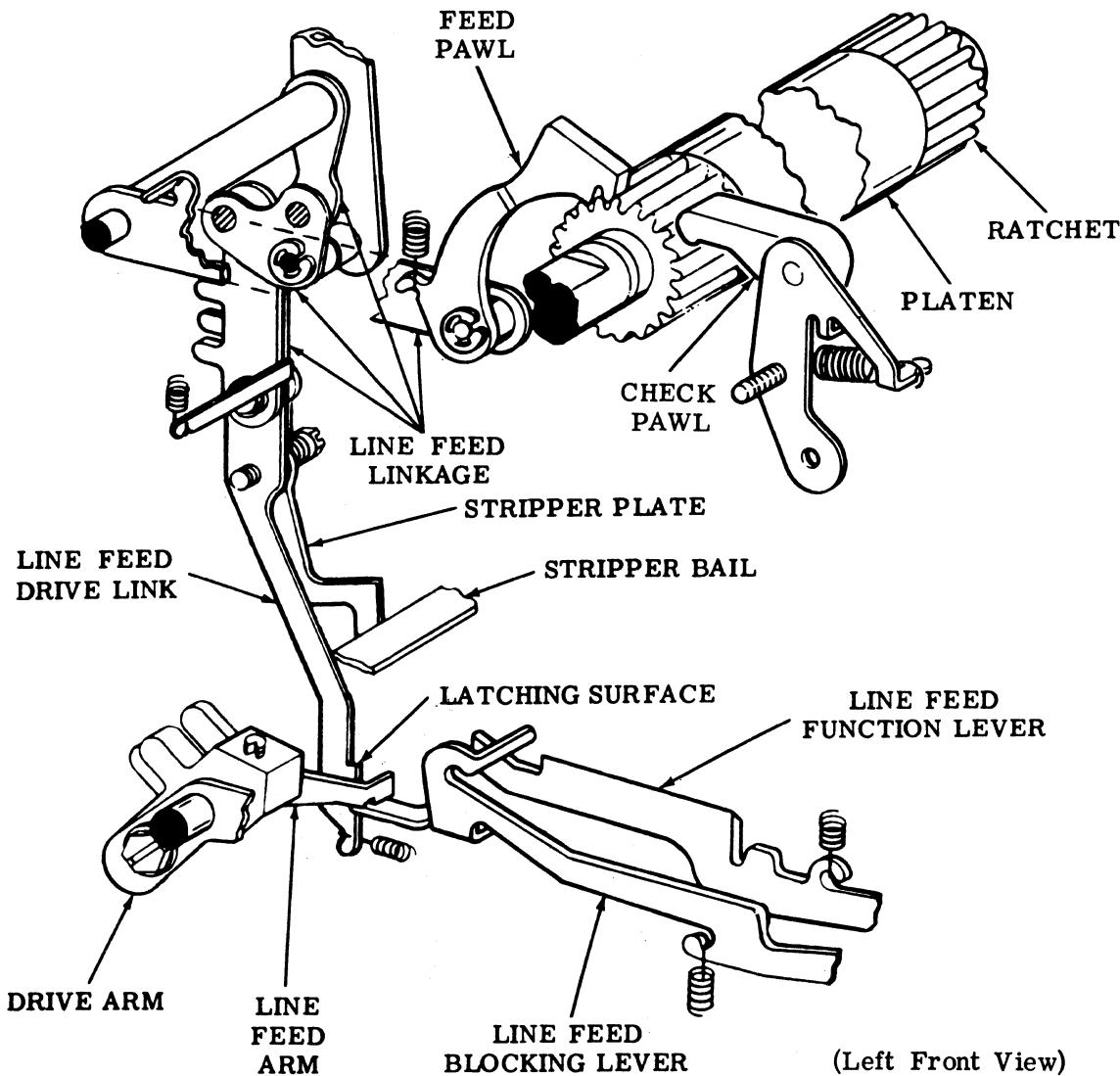


Figure 30 - Paper Feed Mechanism (Friction Feed)

**4.91** The feed pawl is guided into the teeth of the platen ratchet by two posts. A check pawl riding on the ratchet at the left side of the platen holds the platen firmly until the platen is again rotated. At the end of the cycle, the function stripper bail contacts a stripper plate and strips the drive link from the blocking lever.

#### Q. Sprocket Feed Typing Units

**4.92** The platen drive mechanism (Figure 32) rotates the platen for vertical positioning so that the printed characters are properly located in lines on the forms. The platen drive mechanism is activated through the form-out and form-feed mechanisms (Figures 31 and 33),

and controlled by the form-feed clutch. It feeds forms upon receipt of either the "line feed" or "form out" code combination and may be adjusted for single or double line feed.

**4.93** Forms feed from a conveniently located stack of forms. They feed under a paper roll spindle and, if used, a low-paper arm and a paper-out arm. From here, the forms, led by a paper guideplate, engage sprocket pins and advance between the platen and two paper guides until vertically positioned in front of the type-wheel. The two paper guides and a wire guide hold the forms to the front of the platen and insure that the forms advance around the platen while moving up and out of the typing unit. As the forms move out of the typing unit, they go

over the paper roll spindle, which separates incoming from outgoing forms.

**Note:** Forms can be manually fed by depressing the center knob and rotating the platen knob located on the left end of the platen.

**4.94 Form Feed:** When the typing unit receives the "line feed" code combination, the line feed function lever (Figure 31) moves up to engage the line feed function pawl in slot

no. 13. The function pawl, by means of a lug, connects with the line feed strip pawl in the adjacent slot on the function casting (slot M). During the function cycle the function pawl engages and pulls down the strip pawl. The strip pawl pivots the line feed lever. An extension on the line feed lever contacts the trip lever extension which pivots the clutch trip lever away from the shoe lever on the form feed clutch. The clutch engages and the typing unit advances the form for single or double line feed by means of the platen drive mechanism.

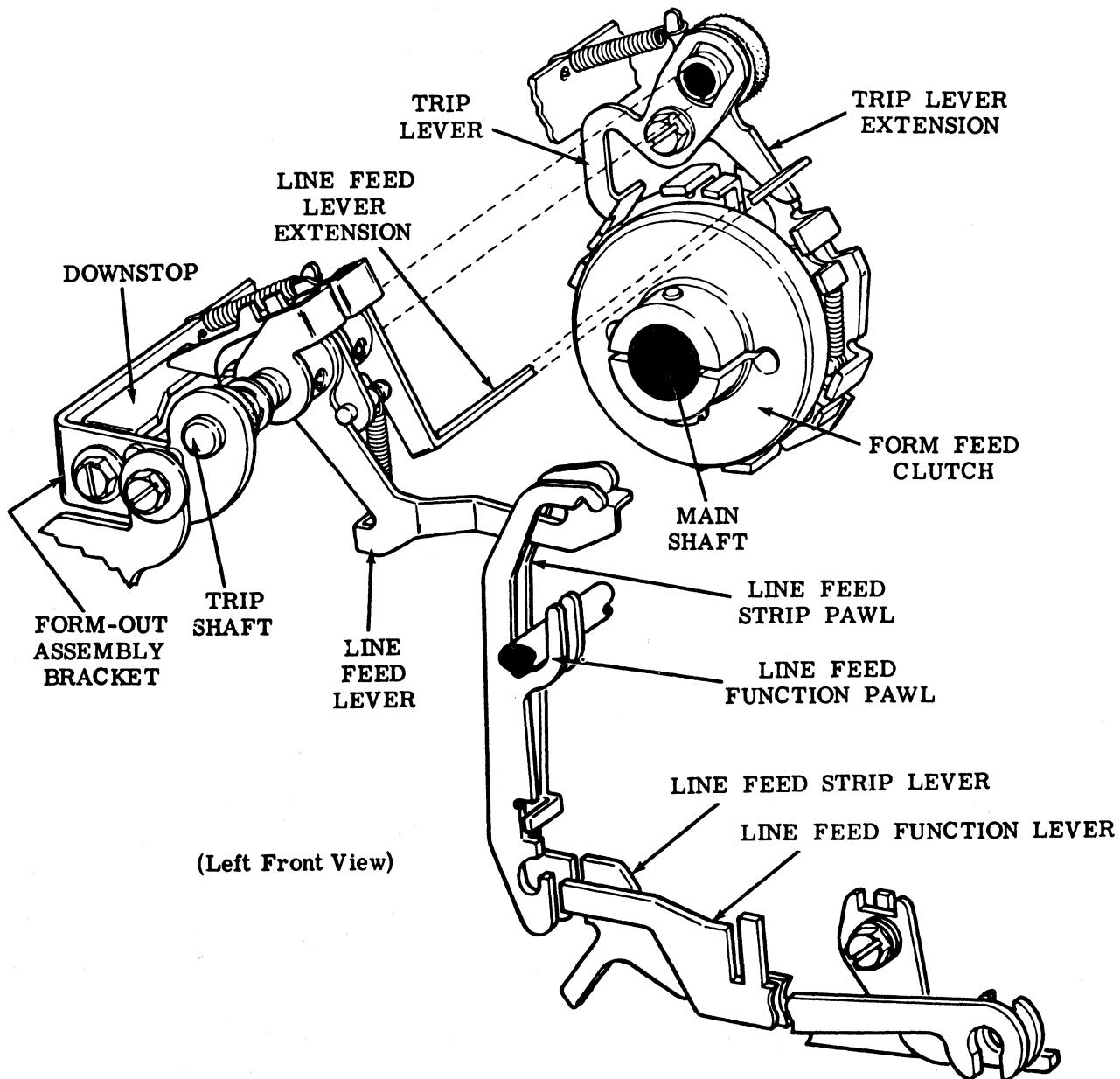
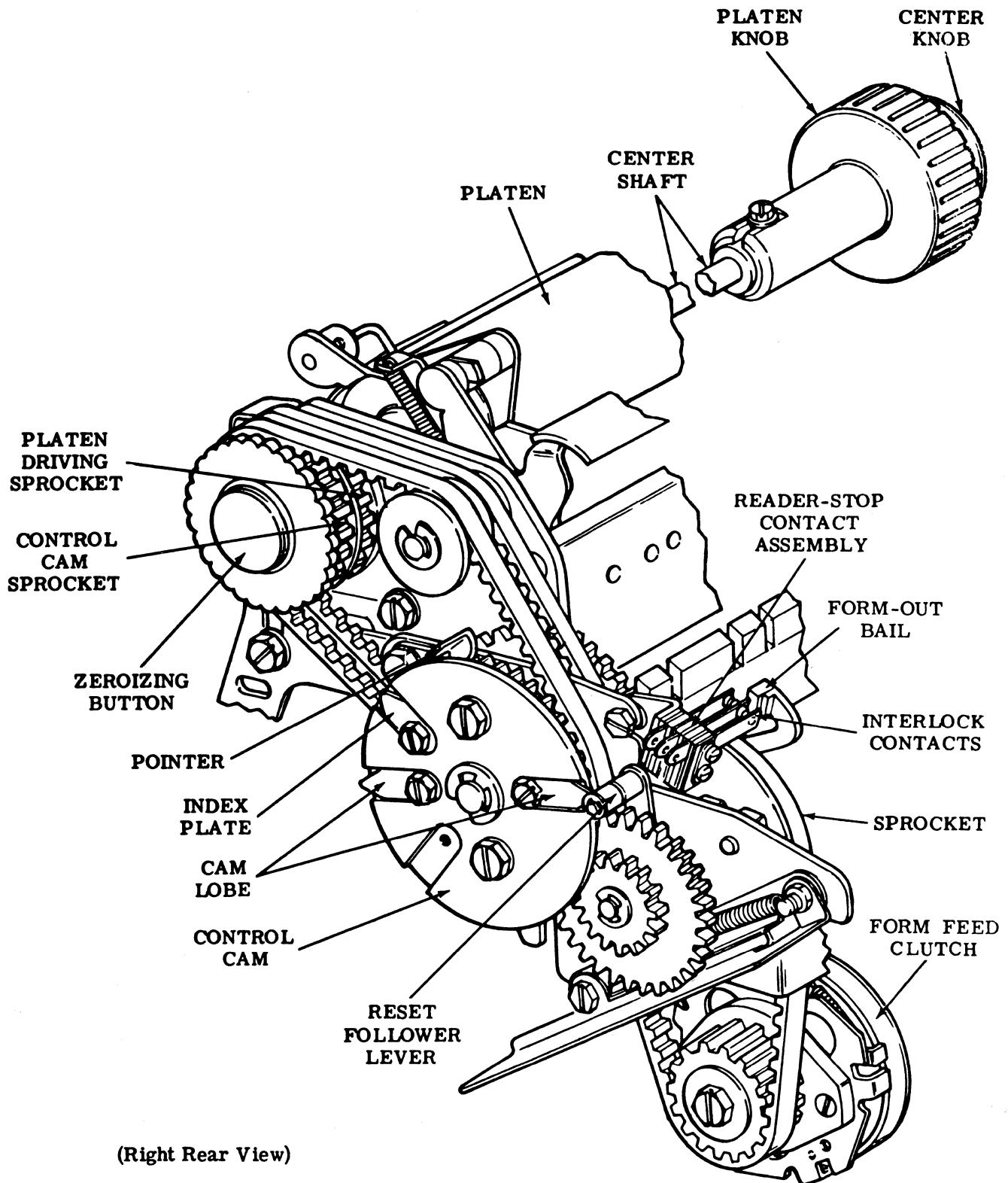
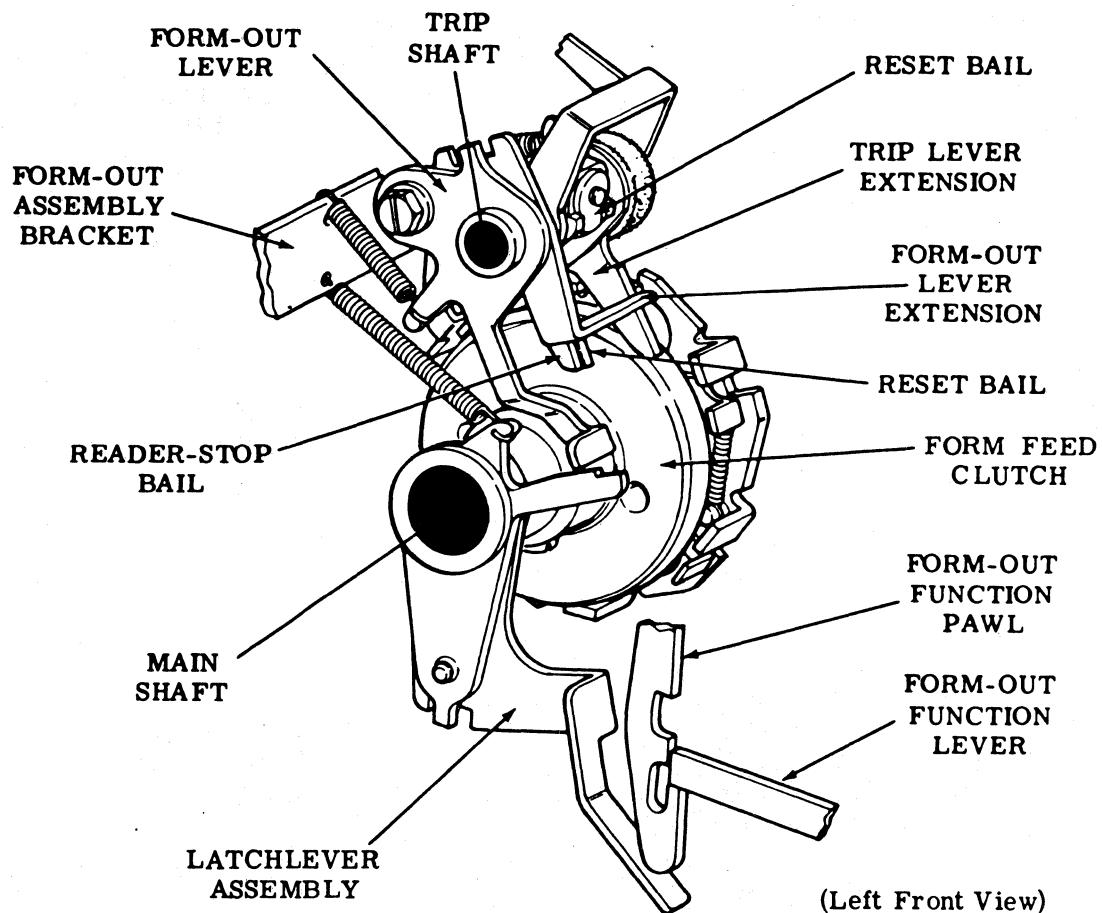


Figure 31 - Form-Feed Mechanism (Sprocket Feed)



(Right Rear View)

Figure 32 - Platen Drive Mechanism (Sprocket Feed)



(Left Front View)

Figure 33 - Form-Out Mechanism (Sprocket Feed)

4.95 Late in the function cycle the strip pawl strikes the tail of the line feed strip lever and moves to the rear. The lug on the strip pawl moves the function pawl to the rear, disengaging it from the function lever. Due to spring tension the line feed lever and its extension return to their front position. The trip lever strikes the clutch shoe lever and the clutch is disengaged.

4.96 The number of lines the form advances depends on how much the clutch rotates before it is disengaged. If the clutch becomes disengaged at the first shoe lever, the form will advance one line; if the clutch becomes disengaged at the second shoe lever, the form will advance two lines; and so on. The amount of clutch rotation depends on how soon the strip pawl comes in contact with the line feed lever. This time will depend upon the distance between the strip pawl and the line feed lever. When the distance is small the clutch will trip and engage sooner, rotating a greater amount before it is disengaged. Double line feed will result. If the

distance is greater the clutch will trip and engage later, rotating a smaller amount before it is latched. Single line feed will result.

4.97 Form-Out: When the typing unit receives the "form out" code combination, the form-out function lever (Figure 33) moves up to engage the form out function pawl in slot no. 14. During the function cycle the pawl is pulled down. This action pivots the latchlever assembly which becomes disengaged from the form-out lever. Due to spring tension the form-out lever pivots to the rear. An extension on the form-out lever pivots the trip lever extension which in turn moves the clutch trip lever away from the clutch shoe lever. The form feed lever engages and remains engaged throughout the form-out cycle.

4.98 When engaged the clutch drives the platen drive mechanism which consists of belts, gears, and sprockets. The platen drive mechanism is illustrated in Figure 32.

4.99 As long as the form-out lever stays pulled to the rear by spring tension, the form will advance except as regulated by the control cam of the platen drive mechanism. Whenever the platen rotates, the control cam, being related to the platen by belts and gears, also rotates. The rotating cam, through cam lobes, a reset follower lever, and a reset bail initiates the action to terminate the advance of the platen and thus the form-out cycle.

4.100 When a cam lobe contacts the reset follower lever and rotates it toward the rear, a reset bail also rotates and pivots the form-out lever extension away from the trip lever extension. The trip lever engages a shoe lever and disengages the clutch, terminating form-out.

4.101 With the form-out just terminated the reset follower lever remains on the high part of a cam lobe, and the form-out lever is blocked by the reset bail from rotating to its latched position. When a "form feed" code combination is received, however, the control cam rotates and the reset follower lever moves from the high part of the cam lobe. This causes the reset bail to rotate downward and move away from the form-out lever extension. As a result, the form-out lever is permitted to latch. The typing unit can now receive another "form-out" command.

**Note:** It is in order to allow the cam lobe to clear the reset follower lever that a "form feed" command is given before another form-out cycle can begin.

4.102 The gearing on the platen drive mechanism varies to accommodate various size forms.

4.103 When the platen drive mechanism advances the form one or two lines during "form feed" the cam lobe rotates an equivalent distance. Then, when "form-out" is received the rest of the form will be advanced with the cam lobe merely rotating until it strikes the reset follower lever.

4.104 The control cam can have three lobes with the result that the form may be advanced one-third the distance for which the gears were installed. For example, if the gears on the platen drive mechanism were designed to advance a form of a certain length, by installing cam lobes, this length can be varied to smaller lengths.

4.105 When an Automatic Send-Receive Teletypewriter Set receives a "form-out" code combination, the form-out bail (Figure 32) is rotated toward the front by the form-out lever extension. This action causes the interlock contacts of the reader stop contact assembly to be operated with the following results:

(a) A pair of normally closed contacts are opened during the "form-out" function. This stops the tape reader from transmitting and prevents characters "on the fly" from being printed.

(b) A pair of normally open contacts are closed. This keeps the typing unit motor operating in case the typing unit is turned off before the form-out cycle is completed. Thus, synchronization of the forms is maintained.

4.106 The form can be manually advanced any length by pressing the zeroizing button on the platen (Figure 32). This will disengage the platen from the platen drive sprocket and allow it to rotate freely.

#### R. Margin Bell and End of Line Bell

4.107 **Margin Bell:** As the carriage moves to the right during printing, the carriage upper rear roller makes contact with and depresses a latch which is secured to a lever mounted on the rear rail. As the latch is depressed, the lever is rotated and moves the automatic carriage return-line feed codebar to the right a short distance, where a notch in the codebar permits the bell function lever to move up to its selected position, where it is latched by its function pawl. During the middle portion of the function cycle, the lever moves the pawl down against the pressure of the latter spring. When the stripper bail strips the pawl late in the function cycle, the pawl moves up and causes a clapper mounted on a wire spring to snap up and ring a gong.

4.108 **End of Line Bell:** End of line bell operation proceeds in the same manner as above, except that a projection on the carriage picks up the automatic carriage return-line feed codebar at a predetermined point and moves the codebar to the right a short distance until a notch in the codebar permits the bell function lever to move up to its selected position.

→ Automatic Carriage Return-Line Feed (Friction Feed)

4.109 As described for the end of line bell (4.108), the carriage picks up the automatic carriage return-line feed codebar at a pre-determined point and moves it to the right. When the carriage reaches the right margin, a notch in the codebar permits an automatic carriage return-line feed function lever to move up to its selected position, where it is latched by its function pawl.

4.110 The automatic carriage return-line feed function lever, in turn, moves the line feed blocking lever up to where it is latched by the line feed link. Line feed then occurs as described in 4.87 through 4.91 and 4.94 through 4.96.

4.111 When the automatic carriage return-line feed function lever and its function pawl are pulled down during the middle portion of the cycle, the pawl encounters an extension on the carriage return function pawl and moves it down. Carriage return then occurs as described in 4.83 through 4.86.

→ Automatic Carriage Return-Line Feed (Sprocket Feed) (Figure 34)

4.112 Automatic carriage return-line feed in 3300 Series Coded Sets' sprocket feed typing units involves the action of the automatic codebar. The automatic codebar has projections on the right which can be removed to vary the line length and return the carriage on the 69th or 72nd character. The automatic codebar also has two slots on the underside, one associated with the automatic carriage return function lever and one towards the right associated with the automatic line feed function lever.

4.113 As the carriage approaches the right margin the carriage strikes the projection of the automatic codebar, moving it to the right. This allows both the automatic carriage return function lever and the automatic line feed function lever to move up.

4.114 As the automatic carriage return function lever moves up it engages its associated function pawl and carriage return proceeds as described in 4.84 thru 4.86. As the automatic line feed function lever moves up it engages its associated function pawl. As the automatic line feed function pawl moves downward it drives the

line feed strip pawl downward by means of the extension on the line feed strip pawl. An extension on the line feed lever controls the trip lever extension which pivots the clutch trip lever away from the shoe lever on the form feed clutch. The downward movement of the line feed strip pawl drives the line feed lever downward, tripping the form feed clutch. The clutch engages and the typing unit advances the form for single or double line feed. Near the end of the function cycle the line feed strip pawl strikes the projection of the line feed strip lever and moves towards the rear. Moving rearward the extension moves the automatic line feed function pawl to the rear which disengages it from its function lever.

## S. Answer-Back Mechanism

4.115 The answer-back mechanism illustrated in Figures 36, 37, and 38 automatically transmits a predetermined sequence of characters for identification purposes.

4.116 A drum is coded with characters making up the answer-back sequence. When the answer-back mechanism is actuated, it rotates the drum, which sets up the code combinations in a set of answer-back contacts. The distributor converts the positions of the contacts to start-stop signals for transmission. After the answer-back sequence has been transmitted, the answer-back mechanism returns itself to its unoperated condition. For reasons that will be described, provisions are made for shunting the signal line during sensing of the first answer-back character of each cycle; and to prevent the answer-back from being actuated by the local generation of the answer-back call character.

4.117 The answer-back drum illustrated in Figure 35 has 11 levels as follows:

- (a) Five numbered levels
- (b) Feed ratchet
- (c) Stop cam
- (d) Character suppression
- (e) Three more numbered levels

4.118 Viewing it from the numbered end, the answer-back drum has 21 rows, ST (start) and 1 through 20. The feed ratchet serves to rotate the drum. The stop cam has tines

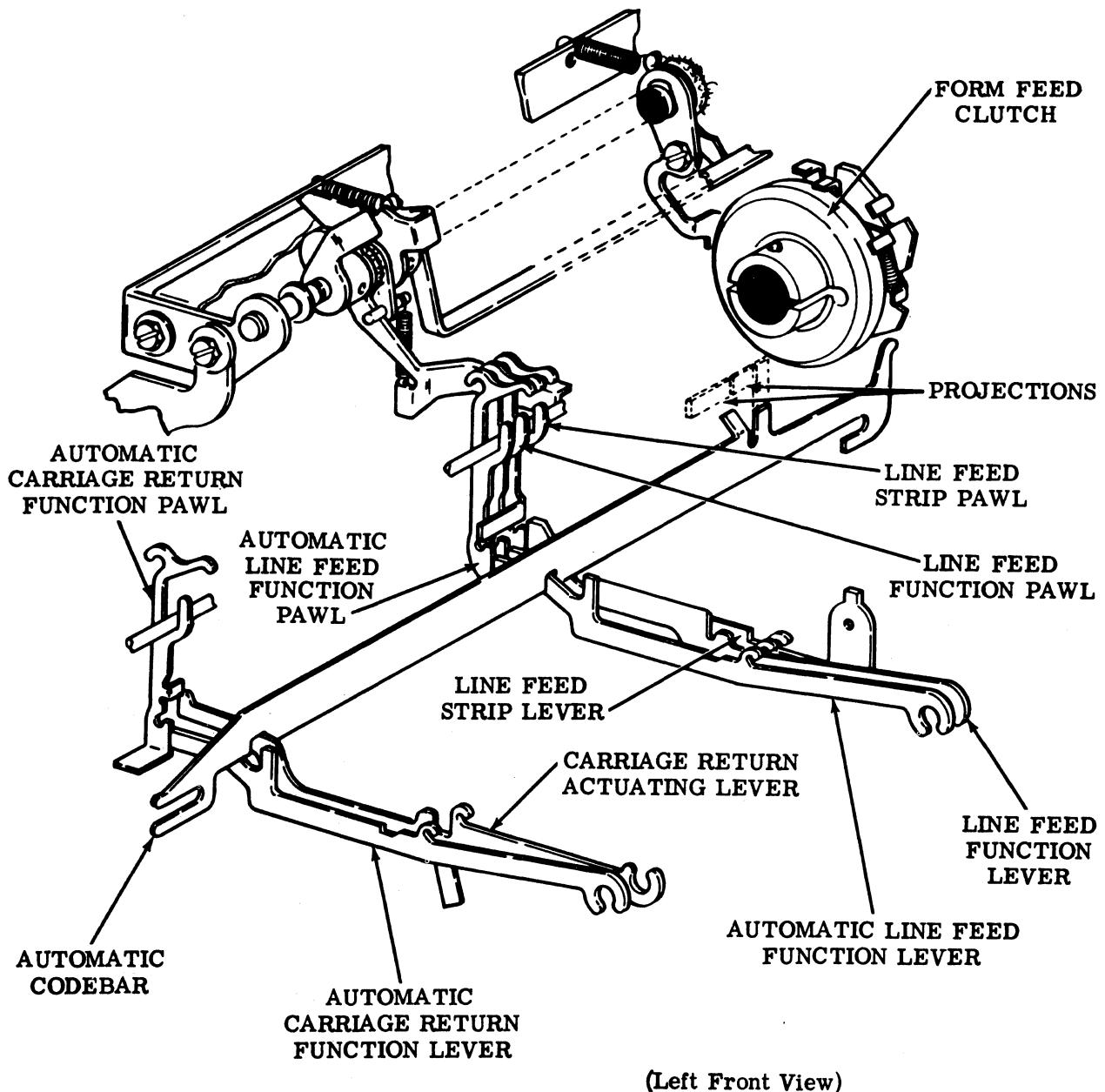
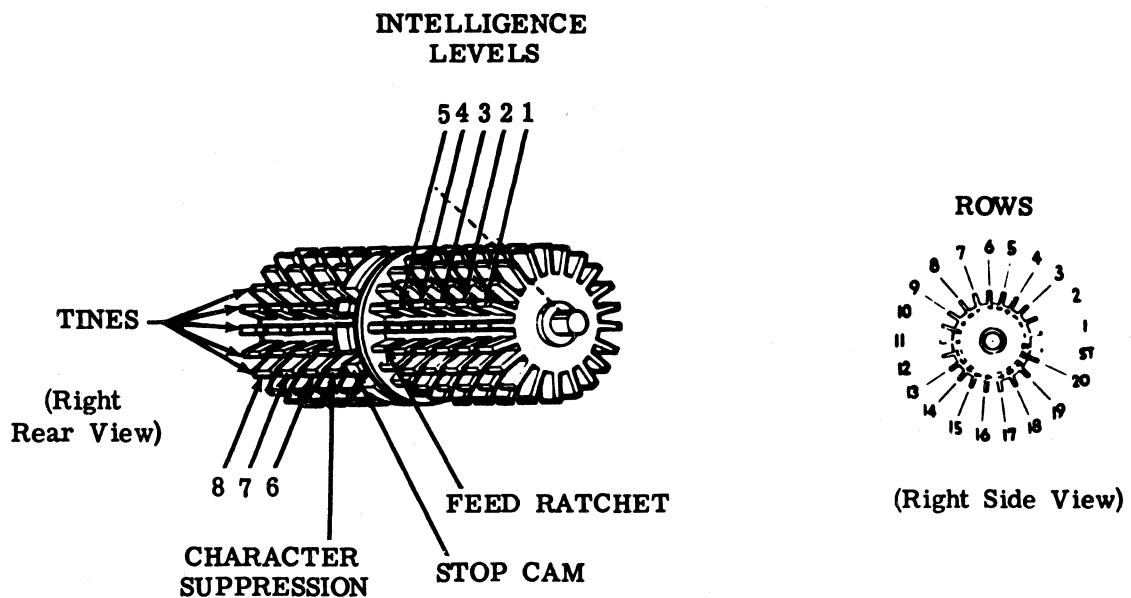
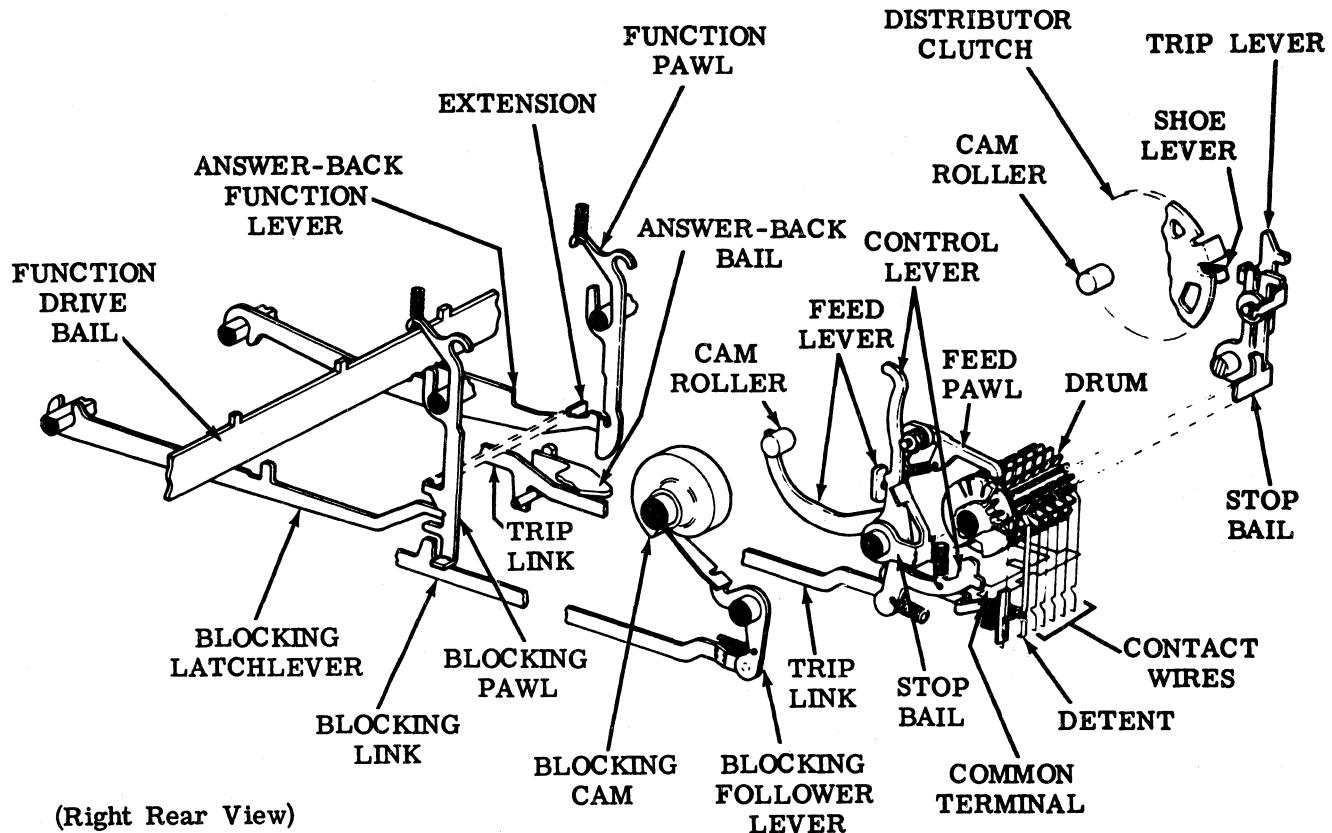


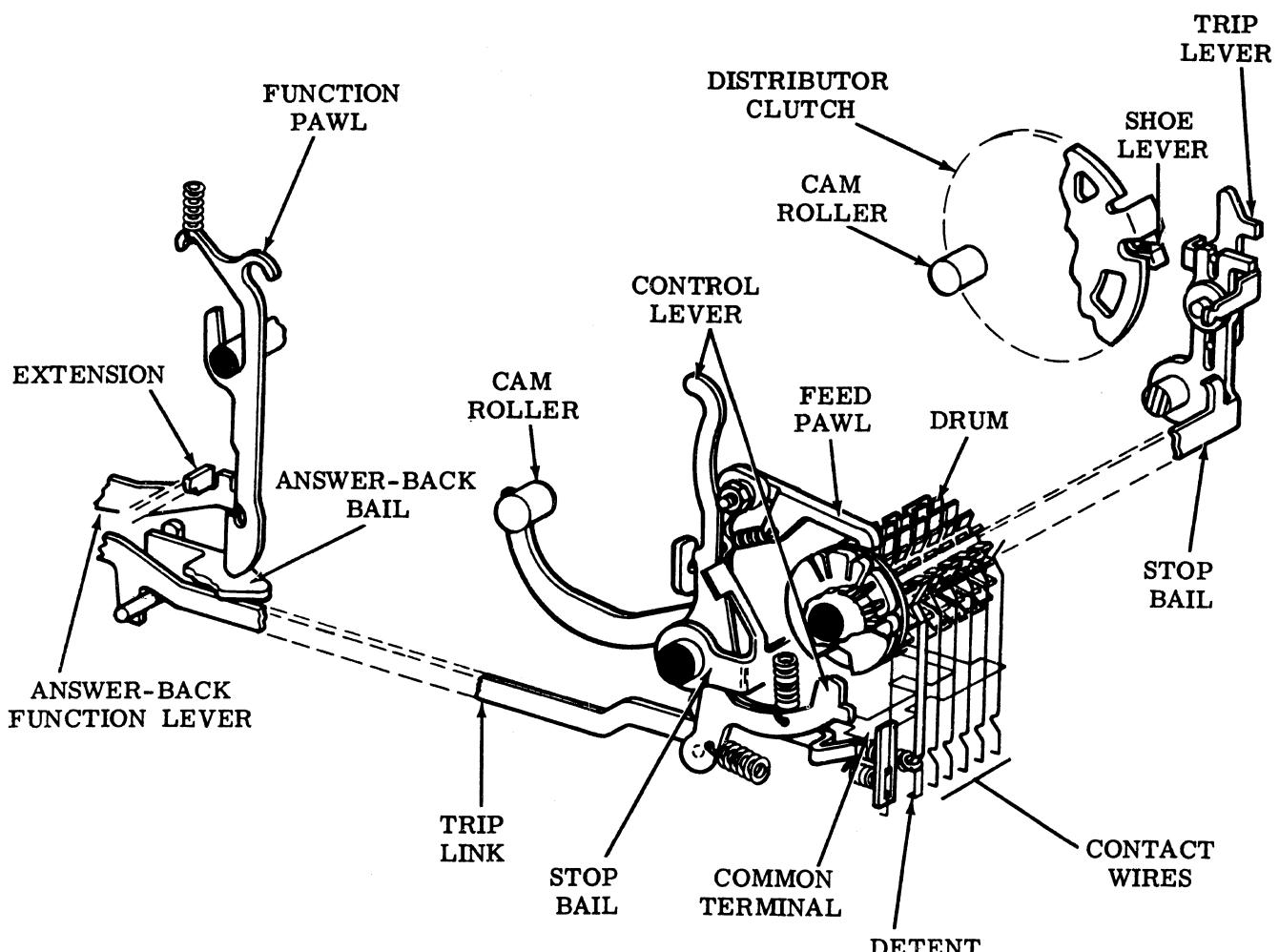
Figure 34 - Automatic Carriage Return-Line Feed Mechanism  
(Sprocket Feed)



**Figure 35 - Answer-Back Drum**



**Figure 36 - Answer-Back Mechanism Remote Actuation**



(Right Rear View)

Figure 37 - Answer-Back Mechanism Local Actuation

which can be removed at various points so that the length of the answer-back message can be varied. The character suppression level is used to shunt the first answer-back character from the signal line. By breaking off tines in the various rows at the numbered intelligence levels, the drum may be coded to generate the proper answer-back characters. For example, if the first character of an answer-back message to be transmitted is the letter D code combination (--3---7-), tines at the no. 3 and no. 7 levels should be broken off in the appropriate row where the answer-back message is to start. The second character of the message would be coded into the next succeeding row.

Note 1: All answer-back messages should be preceded by the "carriage return," and "line feed" code combinations.

Note 2: For details on answer-back drum coding refer to the adjustment Section 574-122-700TC.

4.119 The answer-back mechanism can be actuated in three ways.

- Remotely, by the reception of a pre-determined call character.
- Locally, by depressing the HERE IS key.

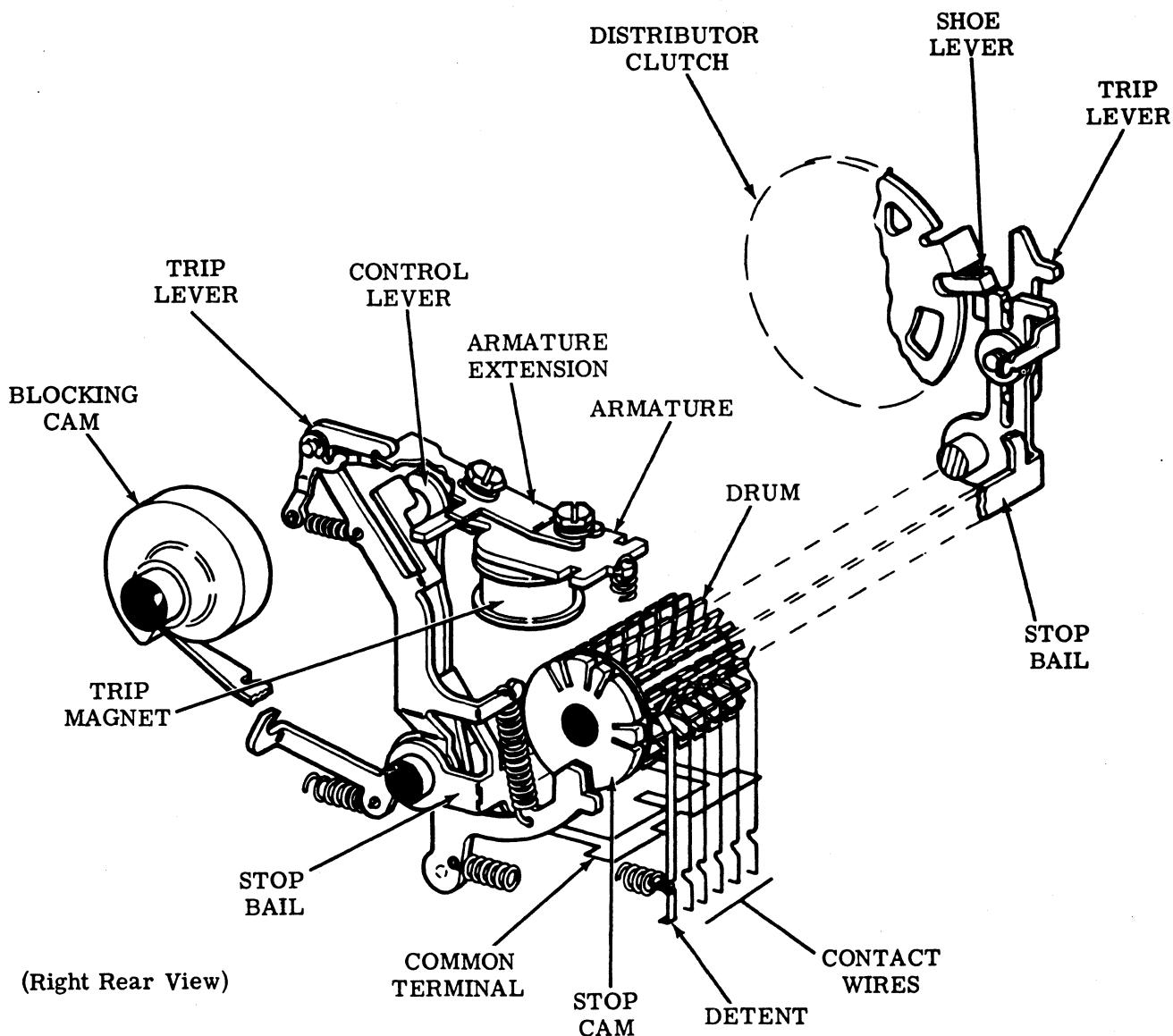


Figure 38 - Answer-Back Mechanism Automatic Actuation

- (c) Automatically, by actuating the answer-back trip magnet mechanism from some external equipment, such as a data set.

**4.120 Remote Actuation (Figure 36):** When the answer-back call character is received by the typing unit, the answer-back function lever moves up to engage its function pawl. As the function lever and pawl are moved down by the function bail, the pawl pivots the answer-back bail. In pivoting, the answer-back bail moves a trip link forward. The trip link pivots the control lever out of the indentation on

the stop cam. The control lever, through the stop bail, moves the trip lever rearward, out of engagement with the shoe lever, allowing the distributor clutch to engage.

**4.121** When the distributor clutch begins to rotate, a cam roller moves up and permits the feed lever to pivot rearward against the control lever. The feed pawl attached to the feed lever moves rearward to engage the next tooth on the drum ratchet. Near the end of the function cycle the function pawl is stripped from its function lever by the stripper bail. The

control lever, under spring tension, tends to return to its unoperated position in the indentation of the stop cam. This would terminate the answer-back operation by disengaging the distributor clutch. However, since the feed pawl is engaged with the next tooth on the ratchet, the spring tension on the control lever is not enough to overcome the combined tension of the feed lever spring and the drum detent. Thus the mechanism remains in its operated condition throughout the distributor cycle.

4.122 Near the end of the distributor cycle, the cam roller on the distributor clutch moves the feed lever and feed pawl forward, and the pawl acts on the ratchet to rotate the drum one tooth. The stop cam on the drum now prevents the control lever and trip lever from returning to their stop position. The distributor clutch thus continues to cycle and rotates the answer-back drum.

4.123 The answer-back contacts are wired in parallel with the keyboard contacts to the segments of the distributor disc. As the drum rotates during the answer-back operation, the contact wires, under spring tension, sense each row of tines. If a tine has been broken off at a given level in a row, the associated wire moves forward to its marking position against a common terminal. On the other hand, if a tine is present, it holds the wire away from the terminal in its spacing position. As the distributor clutch cycles, the distributor converts the positions of the contacts to sequential start-stop signals for transmission.

4.124 The drum continues to rotate until the next indentation in the stop cam is presented to the control lever. The latter then moves into the indentation and returns the associated parts to their unoperated position. The shoe lever then strikes the trip lever and disengages the distributor clutch. The mechanism is thus returned to its unoperated condition.

4.125 Local Actuation: When the HERE IS keytop is depressed on the keyboard, it pivots a bellcrank which moves the trip link forward. The trip link pivots the control lever to its operated position and the answer-back proceeds as described in remote actuation (4.120).

4.126 Automatic Actuation: The answer-back mechanism of a distant station may be actuated by completing a connection through the

local data set or some other equipment. The trip magnet on the distant station is energized. Being energized it attracts the trip magnet armature which allows the trip lever to move forward. A tab on the trip lever pivots the control lever out of the indent of the stop cam allowing the clutch to engage. As the clutch rotates the blocking cam also rotates. A blocking follower rides the blocking cam and rotates clockwise. By means of a tab the blocking follower rotates the trip lever which latches against the de-energized armature extension. It remains in this position until the magnet is again energized.

4.127 Since the answer-back, keyboard, and tape reader (where used) contacts are wired in parallel with the distributor disc, the answer-back contacts must all be in their spacing position when the mechanism is unoperated, so that they do not interfere with keyboard or tape reader transmission. Therefore, because the answer-back feed mechanism does not feed the drum until near the end of the first cycle, the first character sensed should be all spacing to prevent garbling of the regular message sent from the keyboard and/or tape reader. However, an all "spacing" character is undesirable in some systems. Therefore, a way is provided for shunting transmission from the signal line during the sensing of the first answer-back character.

4.128 As mentioned, the trip link moves forward when the answer-back sequence is initiated and remains there until it is terminated. In this position it permits a character suppression contact wire to sense the drum character suppression level. The character suppression contact is wired so that it shunts transmission from the outgoing signal line when it is closed. The tine at the character suppression level of the first character of each answer-back cycle must always be broken off in order to accomplish this. Thus the character suppression contact wire is selected and keeps the line marking until the second character is sensed. The tines are left in the character suppression level in other rows, except for certain conditions, such as to correct coding errors and to vary the message length. This allows, in effect, one character delay before the message coded into the answer-back drum is transmitted. At the end of the operation, the trip link again moves rearward and holds the contact wire unselected while the mechanism is unoperated.

**4.129 Answer-back Suppression on Transmission:** Since the typing unit receives every code combination that it transmits, the sending of the answer-back call character would actuate the local answer-back as well as the one at the distant station. To prevent this, a blocking mechanism prevents the function mechanism from operating in the answer-back area during transmission.

**4.130** As the distributor clutch rotates, the blocking cam pivots the blocking follower lever which pulls a blocking link rearward. The link pivots the blocking pawl rearward until it releases a blocking latchlever which, under spring tension, moves up against the function drive bail. When the function drive bail and the blocking latchlever move up during the function cycle, the blocking latchlever cams the blocking pawl further rearward where an extension on the pawl is over an extension on the answer-back function lever. The function lever is thus prevented from moving up far enough to be latched by its pawl and initiate the answer-back sequence.

**4.131** During the latter part of the distributor cycle, the blocking cam allows the blocking link to move forward to its unoperated position. As the function drive bail moves down during the middle portion of the function cycle, it drives the blocking latchlever downward to the point where the blocking pawl is permitted to pivot forward to its unoperated position. Thus every time a character is initiated locally, the distributor clutch cycles and operates the blocking mechanism which prevents the answer-back function lever from sensing the codebars and initiating the answer-back sequence regardless of what character is processed by the typing unit. On the other hand, when remotely initiated characters are received, the distributor clutch does not cycle, the blocking mechanism is not operated, and the function lever is permitted to sense the codebars and initiate the answer-back sequence upon receipt of the predetermined call-character signal.

**4.132** The length of the answer-back sequence can be varied either by altering the stop-cam level or the character-suppression level.

(a) **Stop Cam:** The answer-back mechanism can be coded for either 1-, 2-, or 3-cycle operation by removing the appropriate tine(s) from the stop-cam level. In 1-cycle operation, the stop cam in row "6" is removed.

This coding yields a maximum of 20 rows which are available for coding different characters into the answer-back drum. There are actually 21 rows on the answer-back drum, but only 20 rows can be used for coding since one row is suppressed. The number of rows available for message coding is summarized below for 1-, 2-, or 3-cycle operation:

<u>Cycle Operation</u>	<u>Actual Rows</u>	<u>Available Rows</u>
1	21	20
2	10(11)*	9(10)*
3	7	6

\* Alternately, one then the other.

When multiple-cycle operation is employed, the answer-back sequence must be coded in each segment of the answer-back drum so that the same message will be transmitted each time the answer-back mechanism is initiated.

(b) **Character Suppression:** Quite often, due to message length, messages coded into the answer-back drum do not require the use of every available row for coding. Unneeded rows are eliminated from the message transmission by removing the unneeded character suppression tine(s). The answer-back drum will stop through its complete cycle, but the transmission of the coded characters from the unneeded rows will be shunted from the signal line.

**Note:** The character-suppression tine in the last row of a cycle should not be removed on 33 typing units used in systems where a response to each answer-back actuation signal must always be obtained. If the tine is removed, the answer-back mechanism will not respond to consecutive answer-back actuation signals. This is due to the operating characteristics of the typing unit which, when the character-suppression tine in the last row of a cycle is removed, leaves the answer-back blocking panel blocking at the end of the answer-back drum cycle of operation. The answer-back blocking pawl will remain blocking until after another character is received through the selector mechanism. The subsequently received character causes the function mechanism to reset the answer-back blocking pawl to its unblocking position. After being reset and

upon receipt of an answer-back actuation signal, the answer-back mechanism will be triggered. Hence, with the character-suppression tine removed from the last row of an answer-back cycle, typing unit answer-back mechanisms will only respond to every other answer-back actuation signal unless an intervening character is received through the selector mechanism.

## 5. OPTIONAL FEATURES

### PRINT NONPRINT

5.01 The function of the print nonprint mechanism is to block all the function levers from rising (except the print suppression function lever) during the function cycle. There are

two types of print nonprint mechanisms, one magnet operated and one solenoid operated.

#### A. Magnet Operated

5.02 The magnet operated print nonprint mechanism shown in Figure 39 allows transmission or reception of tape messages without printed page copy. An on and off toggle switch and a red indicator lamp mount to the right of the platen on the call control unit panel. The switch controls a magnet attached to the typing unit casting. The red indicator lamp lights when the mechanism is activated and the typing unit placed in the nonprint mode. Operation of the magnet attracts an armature which pivots a bellcrank. Operation of the bellcrank moves a nonprint codebar which blocks all the function levers except a special function lever. This special function lever rises every cycle. In so doing, it blocks the print suppression

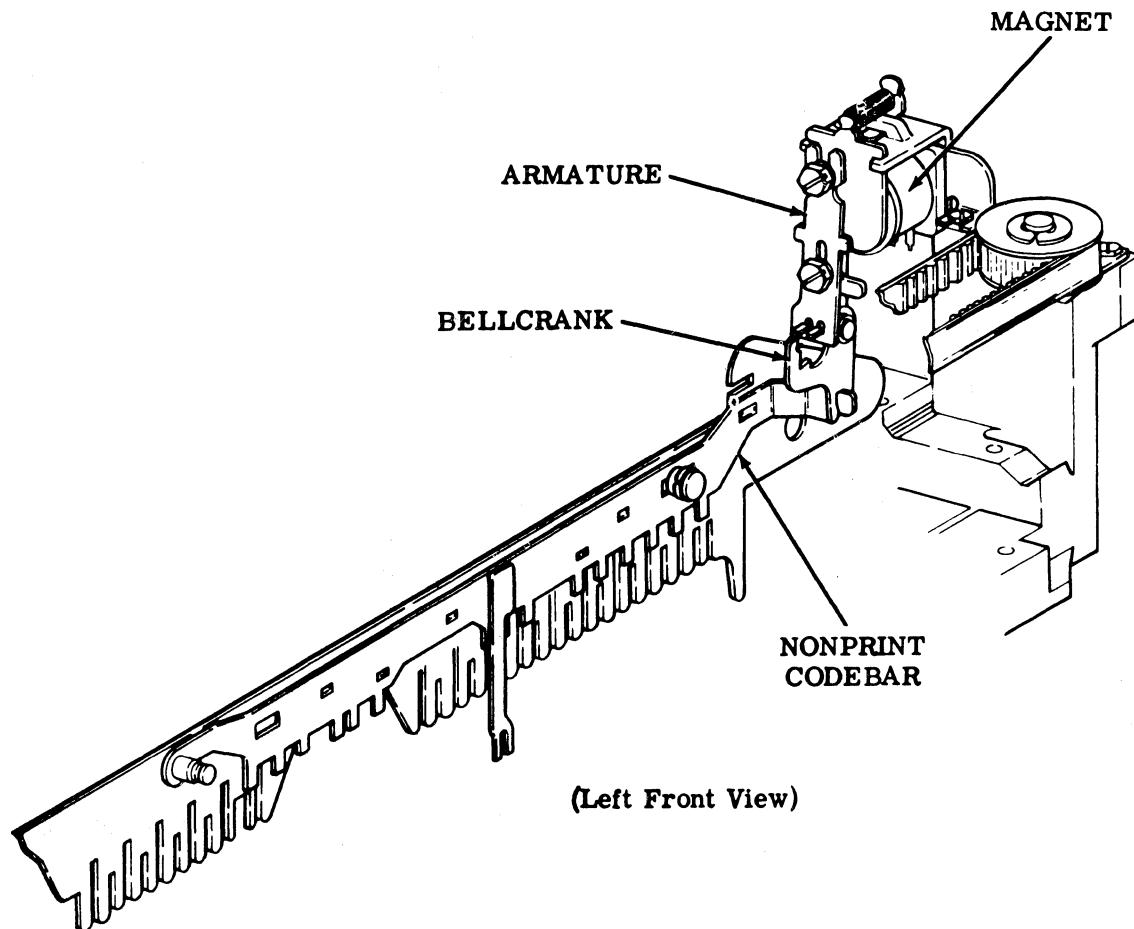


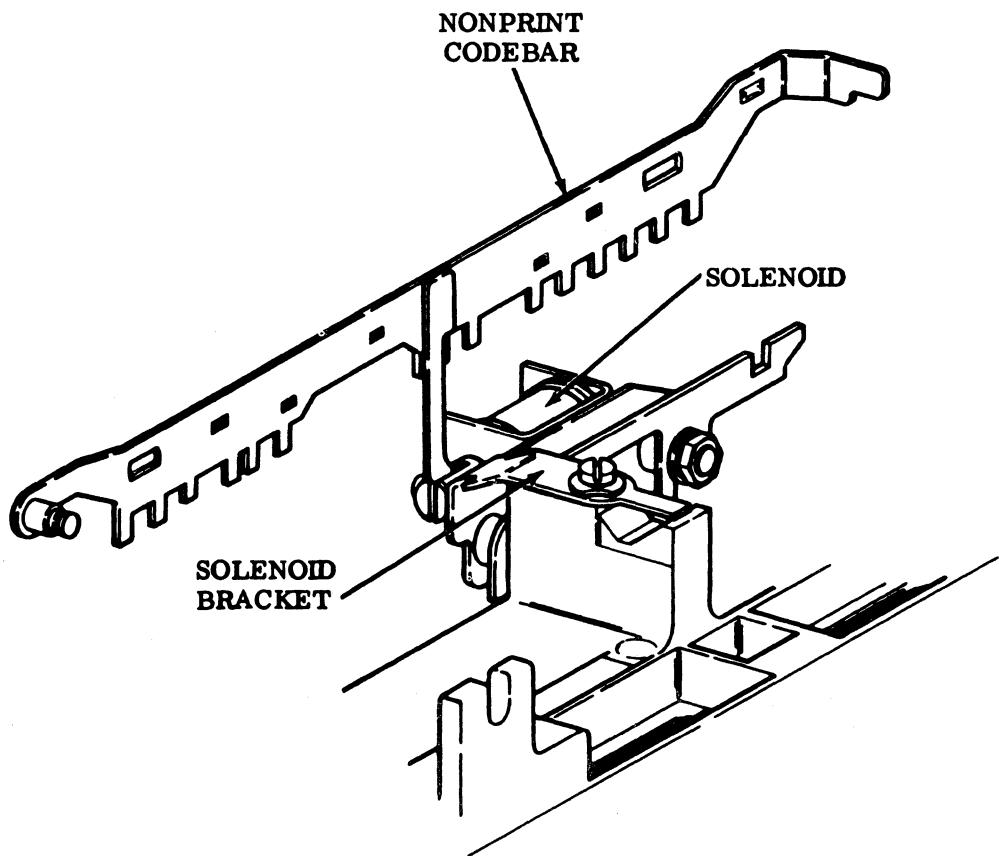
Figure 39 - Magnet Operated Print Nonprint Mechanism

codebar and thus printing is suppressed. Turning the mechanism off extinguishes the indicator light and the nonprint codebar returns to its unoperated position under spring tension.

B. Solenoid Operated

5.03 The solenoid operated print nonprint mechanism shown in Figure 40 is a remote-controlled device consisting of a bracket

which supports a solenoid. At the end of the solenoid plunger is attached a lever which is part of the nonprint codebar. Activation of the solenoid pulls the plunger and thus positions the nonprint codebar, blocking all the function levers except the print suppression function lever. Operation of the print suppression function lever suppresses printing. At the receipt of the off signal the nonprint codebar moves to its unoperated position under spring tension.



(Left Front View)

Figure 40 - Solenoid Operated Print Nonprint Mechanism

## 33 TYPING UNIT

### LUBRICATION

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COMMON MECHANISMS . . . . .		Typewheel mechanism . . . . .	17
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Distributor area . . . . .	7	Platen drive area . . . . .	24
Drive arm . . . . .	16	3. VARIATIONS TO BASIC UNITS . . . . .	
Drive mechanism . . . . .	12	Answer-back area . . . . .	26
Function area . . . . .	9	Answer-back mechanism . . . . .	27
Function clutch . . . . .	4	Trip magnet . . . . .	27
Function levers . . . . .	10	Print nonprint mechanism . . . . .	28
Function rocker shaft . . . . .	7	1. GENERAL	
Function shaft area . . . . .	6	1.01 This section provides lubrication instructions for the 33 typing unit. It is reissued to add new lubrication interval requirements for the typing unit. Marginal arrows indicate changes and additions.	← →
Intermediate gears . . . . .	6	1.02 The general lubrication areas are illustrated by photographs. The specific points to receive lubricant are indicated on line drawings with appropriate textual instructions. Line drawings and textual instructions follow each photograph and are keyed to the photograph by paragraph numbers.	← →
Latchlever . . . . .	8		
Latchlever and trip lever . . . . .	20		
Main shaft area . . . . .	4		
Motor area . . . . .	5		
Print hammer . . . . .	16		
Pushlevers and stripper bail . . . . .	19		
Reset arm . . . . .	16		
Reset bail . . . . .	11		
Ribbon guide spring . . . . .	18		
Ribbon mechanism . . . . .	17		
Rocker and pawls . . . . .	11		
Selector area . . . . .	18		
Selector clutch . . . . .	20		
Selector levers . . . . .	20		
Slides . . . . .	15		
Slide guideplates . . . . .	15		
Spacing area . . . . .	12		
Space bellcrank . . . . .	12		
Spacing mechanism — 1 . . . . .	13		
Spacing mechanism — 2 . . . . .	14		
Stop bail . . . . .	8		
Stripper drive lever . . . . .	10		

1.03 Thoroughly lubricate the typing unit, but avoid overlubrication that might permit the lubricant to drip or be thrown onto adjacent parts. Saturate all felt washers and oilers with oil, and apply oil to each end of all bearings.

1.04 Initial lubrication of the typing unit should be completed just prior to placing it into service. The lubrication intervals for the tape punch are similar to the lubrication intervals of the set. The lubrication intervals are dictated by the hours of use (including idle time) on a daily basis. The following charts and notes list the appropriate lubrication intervals.

**LUBRICATION INTERVALS IN WEEKS  
BASED ON 5-DAY WEEK (Note 1)**

<b>NEWLY INSTALLED EQUIPMENT</b>			
<b>DAILY USE</b>			
<u>SPEED</u>	<u>0 TO 8 HOURS</u>	<u>8 TO 16 HOURS</u>	<u>16 TO 24 HOURS</u>
All Speeds	3 Weeks	2 Weeks	1 Week

<b>REGULAR LUBRICATION</b>			
<b>DAILY USE</b>			
<u>SPEED</u>	<u>0 TO 8 HOURS</u>	<u>8 TO 16 HOURS</u>	<u>16 TO 24 HOURS</u>
60 WPM	39 Weeks	26 Weeks	13 Weeks
100 WPM	26 Weeks	13 Weeks	6 Weeks

Note 1: Reduce lubrication interval 15 percent when usage is 6 days per week, and 30 percent when usage is 7 days per week.

Note 2: Sets operating at speeds between 60 and 100 wpm use lubrication requirements for the lower of the two speeds.

Note 3: The lubrication intervals are for the set as a whole — all components of the set should be lubricated.

Note 4: Just prior to storage all equipment should be thoroughly lubricated.

Note 5: Model 33 typing units having Serial Numbers 144,000 and above use the lubrication interval described in 1.04. Model 33 typing units having Serial Numbers below 144,000 should reduce the lubrication interval by 1/3 or 33 percent.

1.05 On occasion when the printer is disassembled, apply a coat of thoroughly mixed 50 percent KS7470 oil and 50 percent KS7471 grease at places indicated below.

Selector Cam Surfaces (2.44)  
Spacing Gear Teeth (2.23)  
Codebar Pivot Shaft (2.17 and 2.18)  
Eccentric Cams (2.02 and 2.04)  
Stop Bail Adjusting Tab (2.11)  
Platen Shaft Bearings — Sprocket Feed Units only (2.49)  
Distributor Shaft Cam Roller (Early Design) or Stud (Late Design) (2.13)  
H-Lever (2.13)

Note 1: On occasion when the clutch is disassembled, lubricate the Internal Clutch Assemblies (2.02, 2.04, 2.44, and 2.53 on Form Feed Mechanisms only) as follows: Apply a thin coat of KS7471 grease at the loops of the clutch shoe lever spring, and lubricate the internal mechanism of the clutch with KS7470 oil.

Note 2: At regular lubrication intervals lubricate the clutch mechanism with KS7470 oil only.

1.06 The textual instructions that accompany the line drawings consist of abbreviated directions, specific lubrication points, and parts affected. The meanings of the abbreviated directions (symbols) follow:

<u>Symbol</u>	<u>Meaning</u>
D	Keep dry — no lubricant permitted.
G	Apply thin coat of grease (KS7471).
O	Oil (KS7470).

1.07 References to left, right, front, or rear, etc, consider the typing unit to be viewed from a position where the carriage area faces up and the selector area is located to the viewer's left.

**CAUTION: DO NOT USE ALCOHOL, MINERAL SPIRITS, OR OTHER SOLVENTS TO CLEAN PLASTIC PARTS OR PARTS WITH PROTECTIVE-DECORATIVE FINISHES. NORMALLY, A SOFT, DRY CLOTH SHOULD BE USED TO REMOVE DUST, OIL, GREASE, OR OTHERWISE CLEAN PARTS OR SUB-ASSEMBLIES. IF NECESSARY, A SOFT CLOTH DAMPENED WITH SOAP OR MILD DETERGENT MAY BE USED.**

AFTERWARDS, RINSE EACH CLEANED PART OR SUBASSEMBLY WITH SOFT, DAMP CLOTH AND BUFF WITH A SOFT, DRY CLOTH.

1.08 Tools and materials needed for tele-typewriter lubrication are listed in Section 570-005-800TC.

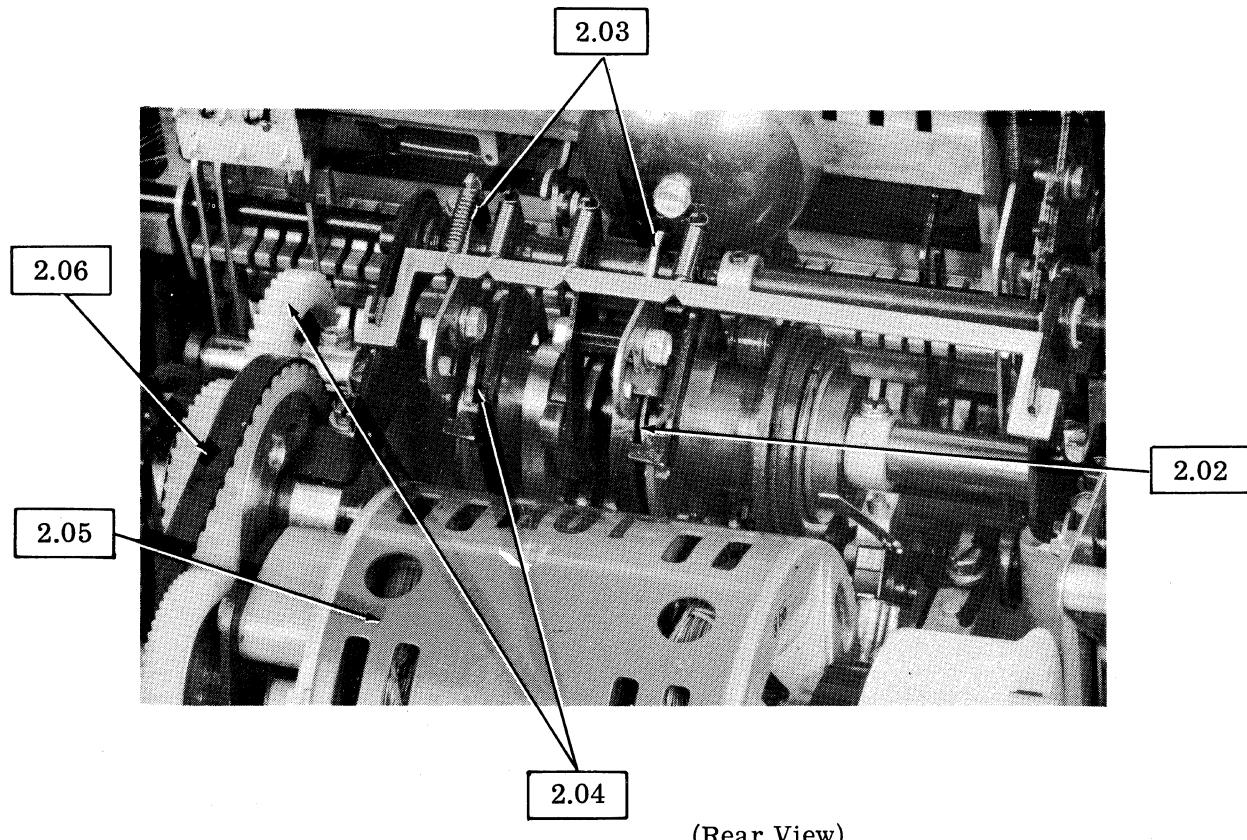
1.09 For disassembly and reassembly information, refer to Section 574-122-702TC.

**CAUTION: ALL ELECTRICAL POWER MUST BE REMOVED FROM UNIT BEFORE LUBRICATING OR REMOVING COMPONENTS FOR LUBRICATION.**

## 2. BASIC UNITS

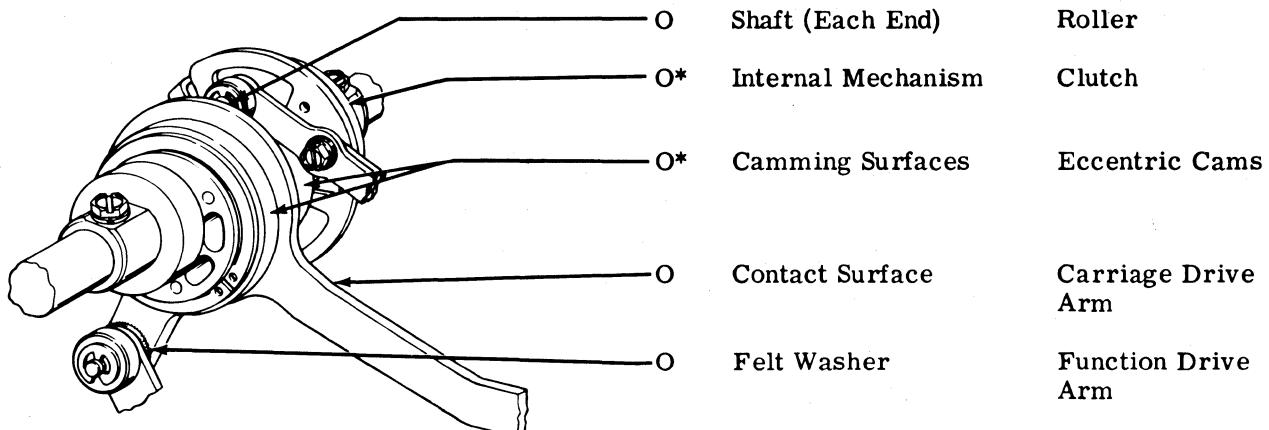
### COMMON MECHANISMS

#### 2.01 Main Shaft Area



**SECTION 574-122-701TC**

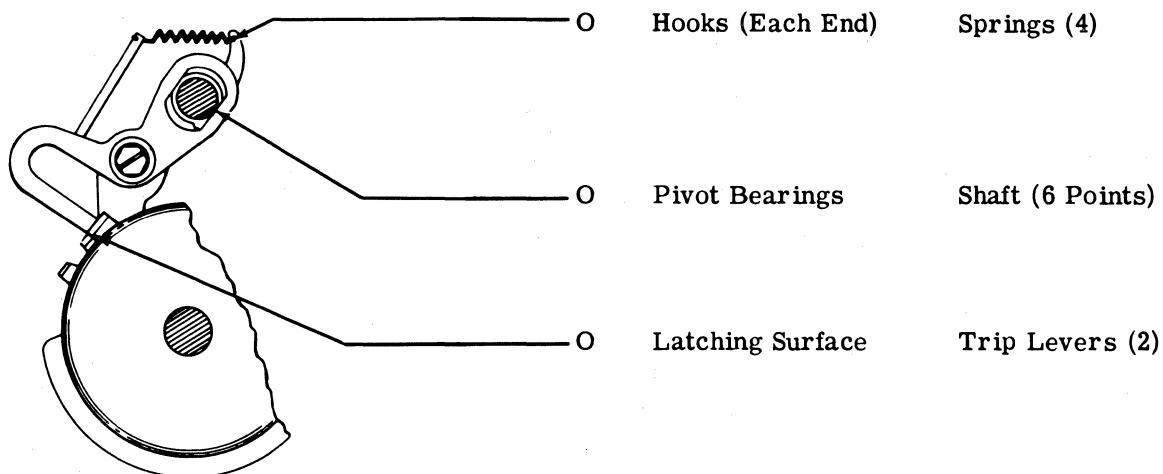
**2.02 Function Clutch**



\*Refer to 1.05.

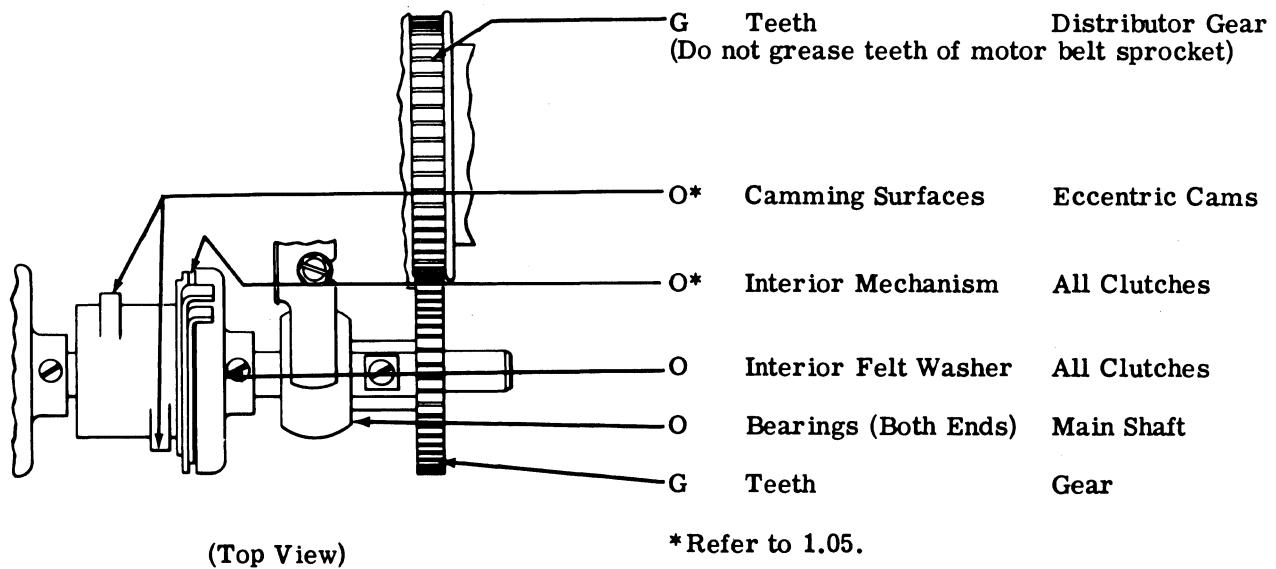
(Left Front View)

**2.03 Trip Shaft**



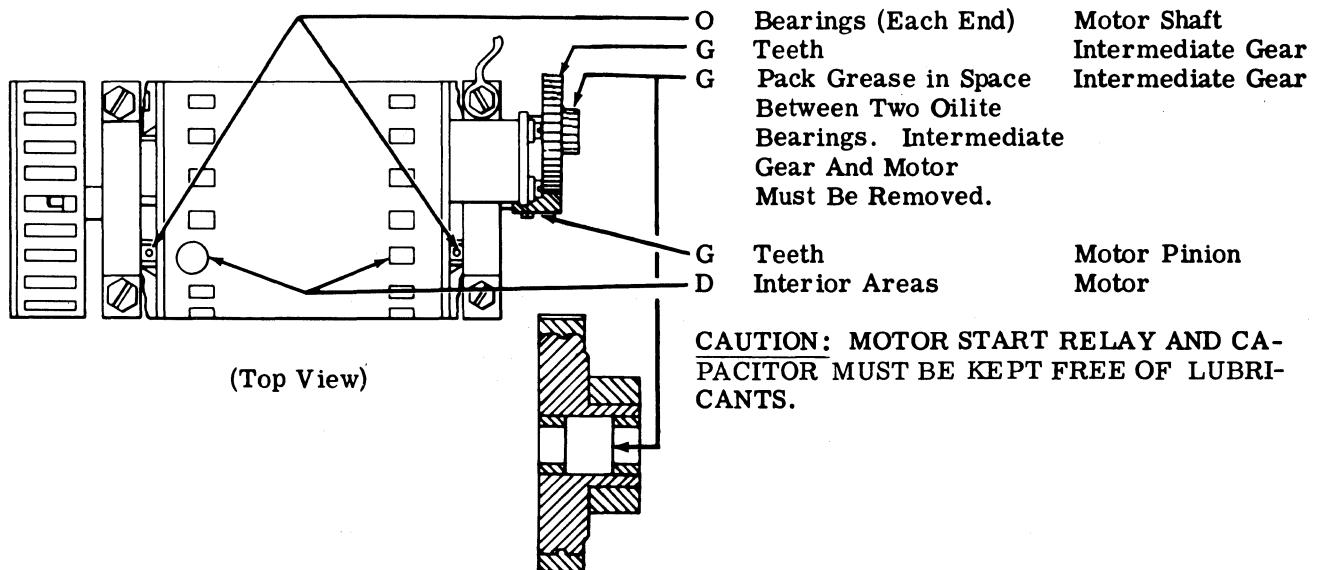
(Left Side View)

## 2.04 Codebar Clutch



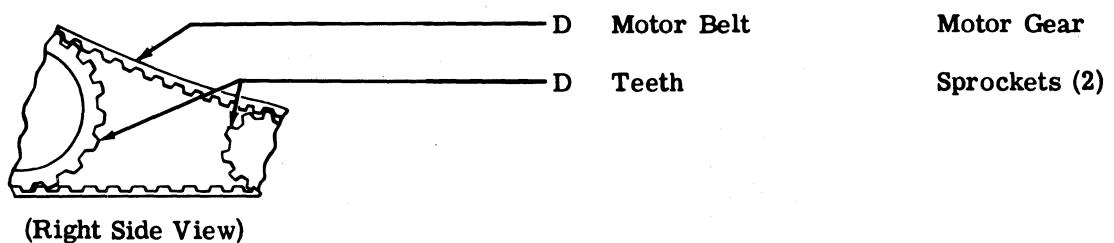
\*Refer to 1.05.

## 2.05 Motor Area

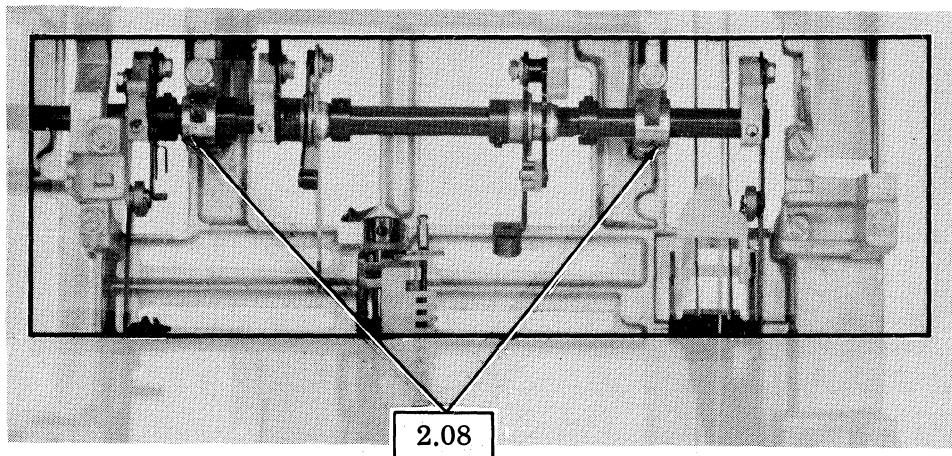


**SECTION 574-122-701TC**

**2.06 Intermediate Gears**

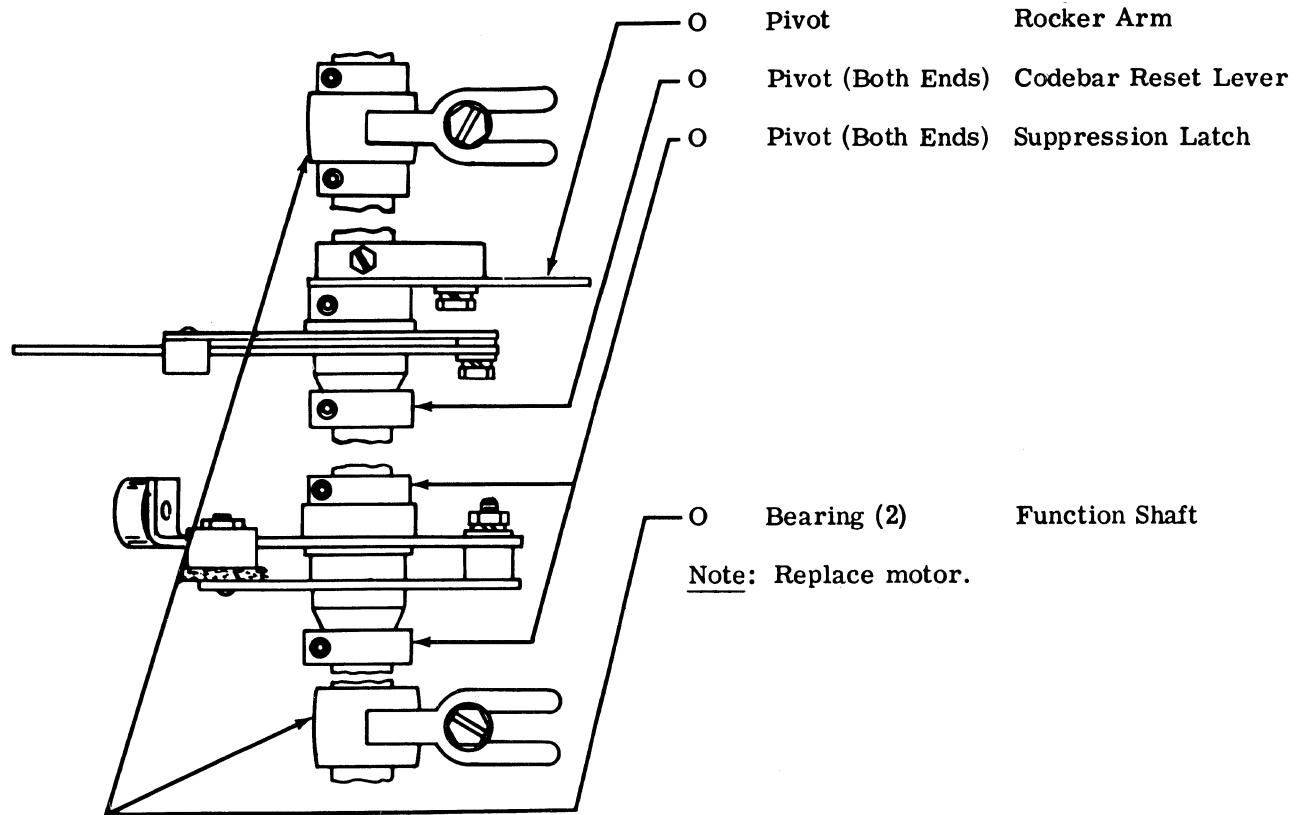
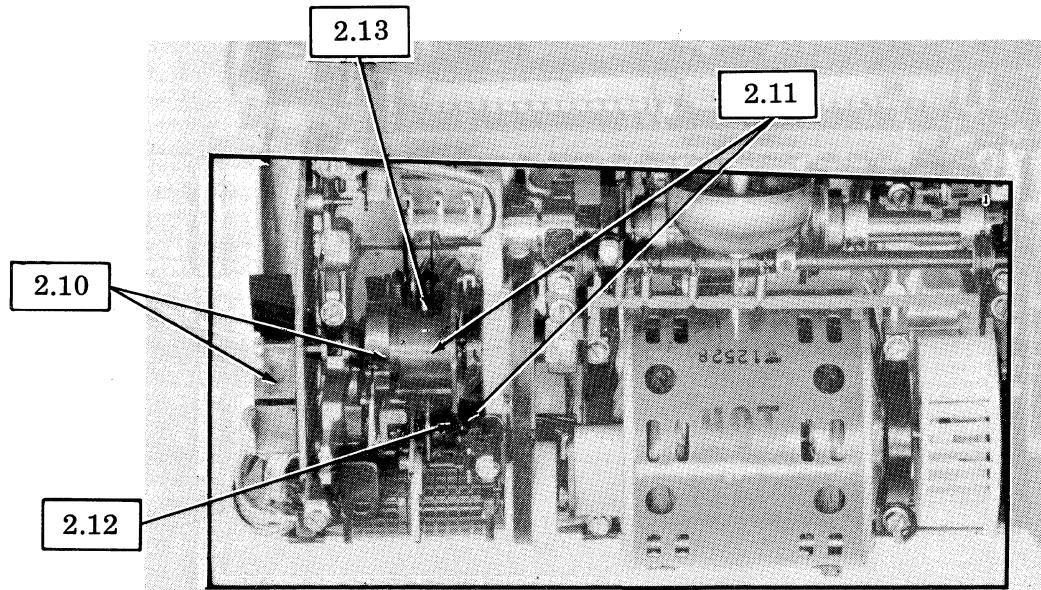


**2.07 Function Shaft Area**



(Top View)

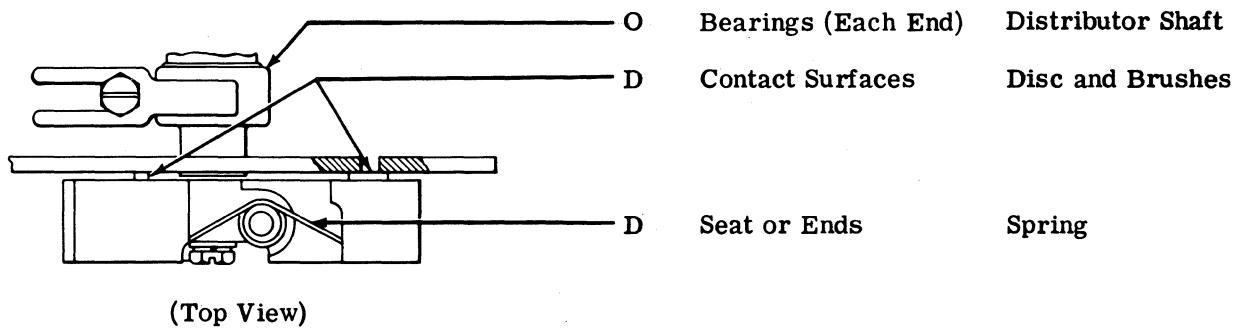
(Typing unit disassembled for illustration only.)

**2.08 Function Rocker Shaft****2.09 Distributor Area**

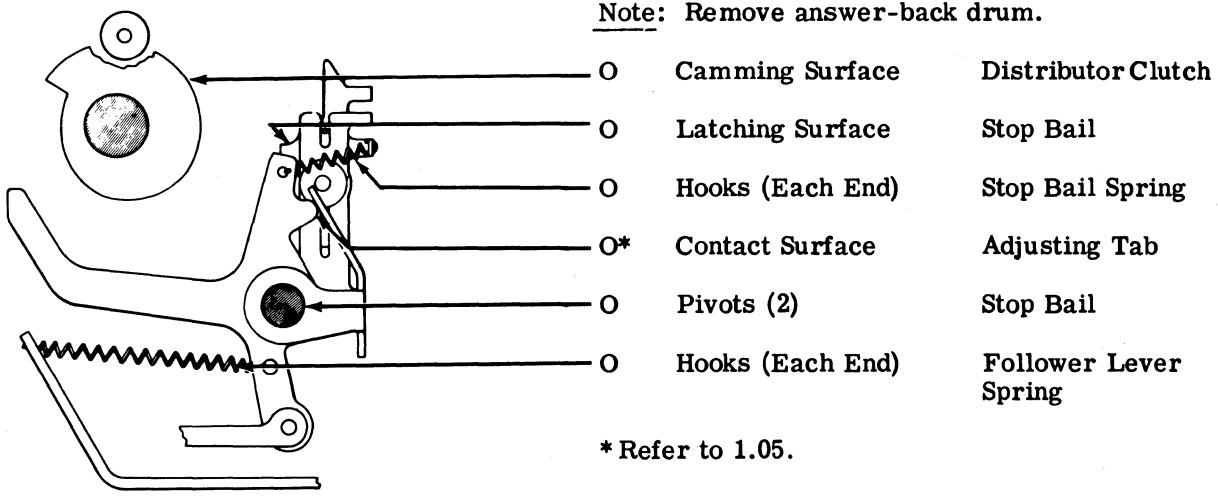
(Top View)

SECTION 574-122-701TC

2.10 Disc and Brushes

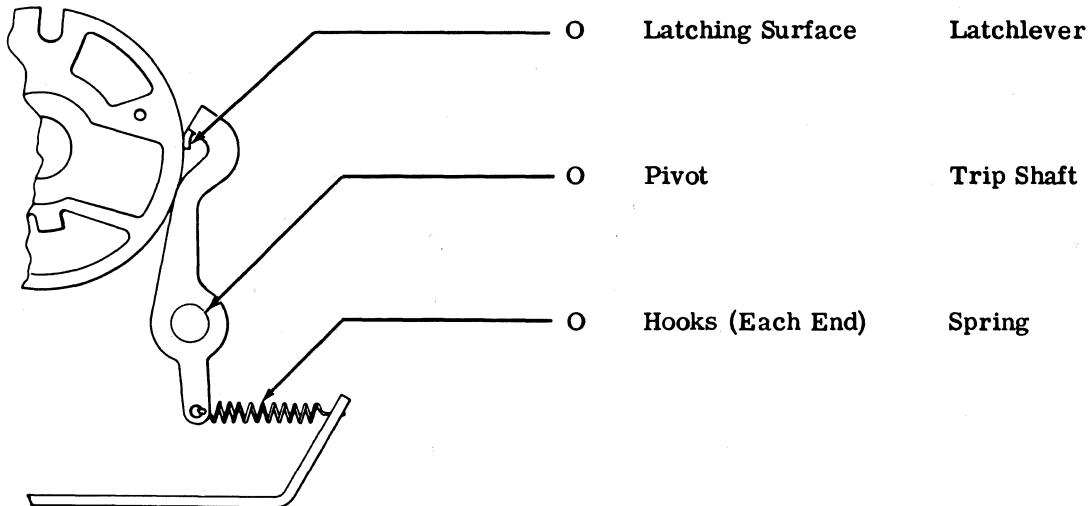


2.11 Stop Bail

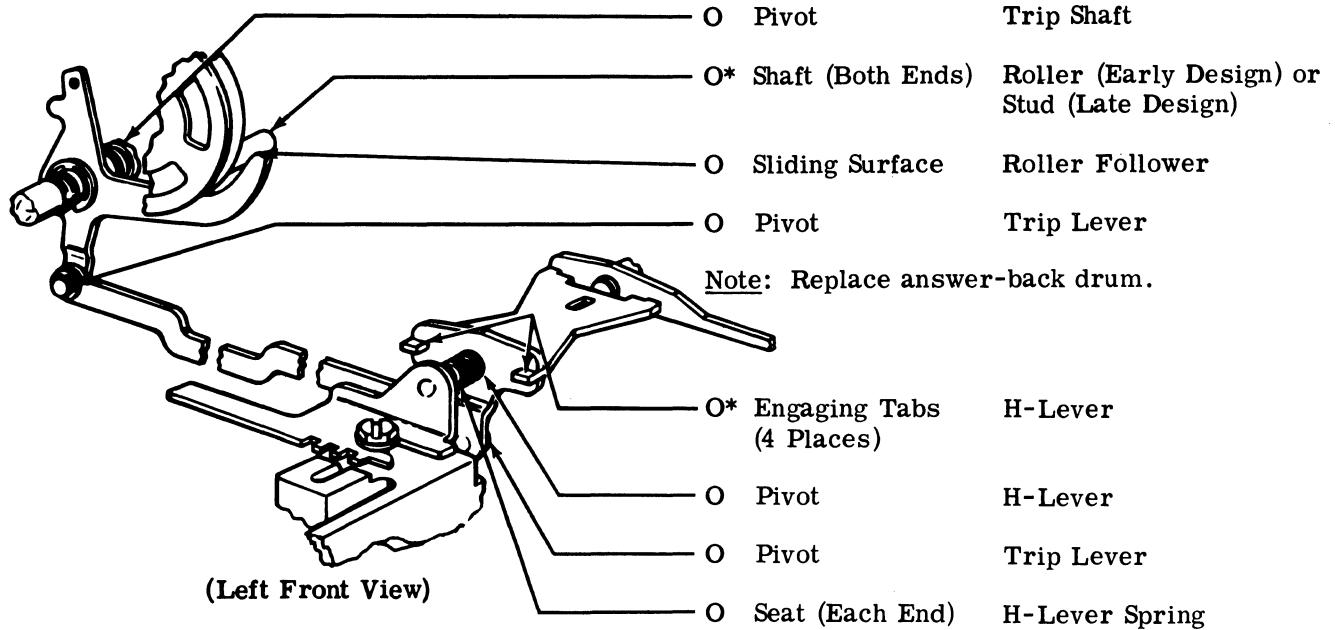


(Right Side View)

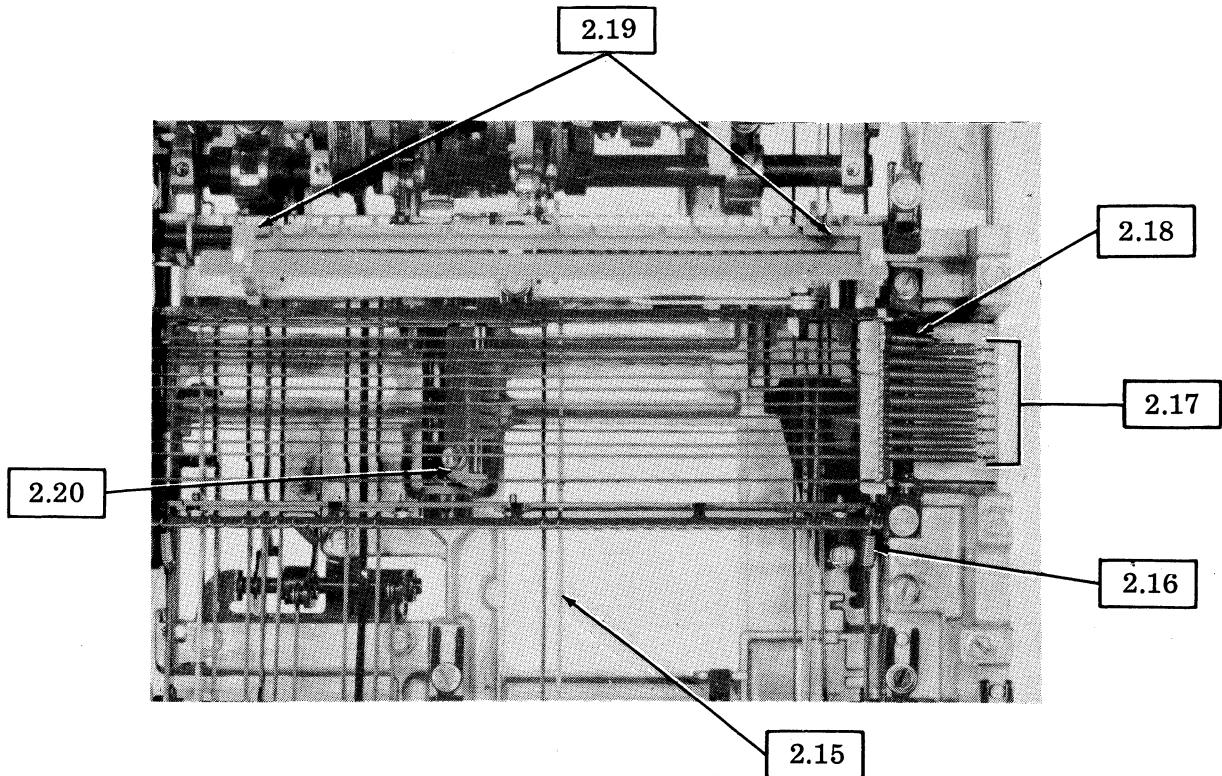
2.12 Latchlever



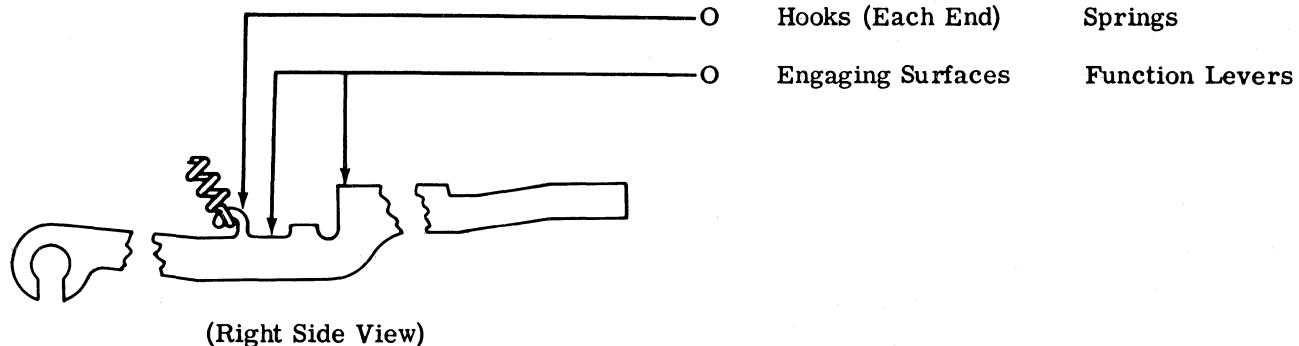
(Right Side View)

**2.13 Trip Lever**

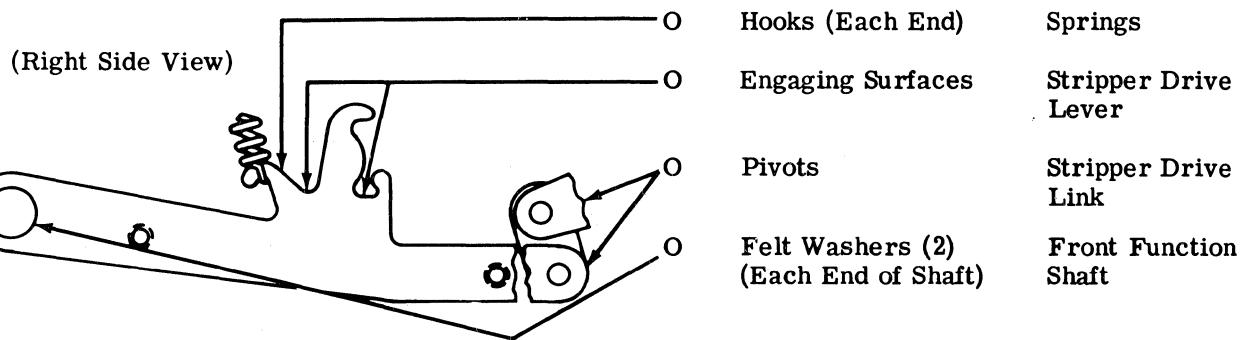
\*Refer to 1.05.

**2.14 Function Area**

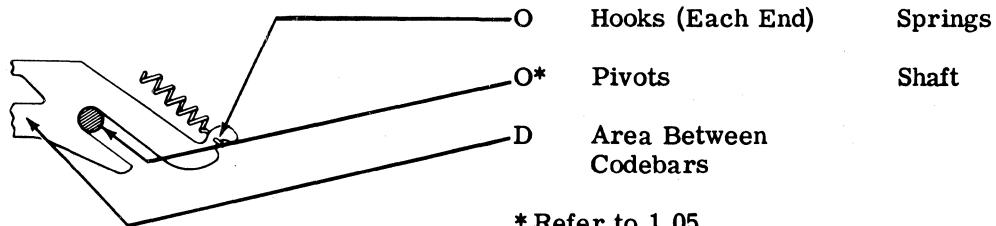
## 2.15 Function Levers



## 2.16 Stripper Drive Lever



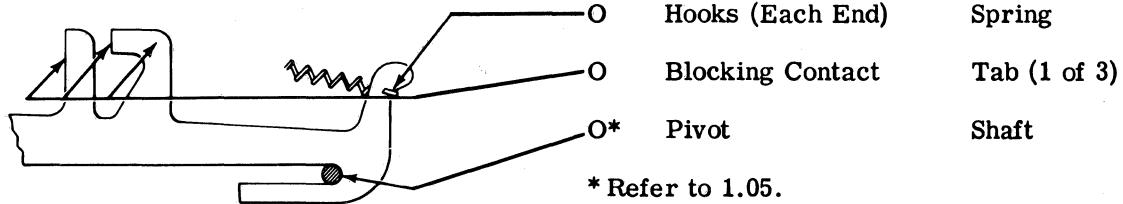
## 2.17 Codebars



\* Refer to 1.05.

(Front View)

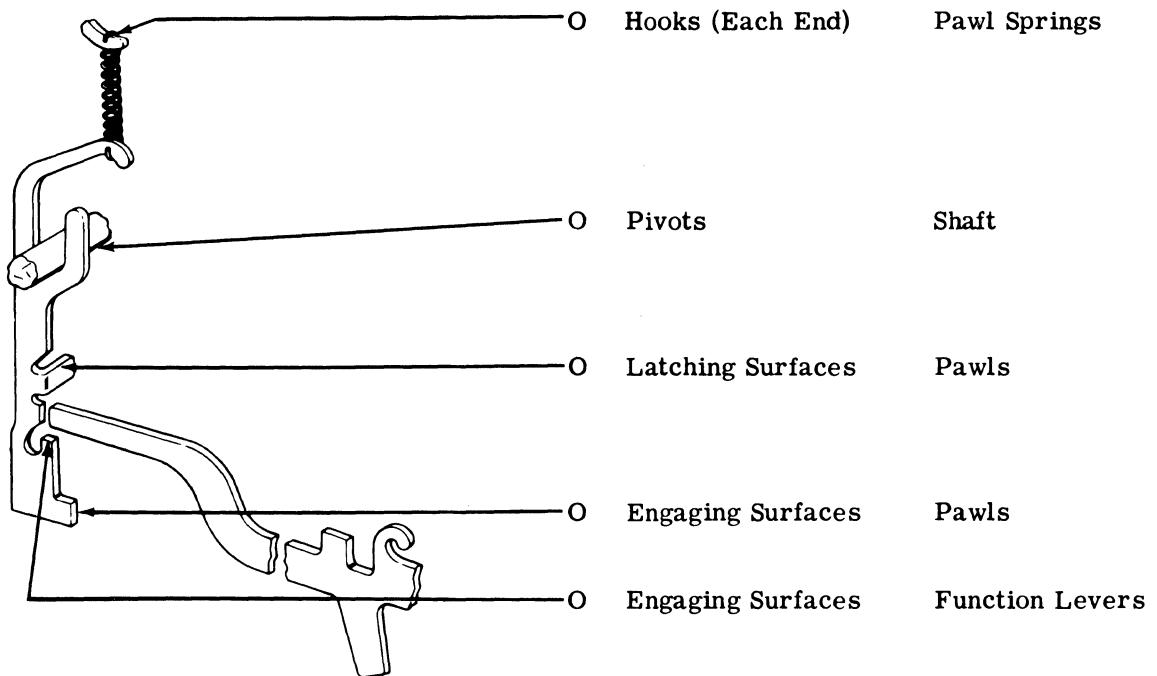
## 2.18 Automatic Codebar



\* Refer to 1.05.

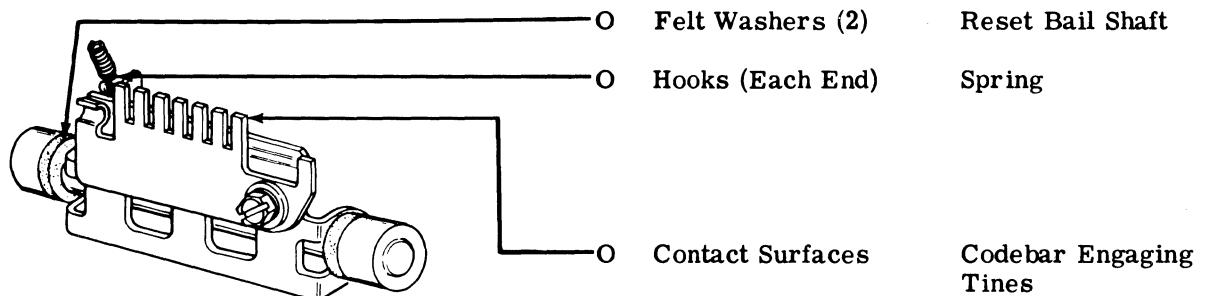
(Front View)

### 2.19 Rocker and Pawls



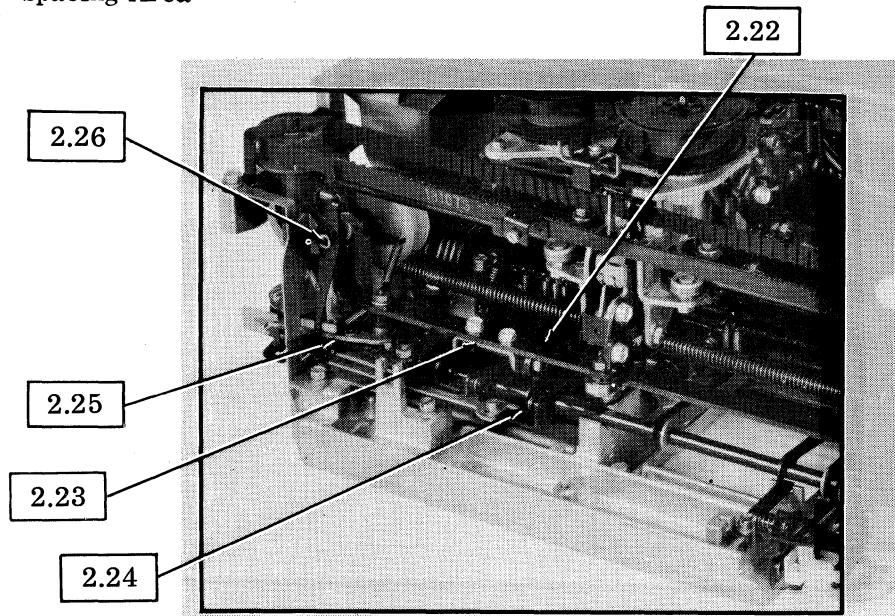
(Left Front View)

### 2.20 Reset Bail



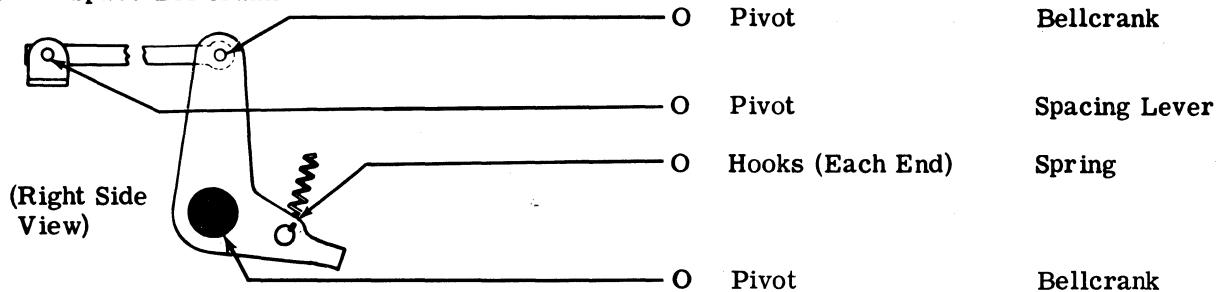
(Left Front View)

2.21 Spacing Area

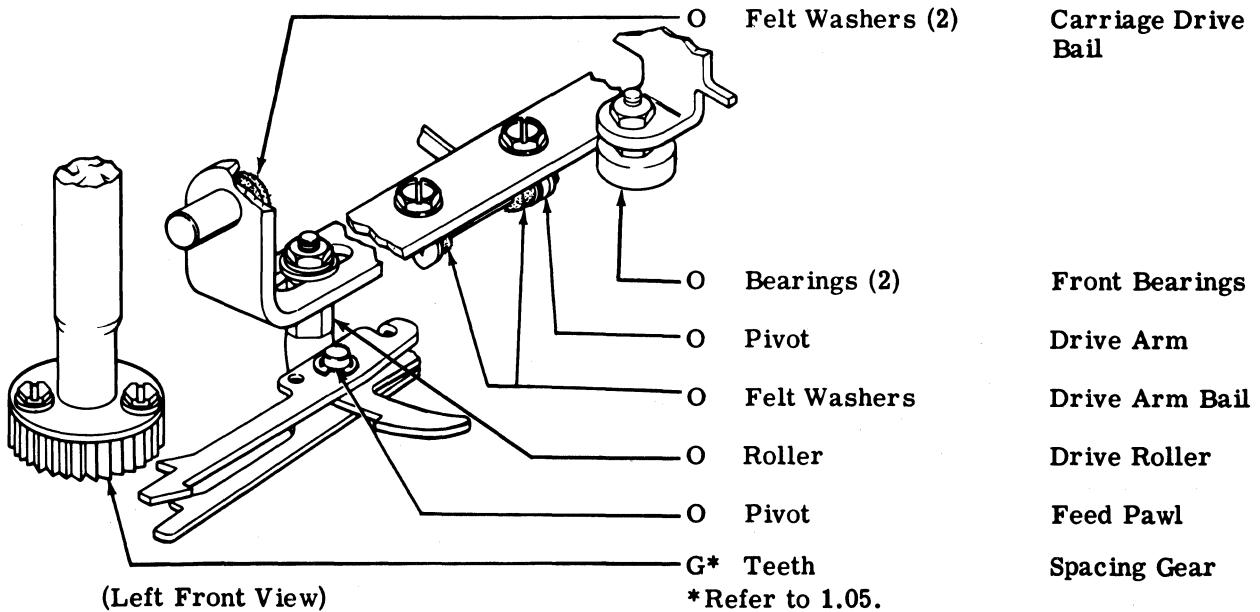


(Left Front View)

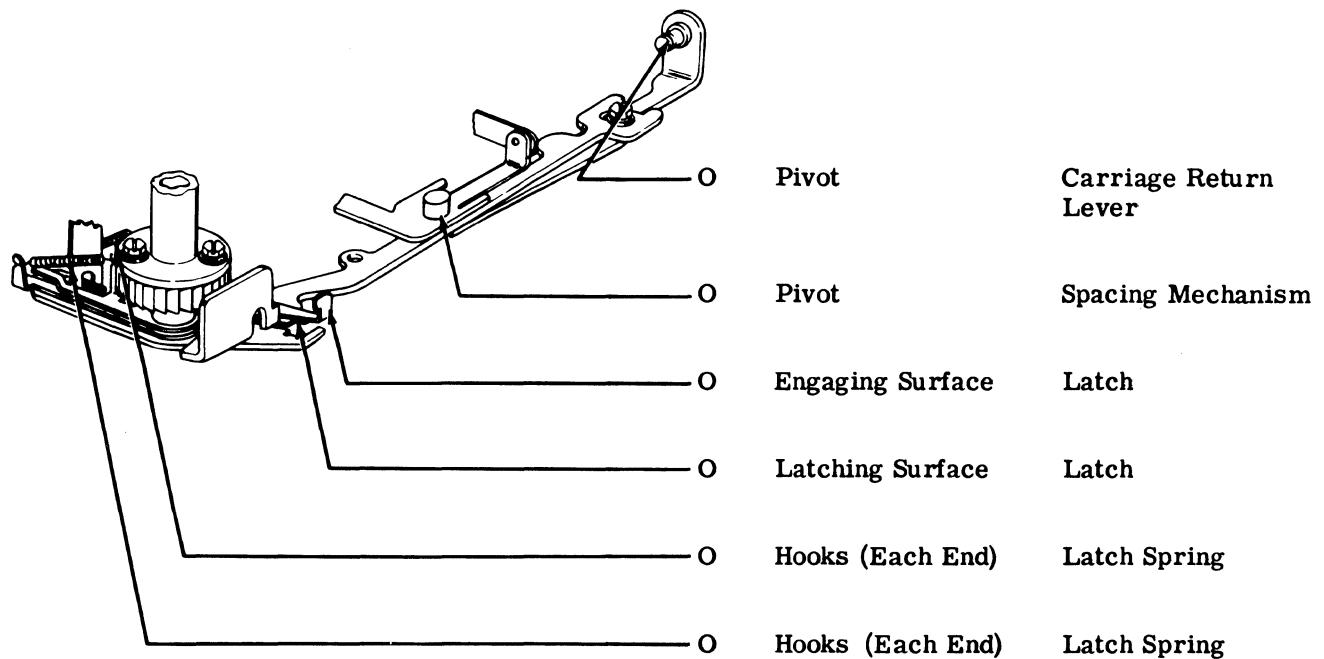
2.22 Space Bellcrank



2.23 Drive Mechanism

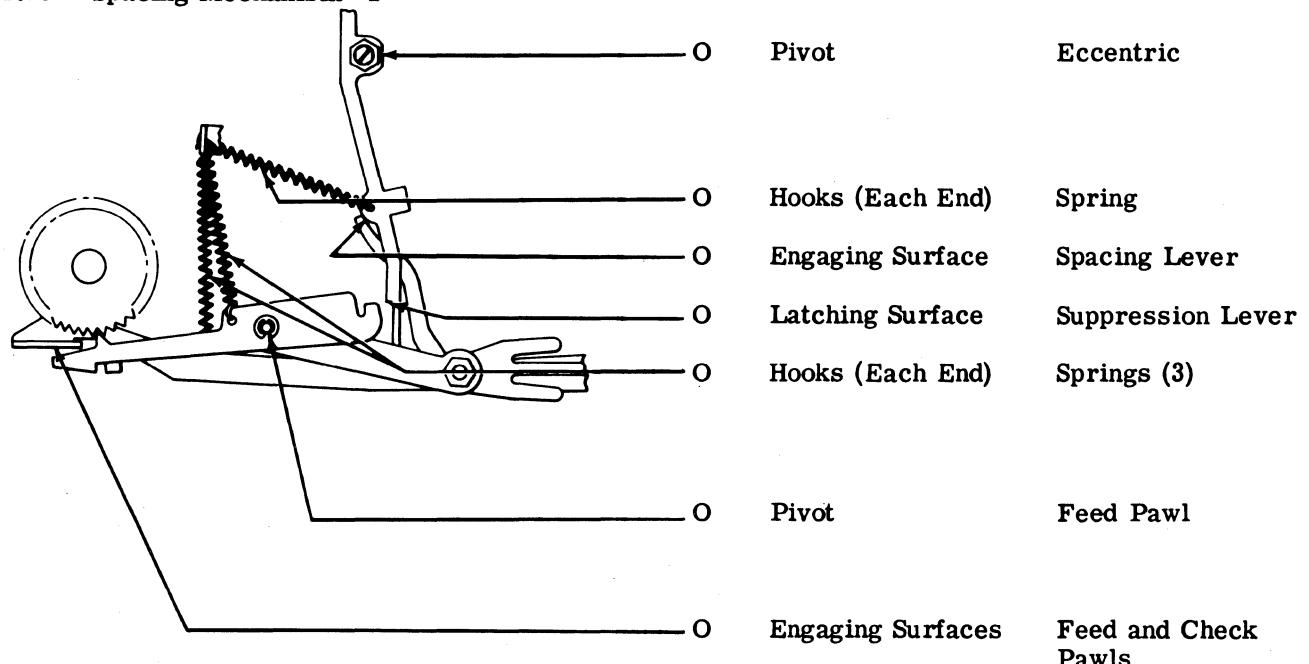


## 2.24 Carriage Return and Spacing Levers



(Left Front View)

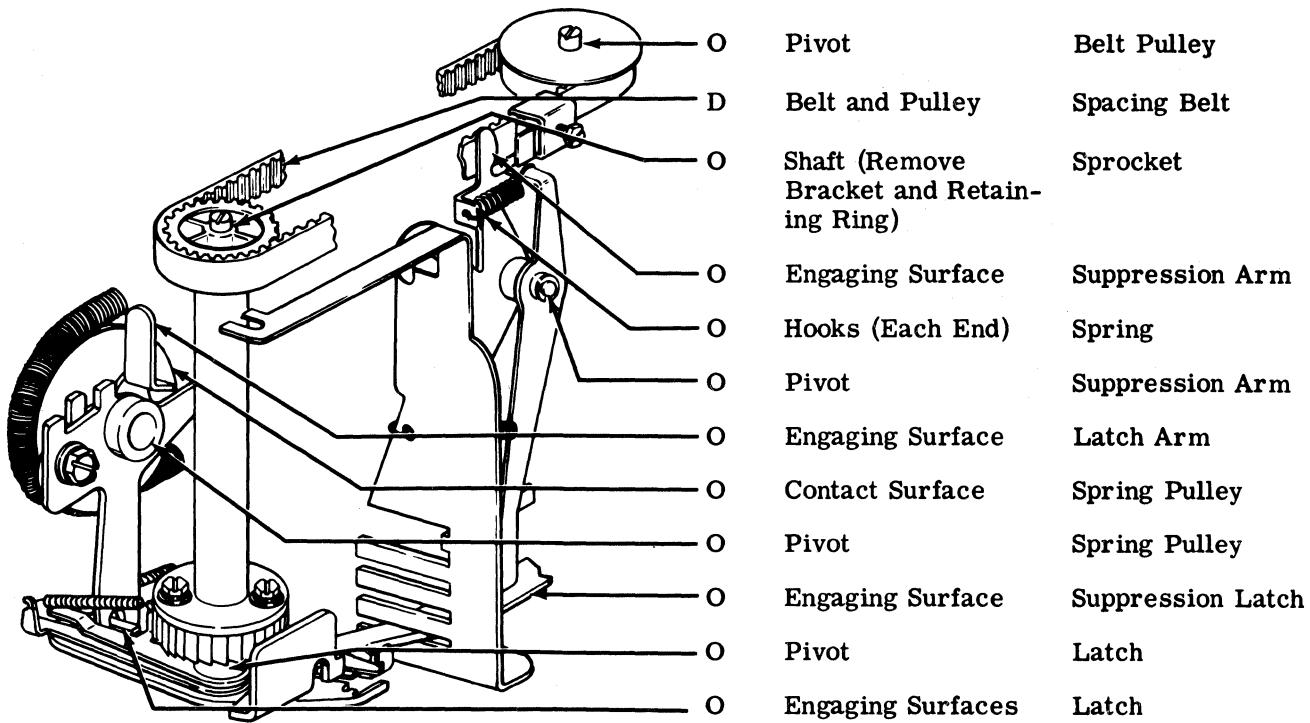
## 2.25 Spacing Mechanism - 1



(Top View)

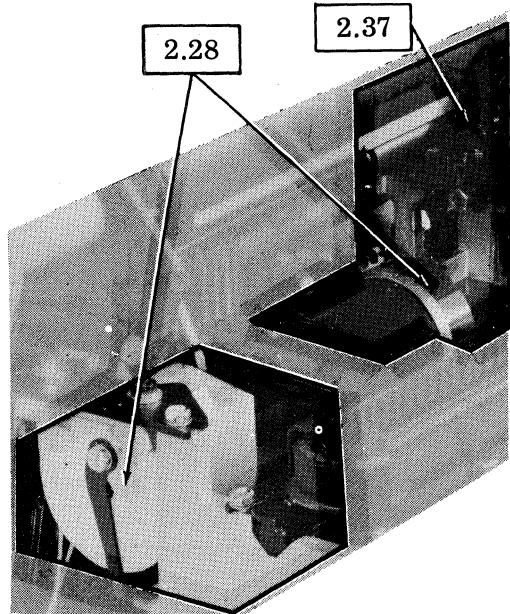
SECTION 574-122-701TC

2.26 Spacing Mechanism - 2

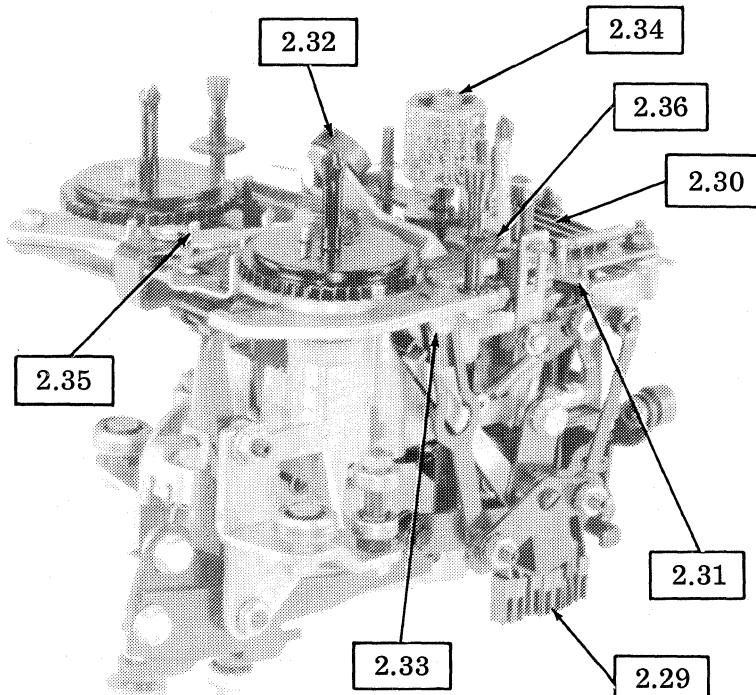


(Left Front View)

2.27 Carriage Area



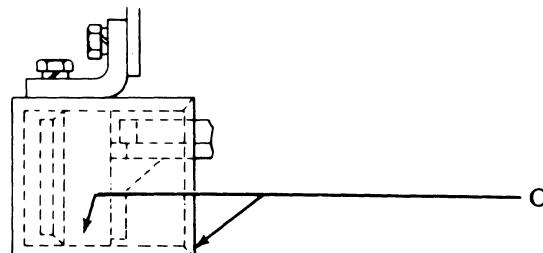
(Left Front View)



(Right Front View)

Note: Remove ribbon mechanism and carriage return spring before lubricating. For instructions, see the appropriate disassembly and reassembly section.

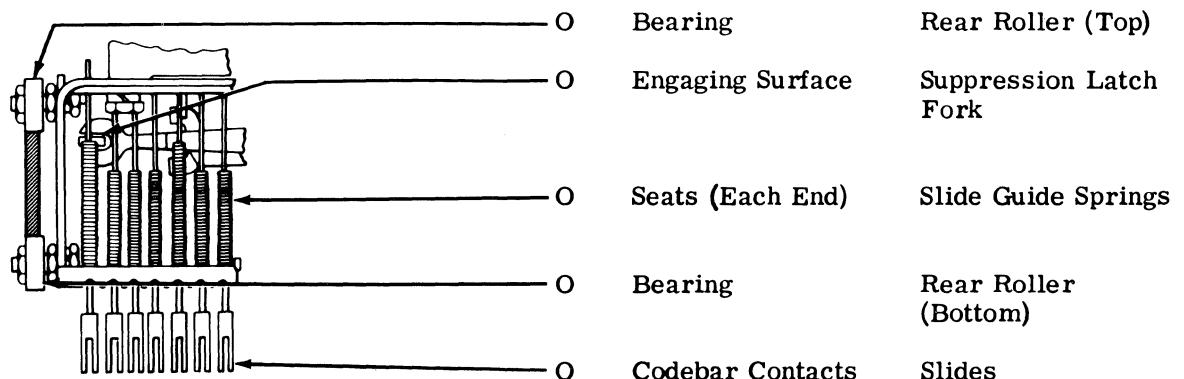
## 2.28 Dashpot



(Front View)

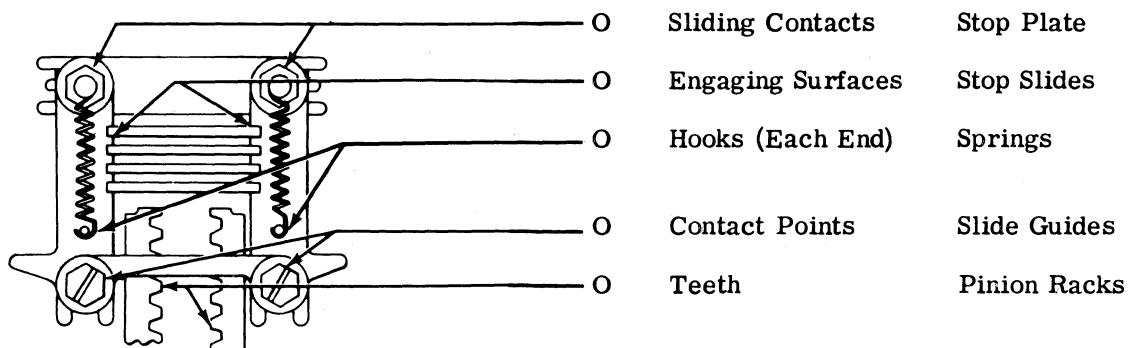
Sliding Surfaces      Dashpot and Cylinder  
 (Apply with oil dampened cloth. Too much lubricant will cause malfunction.)

## 2.29 Slides



(Left Side View)

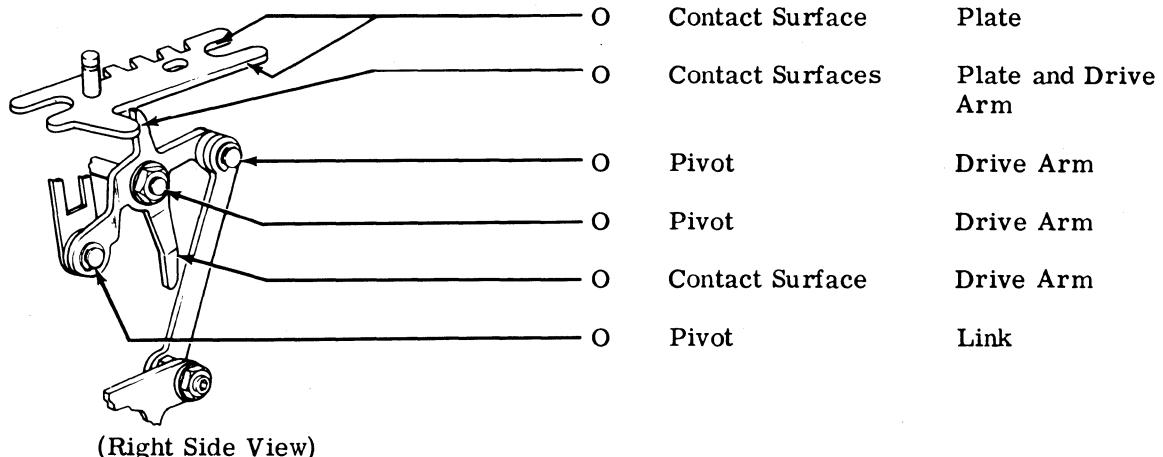
## 2.30 Slide Guideplates



(Top View)

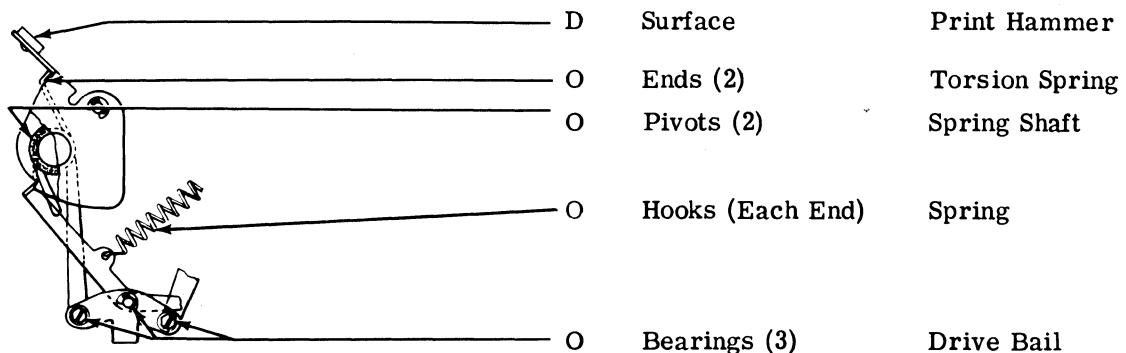
**SECTION 574-122-701TC**

**2.31 Drive Arm**



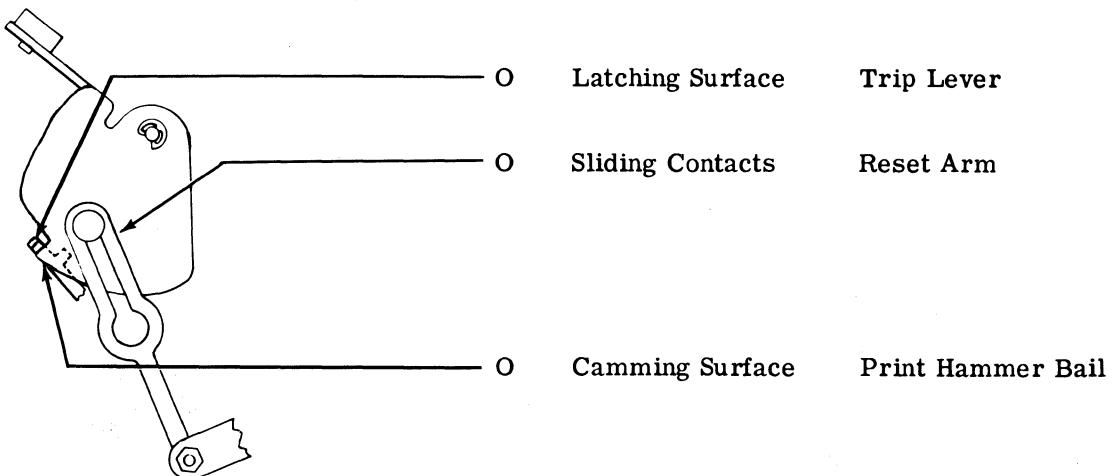
(Right Side View)

**2.32 Print Hammer**



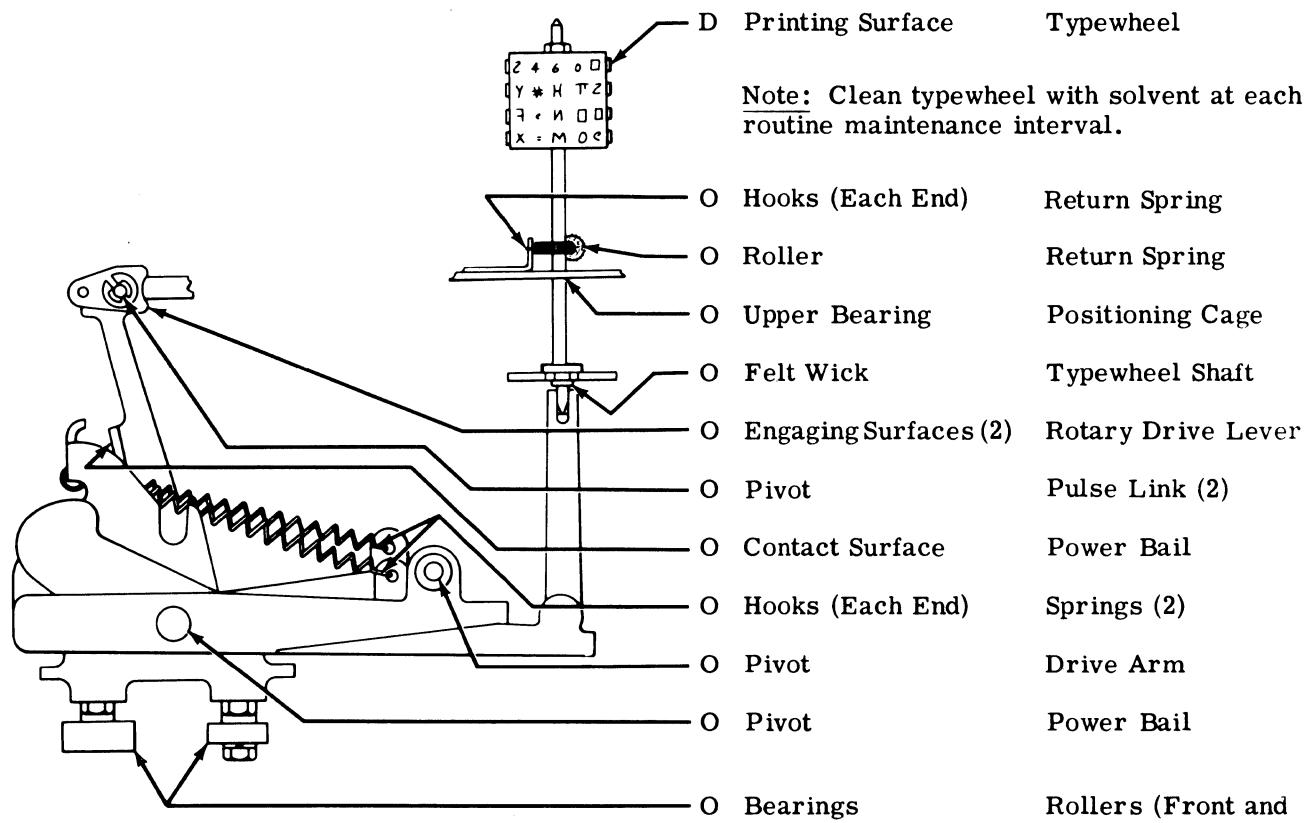
(Right Side View)

**2.33 Reset Arm**



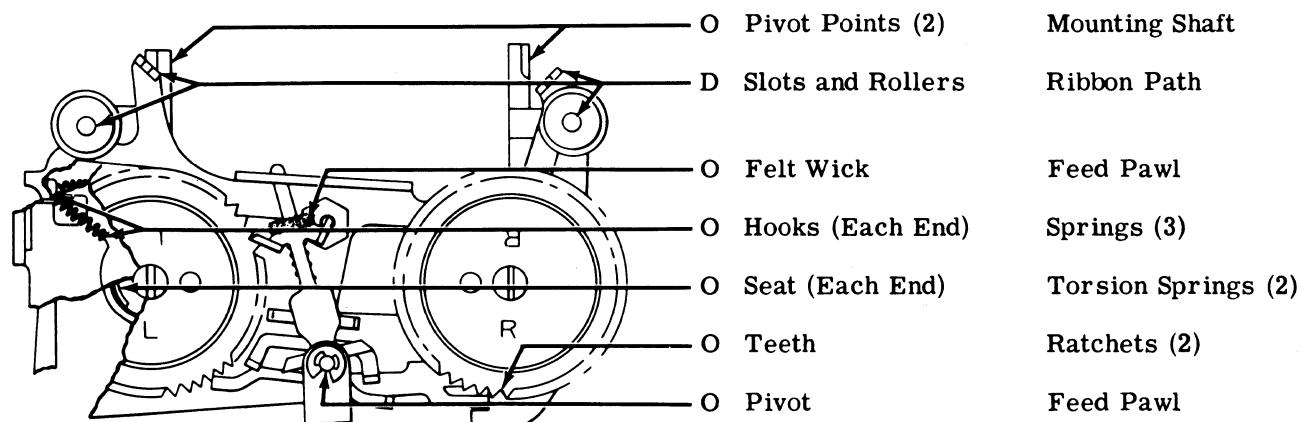
(Right Side View)

## 2.34 Typewheel Mechanism



(Right Side View)

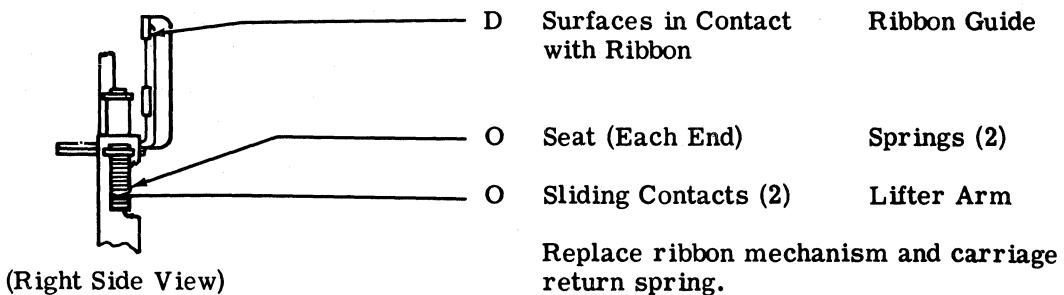
## 2.35 Ribbon Mechanism



(Top View)

## SECTION 574-122-701TC

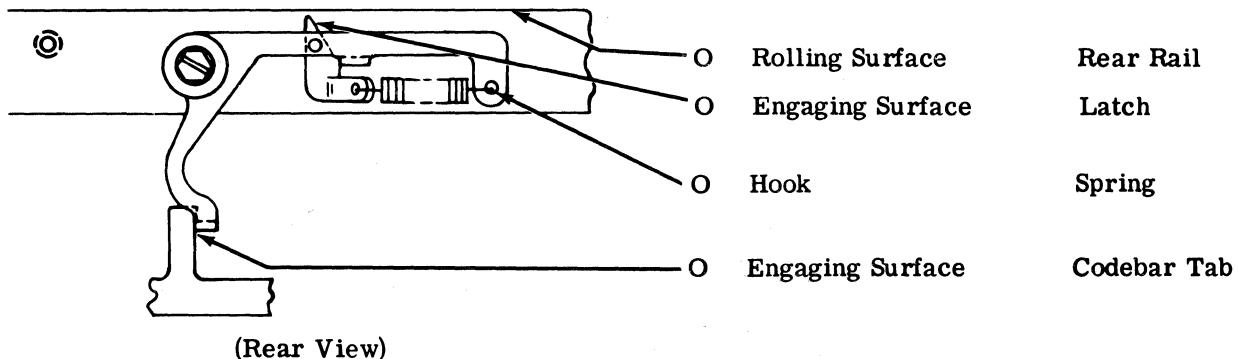
### 2.36 Ribbon Guide Spring



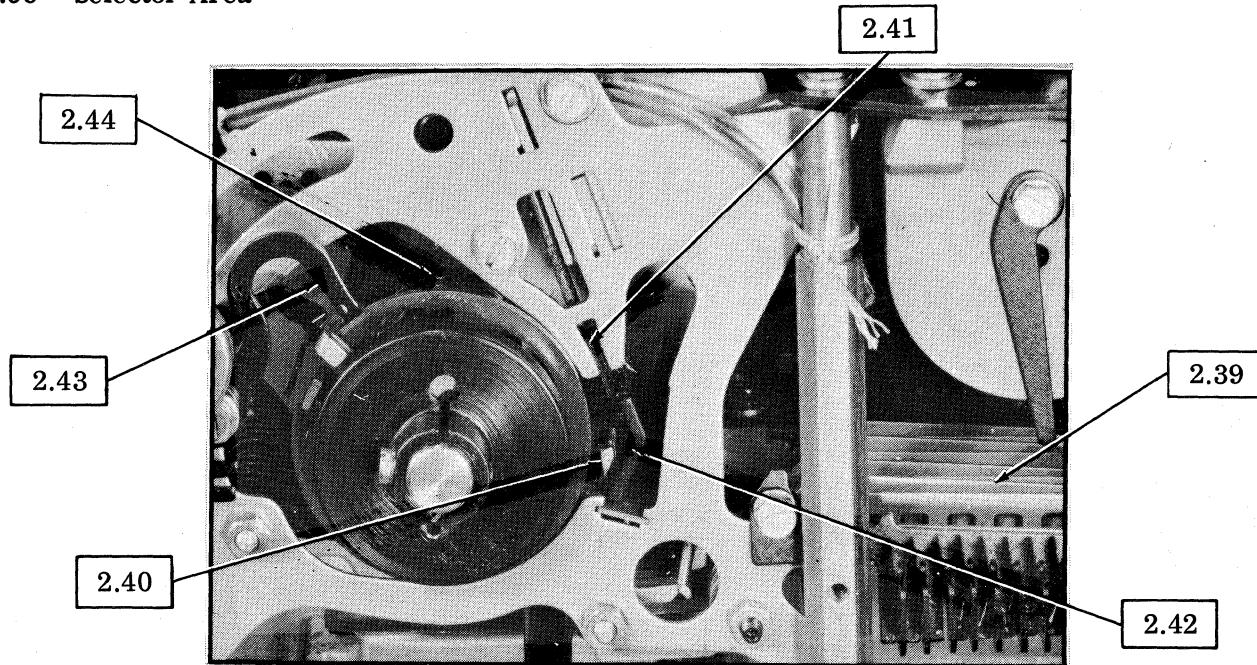
Replace ribbon mechanism and carriage return spring.

### 2.37 Carriage Rear Rail

Note: These lubrication instructions apply only to typing units equipped with a TP181304 latch.

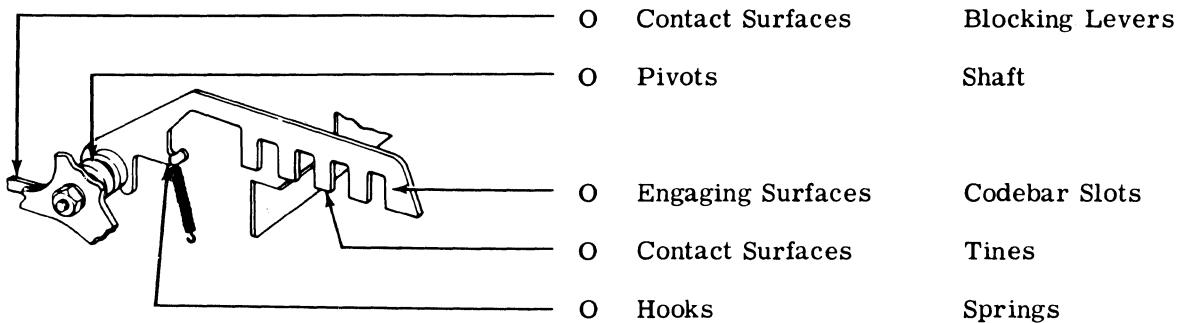


### 2.38 Selector Area



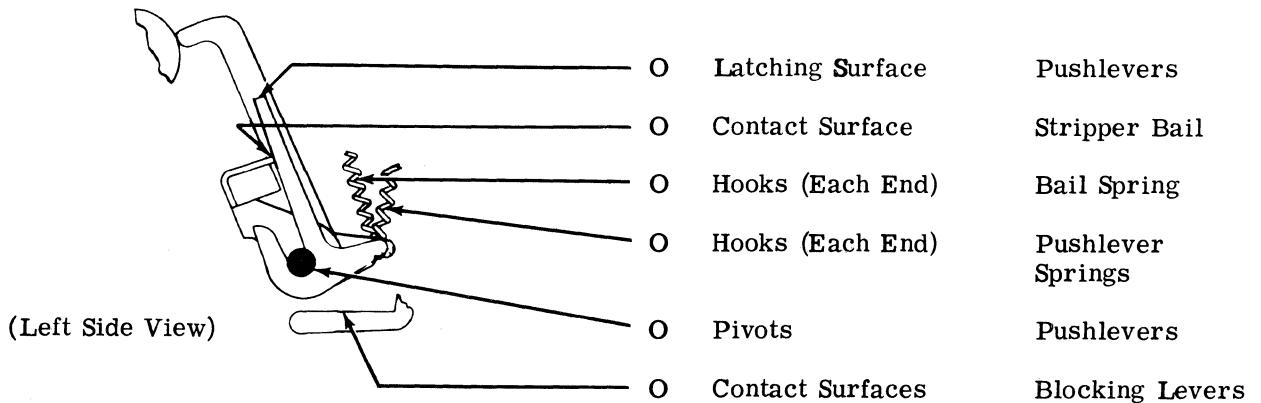
(Left Side View)

## 2.39 Blocking Levers

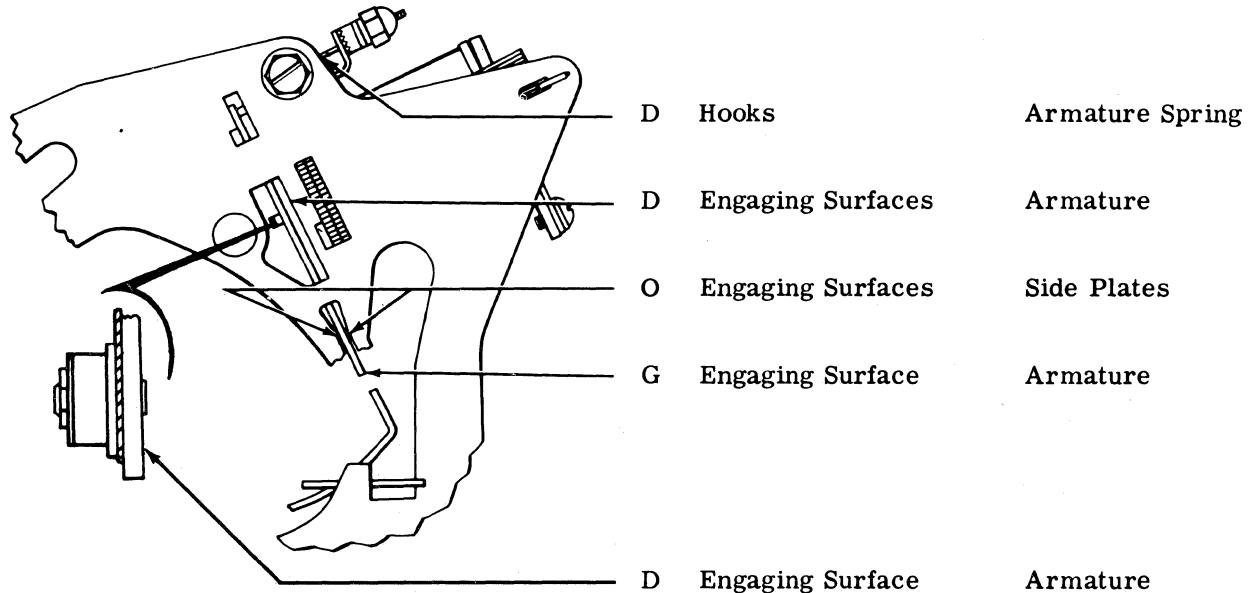


(Left Front View)

## 2.40 Pushlevers and Stripper Bail

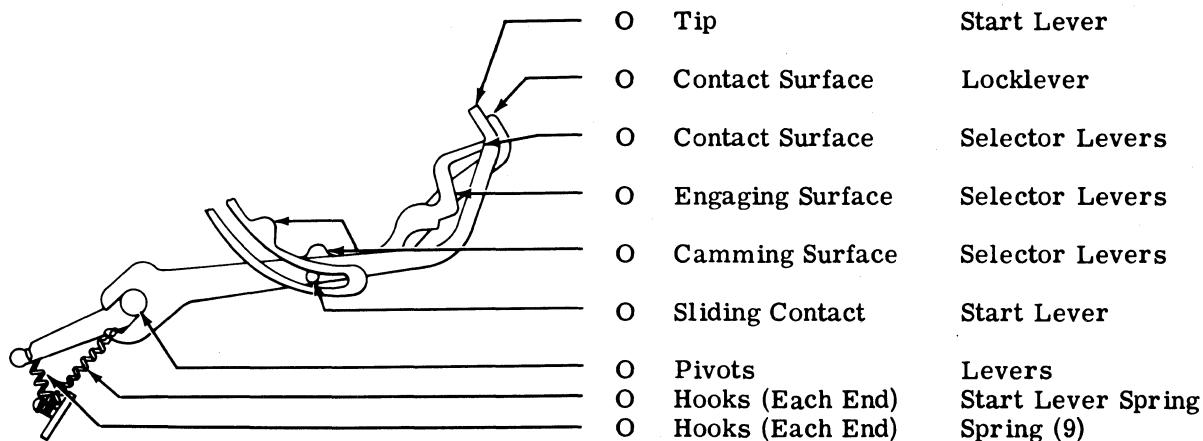


## 2.41 Armature



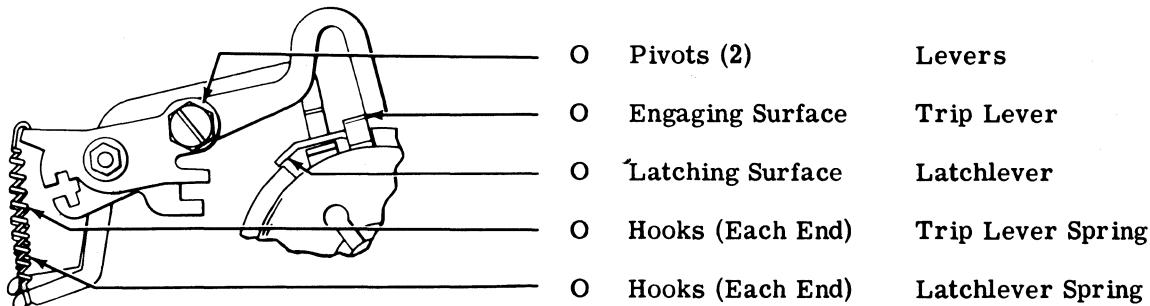
(Left Side View)

2.42 Selector Levers



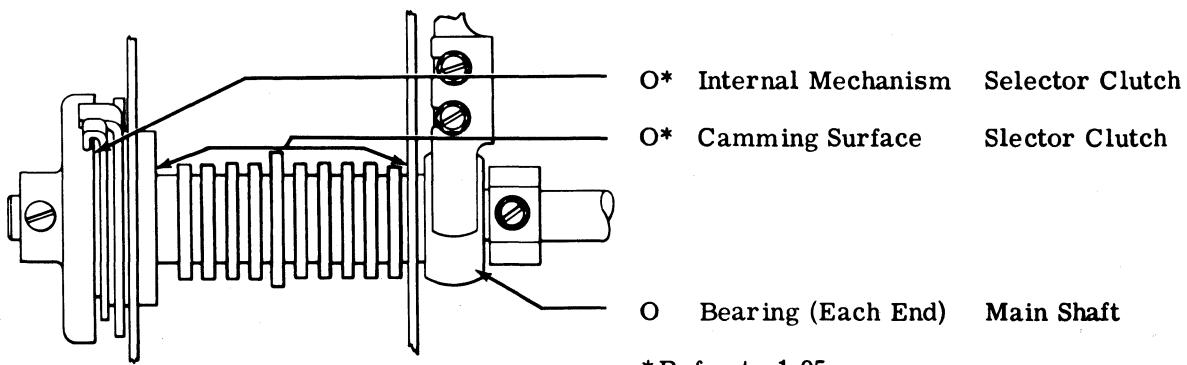
(Left Side View)

2.43 Latchlever and Trip Lever



(Left Side View)

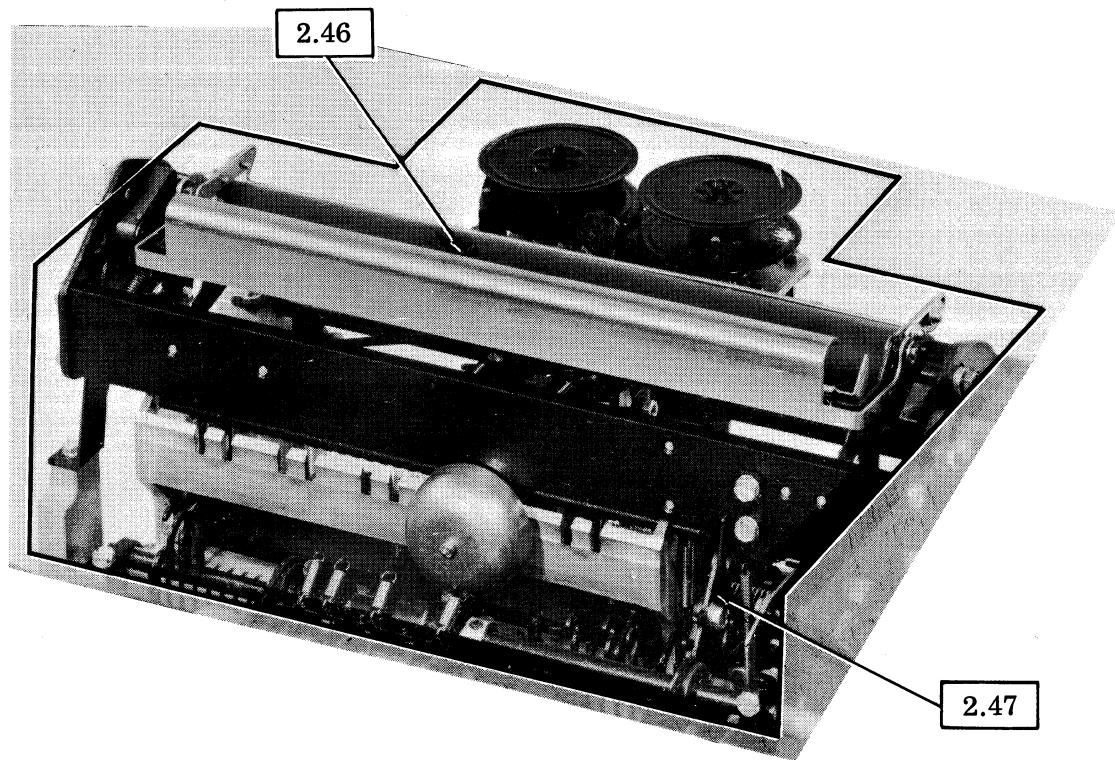
2.44 Selector Clutch



(Top View)

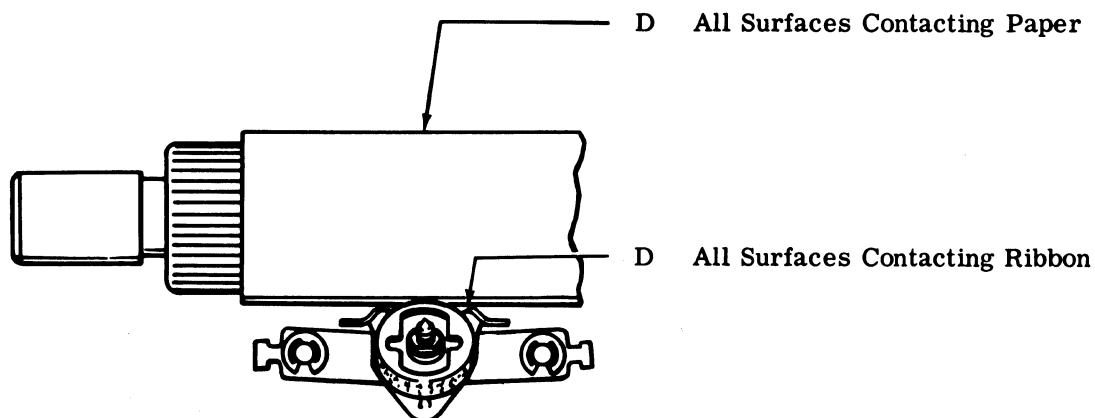
FRICTION FEED MECHANISMS

2.45 Paper Feed Area



(Rear View)

2.46 Platen



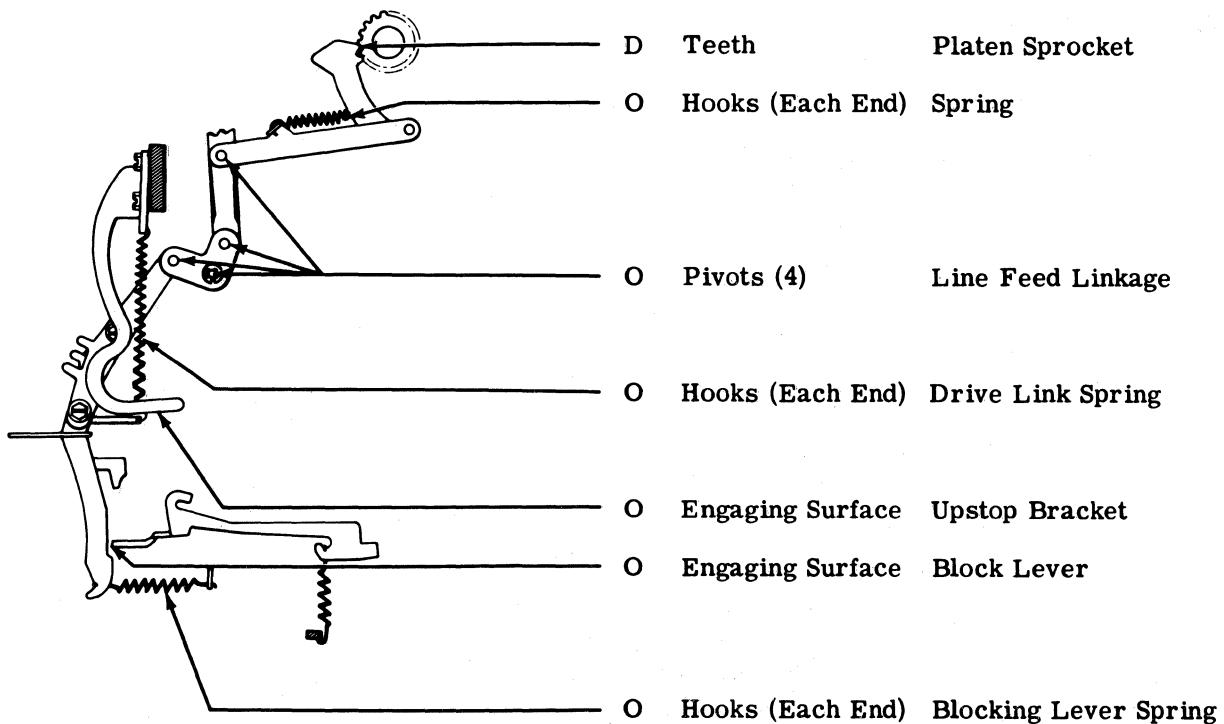
D All Surfaces Contacting Paper

D All Surfaces Contacting Ribbon

**CAUTION: DO NOT CLEAN PLATEN  
WITH SOLVENTS.**

SECTION 574-122-701TC

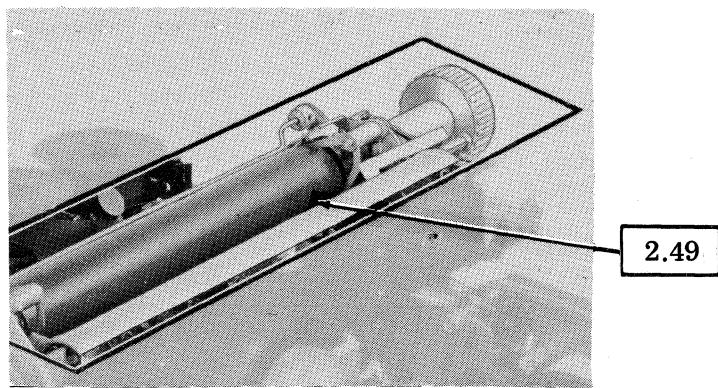
2.47 Line Feed Mechanism



(Left Side View)

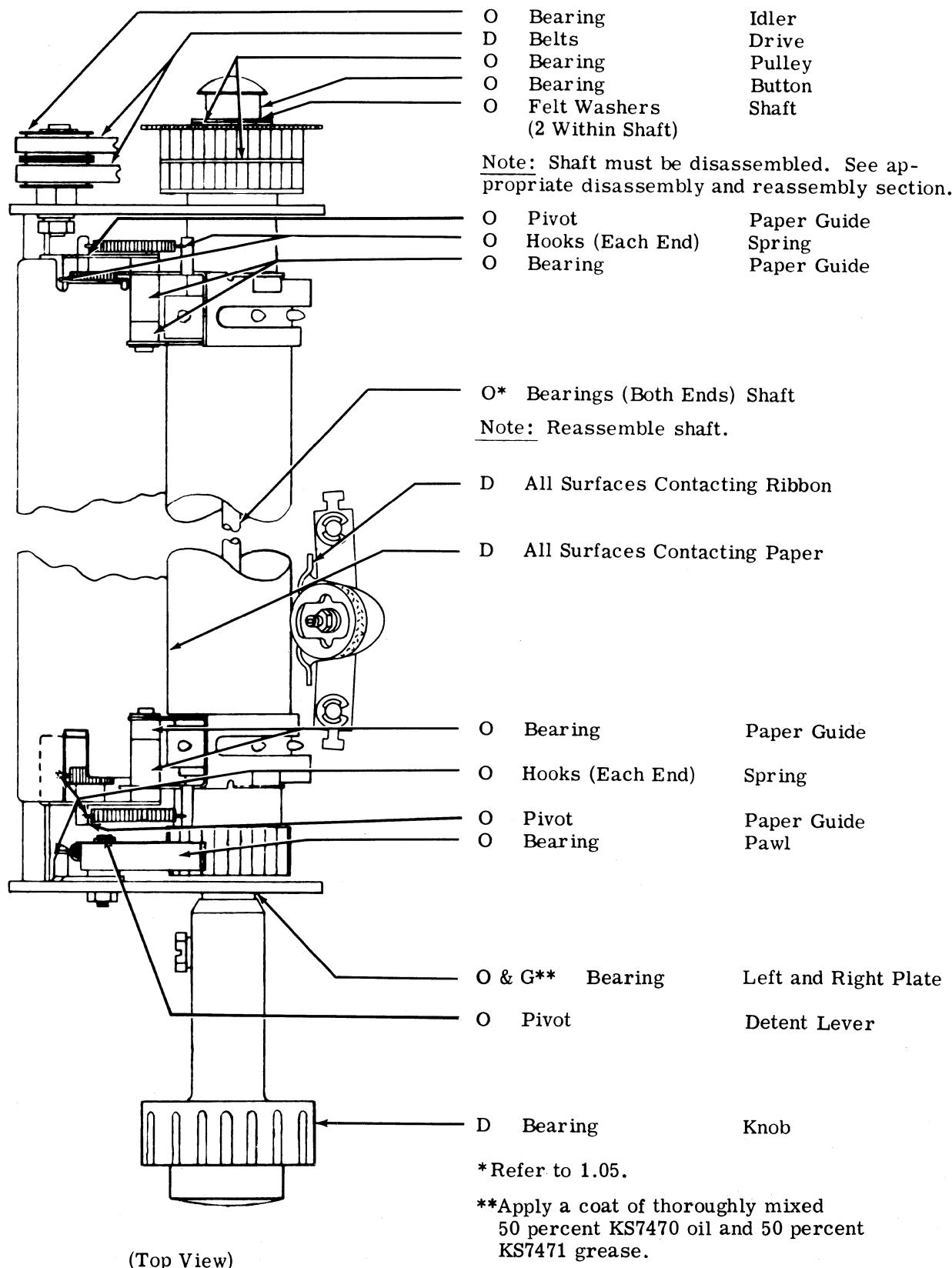
SPROCKET FEED MECHANISMS

2.48 Paper Feed Area



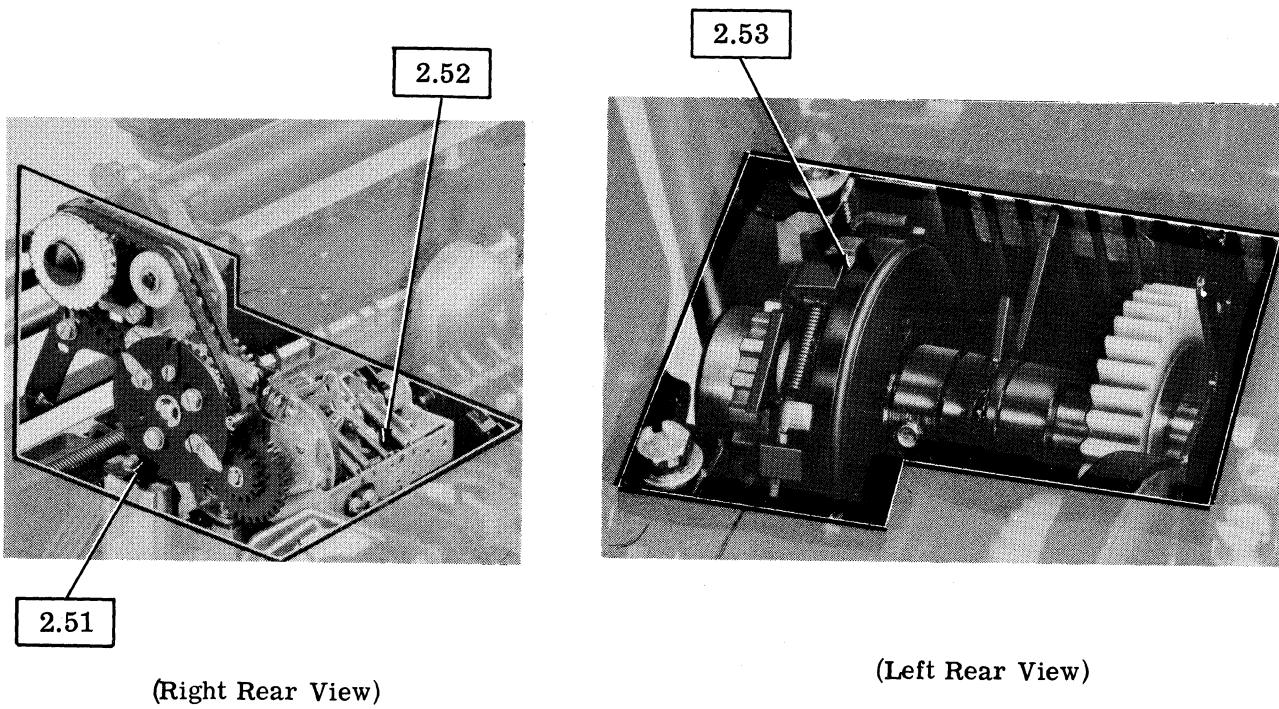
(Right Rear View)

## 2.49 Platen Mechanism



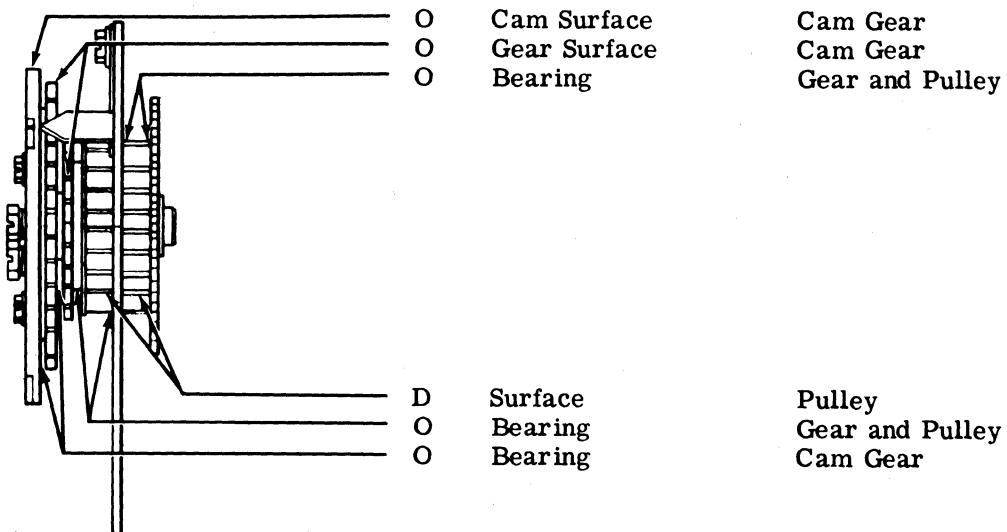
## SECTION 574-122-701TC

### 2.50 Platen Drive Area



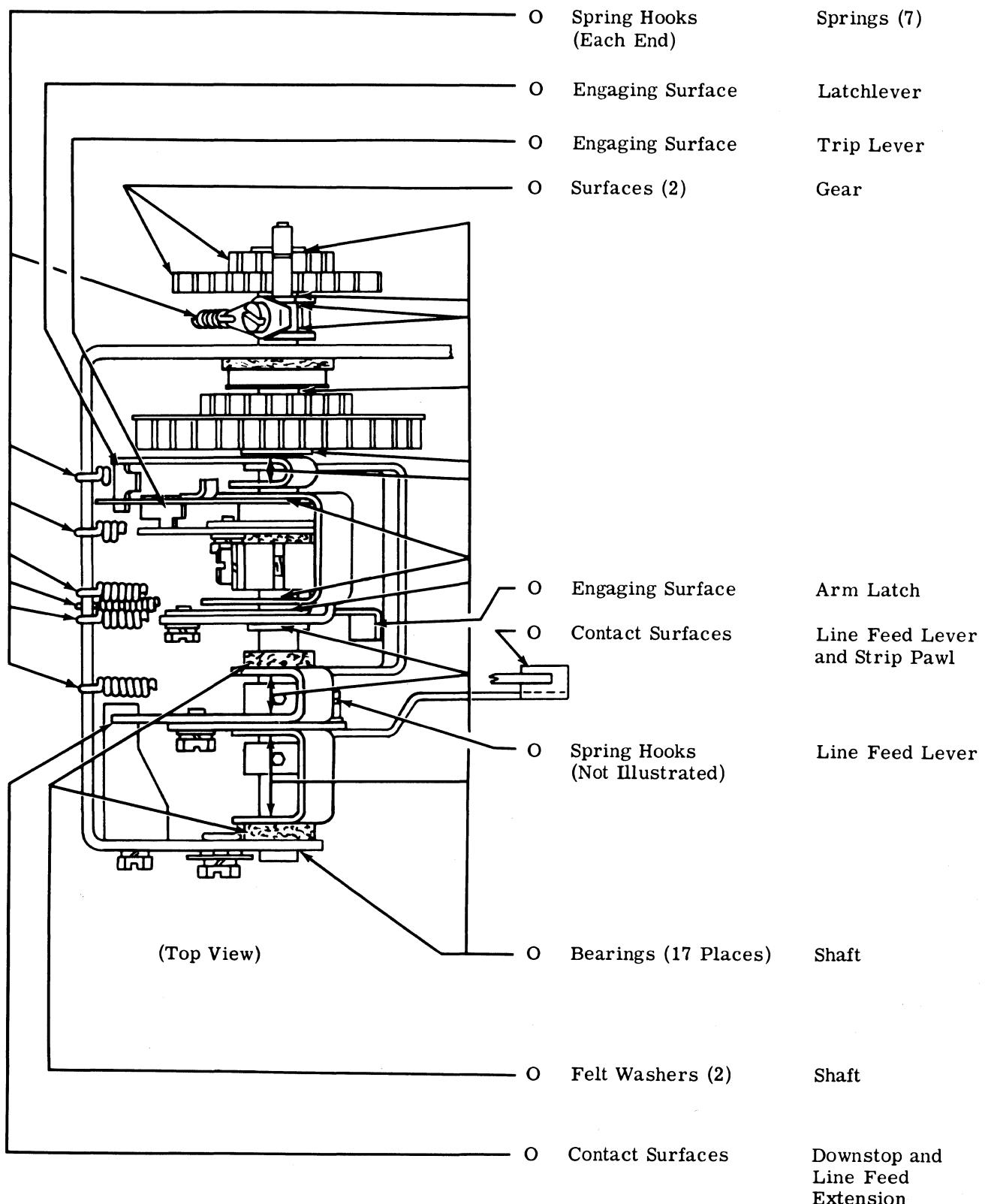
(Form-out mechanism removed for illustration purposes. Removal for lubrication is not required.)

### 2.51 Cam, Pulley, and Gear Combination

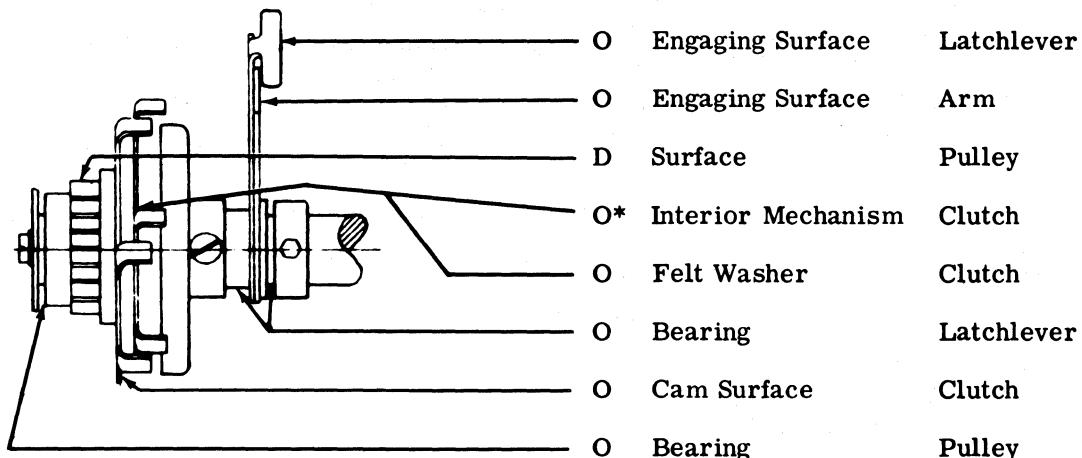


(Top View)

## 2.52 Form-Out Mechanism



2.53 Line Feed Clutch

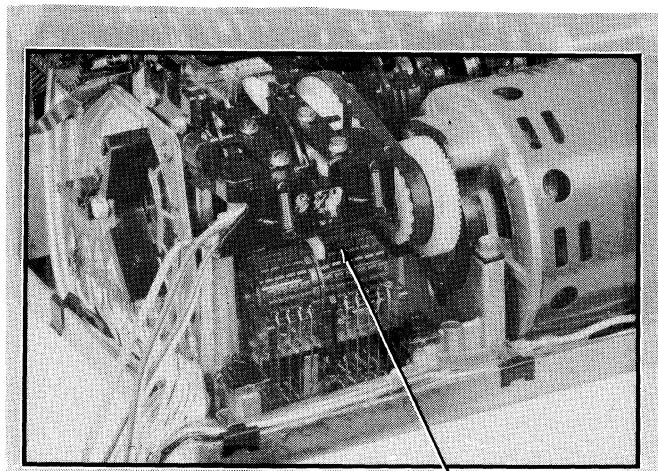


\* Refer to 1.05.

(Top View)

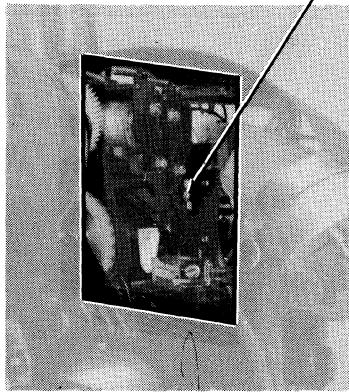
3. VARIATIONS TO BASIC UNITS

3.01 Answer-Back Area



(Left Rear View)

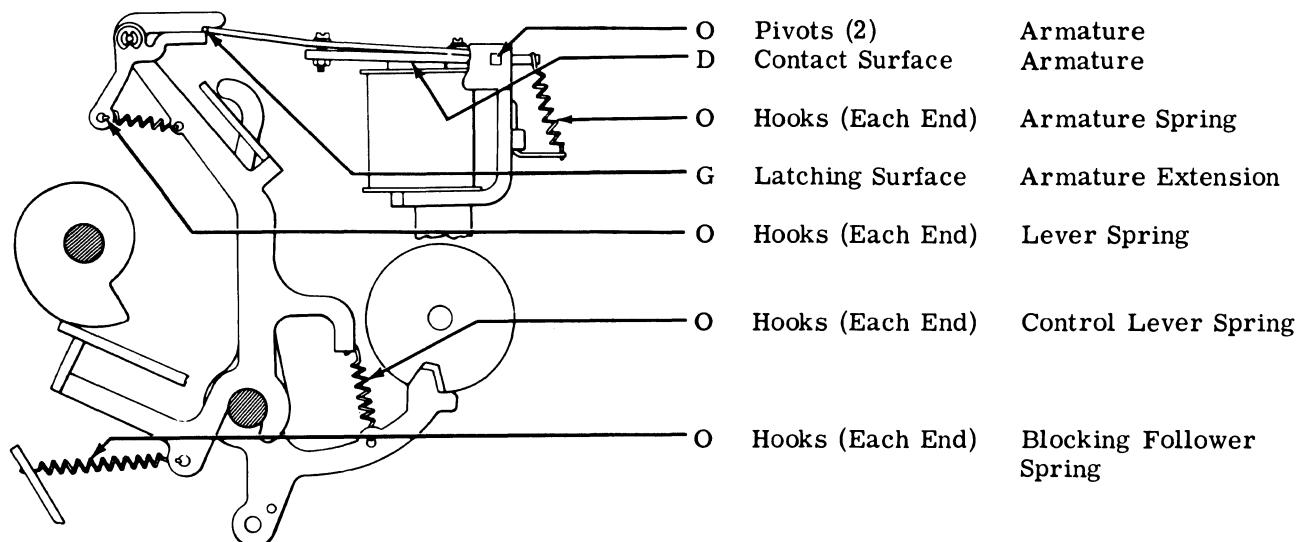
3.02



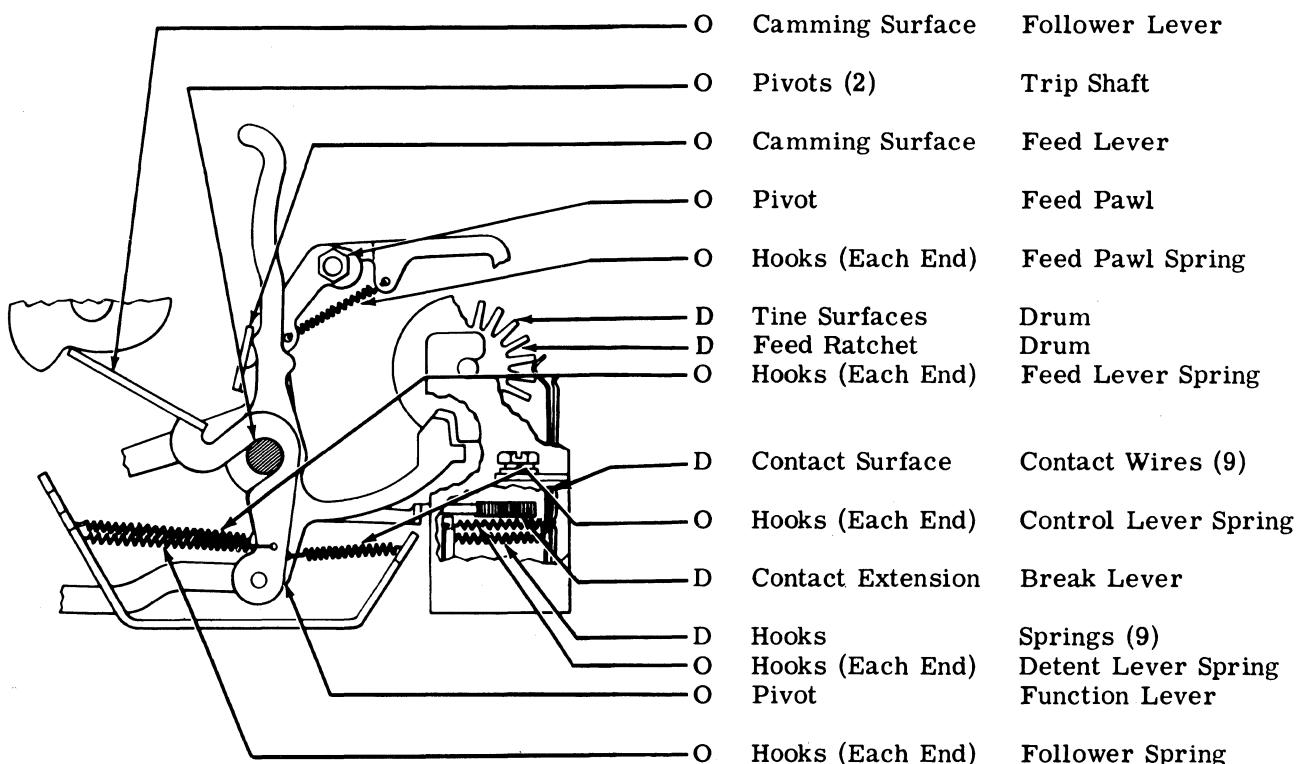
(Left Side View)

3.03

## 3.02 Trip Magnet

Note: Remove answer-back drum.

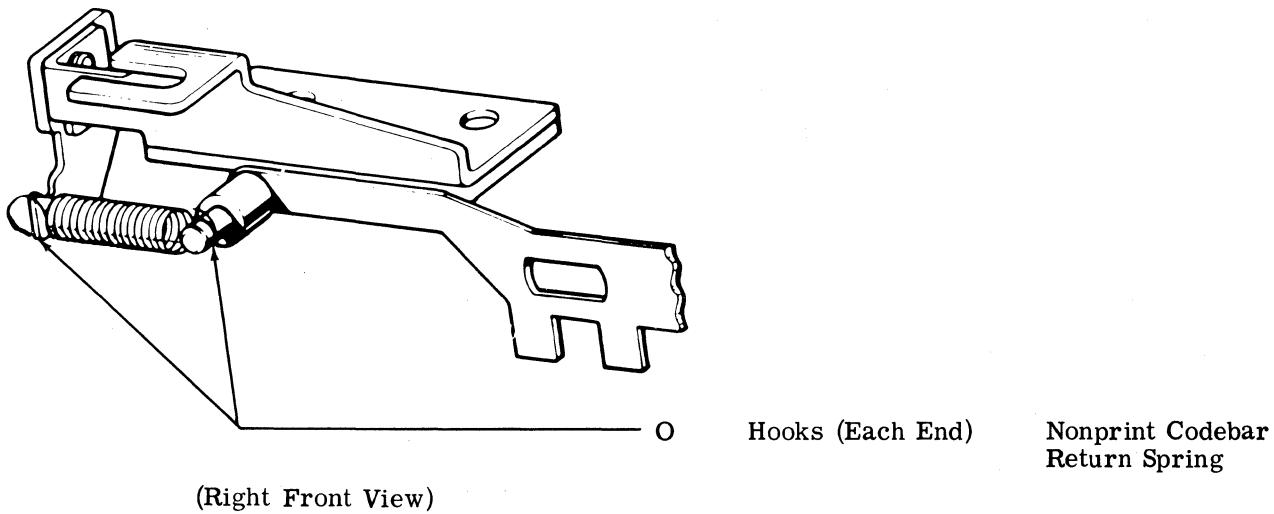
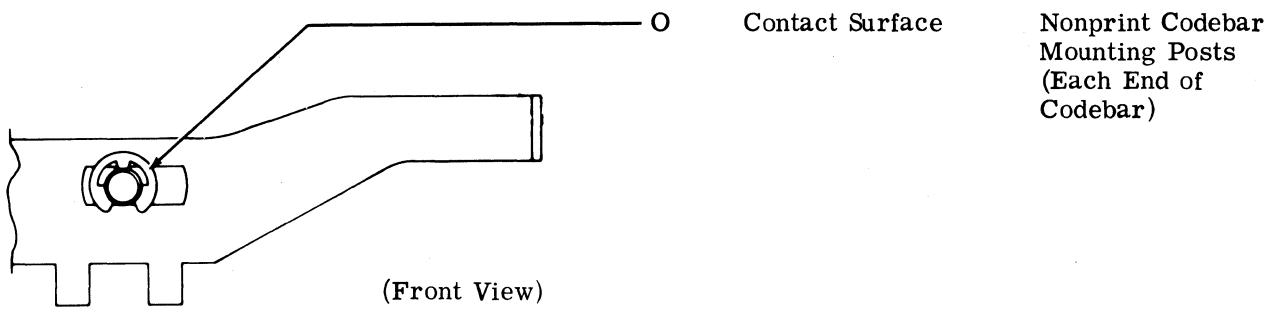
## 3.03 Answer-Back Mechanism

Note: Replace answer-back drum.CAUTION: DO NOT CLEAN CONTACT BLOCK  
WITH SOLVENTS.

## SECTION 574-122-701TC

### 3.04 Print Nonprint Mechanism (Units So Equipped)

Note: These lubrication instructions apply to both the magnet operated and solenoid operated print nonprint mechanisms.



33 TYPING UNIT

DISASSEMBLY AND REASSEMBLY

CONTENTS	PAGE	1. GENERAL
1. GENERAL .....	1	1.01 This section provides disassembly and reassembly information for the 33 typing unit. It is reissued to include instructions concerning the downstop bracket for the form-out mechanism on sprocket feed units. Marginal arrows indicate additions and changes.
2. DISASSEMBLY AND REASSEMBLY..	2	
RIBBON MECHANISM .....	2	
CARRIAGE MECHANISM .....	2	1.02 References to left, right, front, rear, etc, consider the typing unit to be viewed from a position where the ribbon mechanism faces up and the selector mechanism is located to the viewer's left.
CARRIAGE DRIVE BAIL .....	3	
CODEBAR MECHANISM .....	4	
CODEBAR RESET BAIL .....	4	1.03 The disassembly procedure given in this section divides the typing unit into its major assemblies and mechanisms. If further disassembly is required, refer to the appropriate illustrated parts section which shows detailed arrangements of parts. Where it will help in determining location, the numbers of the parts are given in the instructions.
SPACING PAWL MECHANISM .....	4	
FUNCTION LEVER MECHANISM ...	5	
SPACING DRUM MECHANISM .....	5	
DISTRIBUTOR TRIP SHAFT MECHANISM .....	5	<b>CAUTION: BEFORE BEGINNING DISAS- SEMBLY, REMOVE CONNECTORS FROM EXTERNAL RECEPTACLES (POWER SOURCE, DATA SET, ETC).</b>
DISTRIBUTOR MECHANISM .....	6	
FUNCTION ROCKER SHAFT MECHANISM .....	7	1.04 Most of the mechanisms are mounted on castings by self-tapping screws. Therefore, to remove the mechanisms, do not remove the screws, merely loosen them unless specifically instructed otherwise.
FUNCTION BOX MECHANISM .....	7	
PLATEN MECHANISM .....	7	
A. Friction Feed .....	7	1.05 Retaining rings are made of spring steel and have a tendency to release suddenly. To avoid loss of these rings when removing them, proceed as follows.
B. Sprocket Feed .....	7	
FORM-OUT MECHANISM .....	7	
TRIP SHAFT MECHANISM .....	9	(a) Hold retaining ring to prevent it from rotating.
SELECTOR MECHANISM .....	9	
MAIN SHAFT MECHANISM .....	10	(b) Place blade of screwdriver in one of the ring's slots and rotate screwdriver to increase diameter.
MOTOR .....	11	(c) Ring will come off easily in fingers without flying.

1.06 All tools used to remove the mechanisms referred to in this section can be found in the 570-005-800TC standard tool section.

1.07 All damaged, worn, or distorted parts should be replaced if encountered in the disassembly and reassembly procedures.

## 2. DISASSEMBLY AND REASSEMBLY

**Note:** For information concerning the proper procedure to remove the typing unit from the set, refer to Section 574-100-702TC.

### RIBBON MECHANISM

2.01 To remove ribbon mechanism (Figure 1), proceed as follows.

(a) Remove ribbon by removing the two ribbon spools and disengaging the ribbon from the ribbon guide and the TP183324 reverse arm.

(b) Loosen the two TP152893 mounting screws and lift ribbon mechanism from carriage.

(c) To replace ribbon mechanism, reverse procedure used to remove it.

### CARRIAGE MECHANISM

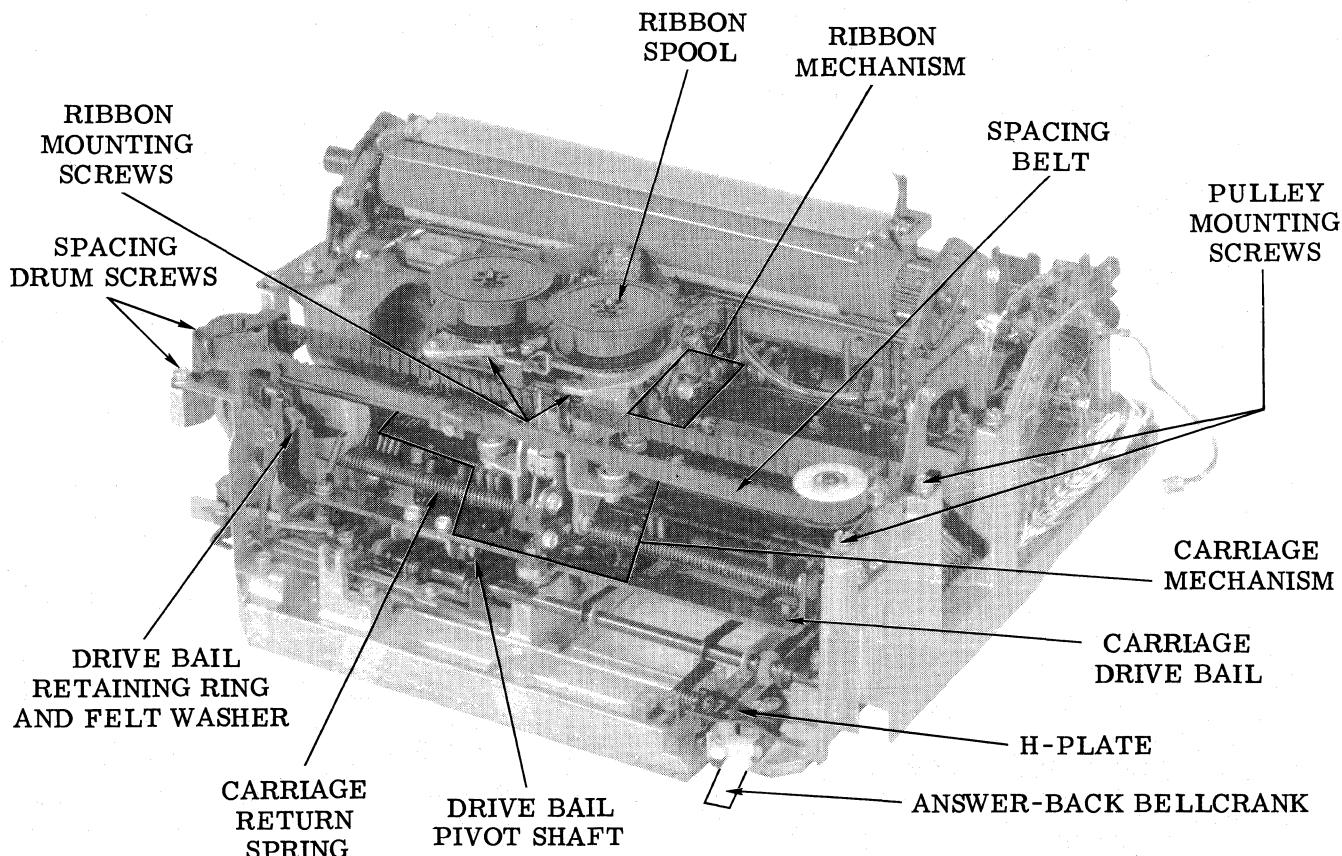
2.02 To remove carriage mechanism (Figure 1), proceed as follows.

(a) Unhook carriage return spring from carriage.

(b) Loosen the two TP180798 mounting screws in spacing pulley mounting bracket. Rotate and remove bracket.

(c) Loosen the two TP180798 mounting screws in spacing drum mounting bracket. Remove mounting bracket.

(d) Disengage spacing belt from pulley on spacing drum.



(Front View)

Figure 1 - Typing Unit

- (e) Remove front carriage shaft by sliding it to the right.
- (f) To disengage the rollers from the drive bail, slightly lift the front of the carriage. Rotate the carriage to the left and disengage the slide guides from the codebars.
- (g) Lift the carriage from the unit.
- (h) To replace the carriage mechanism, reverse the procedure used to remove it and observe the following precautions.

(1) Make sure nylon slide guides engage proper associated codebars.

(2) Make sure two rear rollers engage carriage rear plate.

#### CARRIAGE DRIVE BAIL

2.03 To remove carriage drive bail (Figures 1 and 2), proceed as follows.

- (a) Remove the carriage mechanism (2.02).

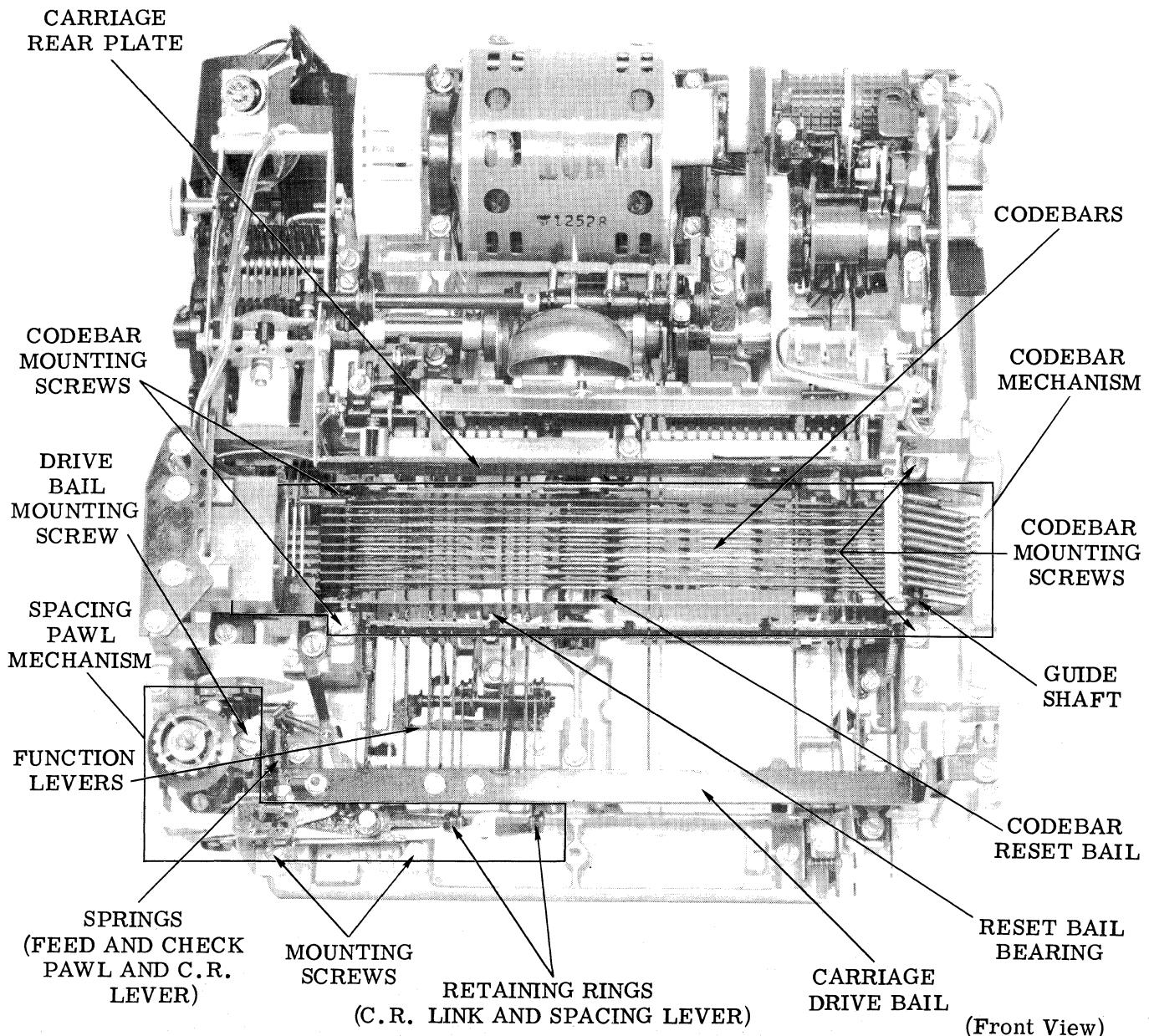


Figure 2 - Typing Unit (Carriage and Platen Removed)

- (b) Remove the TP3598 nut from the TP180546 post.
- (c) Loosen the TP180798 mounting screw and remove the TP181230 clamp plate at left end of carriage drive bail.
- (d) Remove the TP119651 retaining ring and felt washer at right end of bail.
- (e) Remove drive bail by sliding it to left.
- (f) To replace drive bail assembly, reverse procedure used to remove it.

#### CODEBAR MECHANISM

2.04 To remove codebar mechanism (Figure 4), proceed as follows.

- (a) Remove the carriage mechanism (2.02).
- (b) Loosen the TP180798 mounting screw and remove the TP180682 upstop bracket. Tighten the TP180798 mounting screw to secure the TP181230 retaining plate to the base casting.
- (c) Remove the TP180788 carriage rear rail.
- (d) Remove the TP180959 bracket.
- (e) Rotate the main shaft so that the TP180751 lever is positioned on the low part of the codebar cam.
- (f) Loosen the four TP180798 mounting screws and remove the four TP180925 clamps.
- (g) Lift the blocking levers from the guide slots and lift the codebar mechanism from the frame.
- (h) To replace codebar mechanism, reverse procedure used to remove it and observe the following precautions.
  - (1) Make sure function levers are in proper slots in codebars.
  - (2) Make sure codebars reset extensions are to right of TP180928 codebar reset bail and in proper slots of guide.
  - (3) Make sure both right and left TP180920 guide shafts are fully seated in their mountings.

- (4) Make sure the TP181070 space suppression lever is to the left of the TP180947 print suppression codebar.
- (5) Make sure the TP180752 print suppression latchlever fits into slot of the TP180923 bracket mounted on the rear tie bracket.
- (6) Make sure that the left ends of the codebars fully engage their respective blocking lever tines.

#### CODEBAR RESET BAIL

2.05 To remove codebar reset bail (Figures 2 and 3), proceed as follows.

- (a) Remove the codebar spring.
- (b) Remove the TP125252 spring from the TP180773 plate.
- (c) From underside of base casting remove the two TP181245 screws from the two TP180930 bearings.
- (d) Lift the TP180928 codebar reset bail from base casting.
- (e) To replace codebar reset bail, reverse the procedure used to remove it. When replacing the TP181245 screws, make sure that one of them passes through the TP180776 spring bracket before it enters the bearing.

#### SPACING PAWL MECHANISM

2.06 To remove spacing pawl mechanism (Figure 2), proceed as follows.

- (a) Unhook the TP74701 spring from the TP181067 feed pawl, the TP70466 spring from the TP181065 check pawl, and the TP70388 spring from the TP181319 carriage return lever.
- (b) Remove the TP119649 retaining rings from the TP181314 carriage return link and the TP181068 spacing lever.
- (c) Remove carriage mechanism (2.02).
- (d) Remove spacing drum mechanism (2.08).
- (e) Loosen the two TP180798 mounting screws.

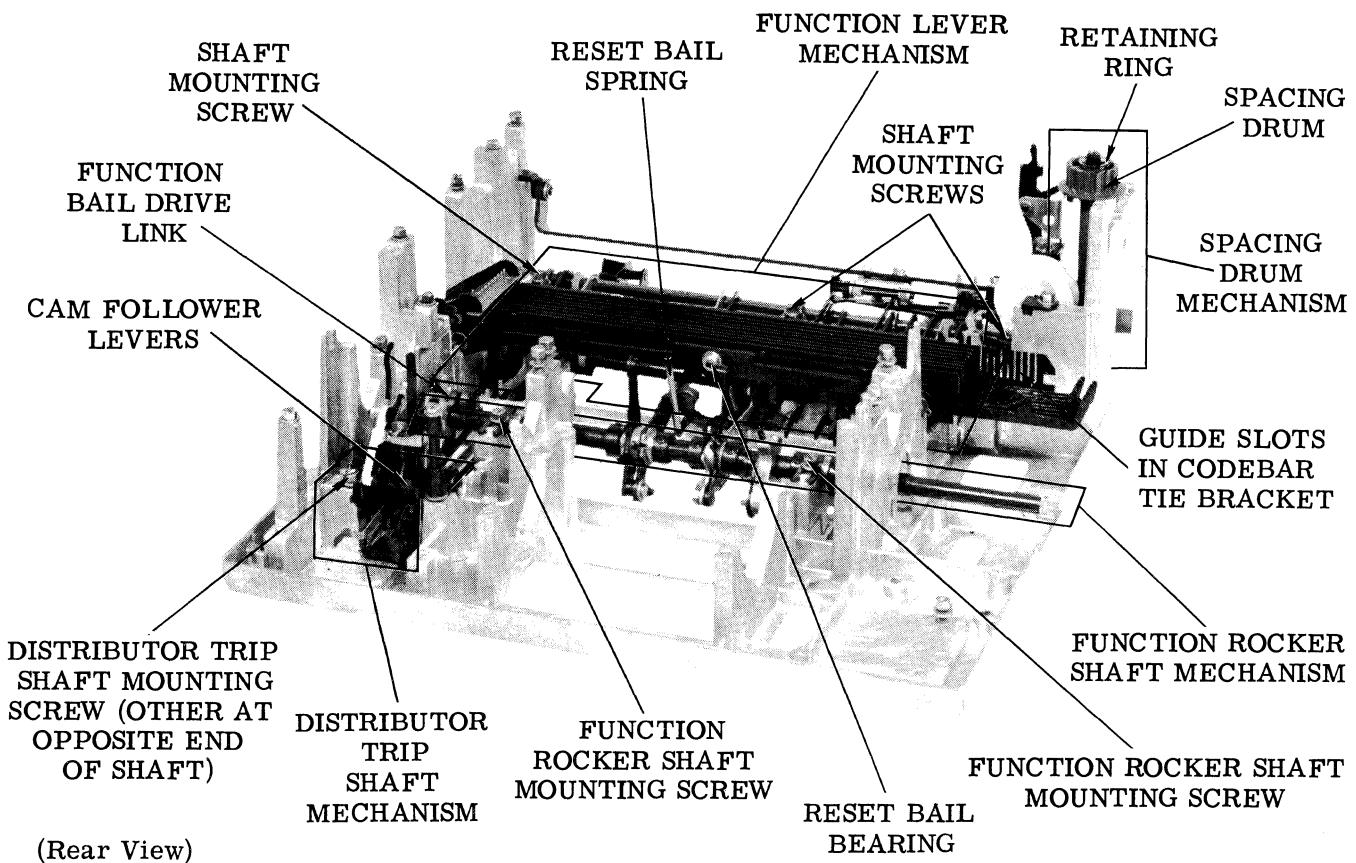


Figure 3 - Typing Unit (A Number of Mechanisms Removed)

- (f) Lift spacing pawl mechanism from base casting.
- (g) To replace spacing pawl mechanism, reverse the procedure used to remove it.

#### FUNCTION LEVER MECHANISM

- 2.07 To remove function lever mechanism (Figure 3), proceed as follows.
- (a) Loosen the three TP180798 mounting screws and rotate levers pivot shaft so flat side is vertical.
  - (b) To remove any function lever, unhook its spring and disengage lever from pivot shaft.
  - (c) To remove levers pivot shaft, remove the two TP180797 clamp plates and the TP180795 spring bracket. Lift out shaft with two drive links attached.
  - (d) To replace function lever mechanism, reverse the procedure used to remove it.

#### SPACING DRUM MECHANISM

- 2.08 To remove spacing drum mechanism (Figure 3), proceed as follows.
- (a) Remove the carriage mechanism (2.02).
  - (b) Remove the TP119653 retaining ring from top of spacing drum and remove drum.
  - (c) From underside of base casting, remove the TP112626 nut and lockwasher from lower end of spacing drum shaft.
  - (d) Lift spacing drum shaft from base casting.
  - (e) To replace spacing drum mechanism, reverse procedure used to remove it.

#### DISTRIBUTOR TRIP SHAFT MECHANISM

- 2.09 To remove distributor trip shaft mechanism (Figure 3), proceed as follows.

- (a) Remove the distributor mechanism (2. 10).
- (b) Remove the TP119649 retaining ring from post connecting links to each of following cam follower levers: TP180985, TP180820, and TP180821.
- (c) Unhook five springs from the TP180988 spring bracket.
- (d) Loosen the TP180798 screw and TP182264 post, and remove the two TP180972 buffer clamps.
- (e) Remove distributor trip shaft mechanism from base casting.
- (f) To replace distributor trip shaft mechanism, reverse procedure used to remove it.

#### DISTRIBUTOR MECHANISM

2. 10 To remove distributor mechanism (Figure 4), proceed as follows.
- (a) Remove the TP181242 screw and TP180980 brush holder.
  - (b) Loosen the three TP180989 distributor disc mounting screws.
  - (c) Remove the TP180798 mounting screw and the TP180850 bracket and then remove the clutch trip mechanism.
  - (d) Loosen the TP180798 screw and remove the TP180998 clamp.
  - (e) Loosen the TP156740 screw and remove the TP182263 bracket.
  - (f) Loosen the two screws that mount the TP181023 right bracket.

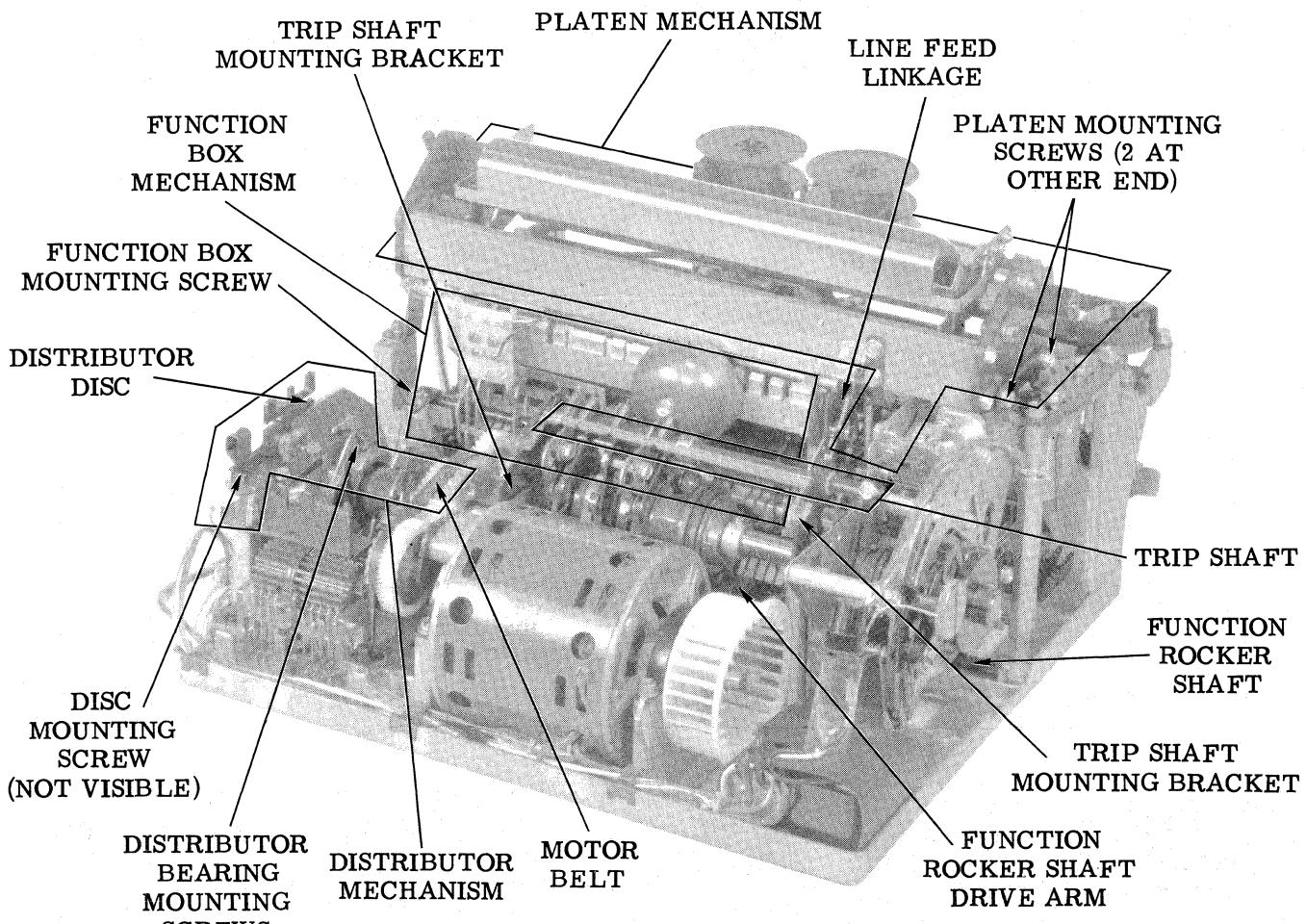


Figure 4 - Typing Unit

- (g) Remove the belt from the motor.
- (h) Lift the distributor mechanism from the base.
- (i) To replace distributor mechanism, reverse procedure used to remove it. Make sure leads are inserted into proper connections on disc. (See the appropriate wiring diagram.)

#### FUNCTION ROCKER SHAFT MECHANISM

- 2.11 To remove function rocker shaft mechanism (Figure 3), proceed as follows.
- (a) Remove the trip shaft mechanism (2.16).
  - (b) Remove the form-out mechanism (2.15).
  - (c) Remove the main shaft mechanism (2.18).
  - (d) Remove the TP119651 retaining rings from posts at rear of the TP180769 left and TP180770 right function bail drive link.
  - (e) Loosen the two TP180798 mounting screws and remove the left and right function rocker shaft bearing clamp plates.
  - (f) Lift the function rocker shaft mechanism from the base casting.
  - (g) To replace the function rocker shaft mechanism, reverse the procedure used to remove it.

#### FUNCTION BOX MECHANISM

- 2.12 To remove function box mechanism (Figures 2, 4, and 7), proceed as follows.
- (a) Remove the carriage mechanism (2.02).
  - (b) Remove the platen mechanism (2.13).
  - (c) Unhook the TP125252 spring (connects to TP180928 codebar reset bail) from the TP180773 plate.
  - (d) Loosen the two TP180798 mounting screws and remove the two TP180796 clamp plates.
  - (e) Lift function box mechanism from base casting.

- (f) To replace function box mechanism, reverse procedure used to remove it. Make sure function levers are in their proper slots and aligned with their respective pawls.

#### PLATEN MECHANISM

##### A. Friction Feed

- 2.13 To remove platen mechanism (Figure 4), proceed as follows.
- (a) Remove the TP119651 retaining ring and the TP90615 spring from line feed linkage.
  - (b) Disengage the TP181176 link from the TP181168 bellcrank.
  - (c) Loosen the four TP181242 mounting screws in the two platen side plates.
  - (d) Lift platen mechanism from typing unit.
  - (e) To replace platen mechanism, reverse procedure used to follow it.

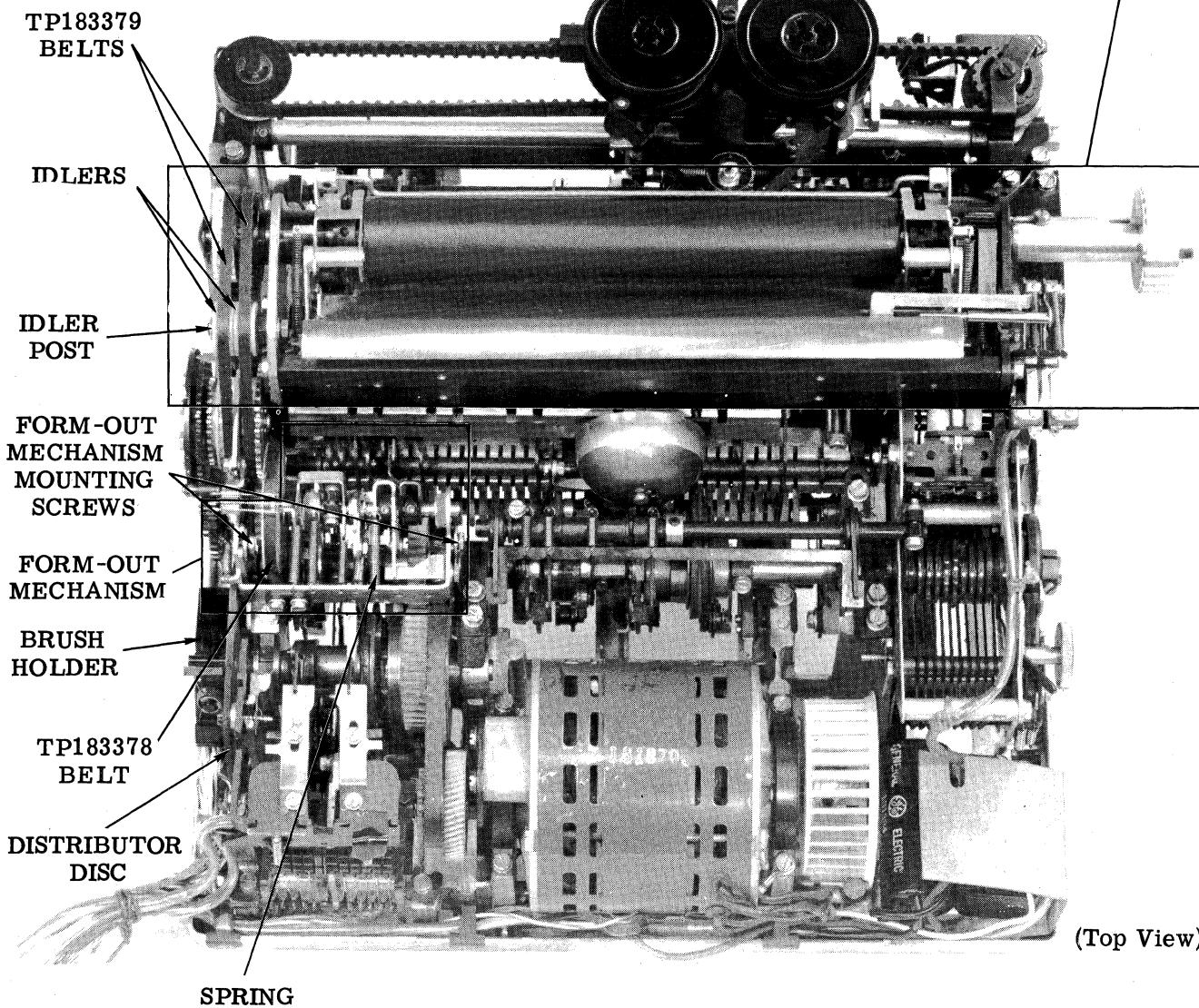
##### B. Sprocket Feed

- 2.14 To remove platen mechanism (Figures 4 and 5), proceed as follows.
- (a) Loosen the TP3598 nut on the TP183351 idler post. Back off the two TP183341 idlers and slip the two TP183379 belts off the sprockets.
  - (b) Loosen the four TP181242 mounting screws in the two platen side plates.
  - (c) Lift platen mechanism from typing unit.
  - (d) To replace platen mechanism, reverse the procedure used to remove it.

#### FORM-OUT MECHANISM

- 2.15 To remove form-out mechanism (Figures 4 and 5), proceed as follows.
- (a) With the typing unit removed from sub-base, remove the TP181242 mounting screw which secures the TP180980 brush holder.
  - (b) Remove brush holder and brush.

Note: Reader feed contact assembly and certain contact wiring removed.



(Top View)

Figure 5 - Typing Unit

Note: On Automatic Send-Receive Teletypewriter Sets, remove the front TP152893 and loosen the rear TP152893 contact bracket mounting screws which secure the tape reader feed magnet contact assembly to the typing unit. Rotate the tape reader feed magnet contact assembly out of the way clockwise, as viewed from the right.

- (c) Loosen the two TP180989 distributor disc mounting screws and pull the distributor disc out of the way.

Note: It is not necessary to remove wires from the distributor disc.

- (d) Loosen the TP3598 nut on the TP183351 idler post. Back off the two TP183341 idlers.
- (e) Slip the two TP183379 belts off the sprockets.
- (f) Loosen the three TP151630 form-out mechanism mounting screws.
- (g) Slip the TP183378 belt off main shaft sprocket.
- (h) Disengage the TP90891 spring from form-out latchlever assembly.

- (i) Gently work form-out mechanism upward and remove it.
- (j) To replace the form-out mechanism, reverse the procedure used to remove it.

Note 1: When tightening the three distributor disc mounting screws, be sure that the longer edges of the TP180676 speed nuts are horizontal with the base casting.

Note 2: The TP186747 downstop bracket (Figure 6) is for factory use only. If the form-out mechanism is removed from the unit as an assembly and the TP186747 downstop bracket is not removed or its mounting screw loosened, the form-out mechanism may be reinstalled in the same unit, using the TP186747 downstop bracket as a stop against the TP183433 bracket. However, if the TP186747 downstop bracket is removed or its mounting screw loosened, it is recommended that the downstop bracket, mounting screw, and flat washer be discarded.

#### TRIP SHAFT MECHANISM

- 2.16 To remove trip shaft mechanism (Figure 4), proceed as follows.

- (a) Loosen the four TP180798 mounting screws, two in the left and two in the right mounting bracket. Push inward on brackets and lift mechanism from base casting.

- (b) To replace trip shaft mechanism, reverse procedure used to remove it.

#### SELECTOR MECHANISM

- 2.17 To remove selector mechanism (Figure 7), proceed as follows.

- (a) Install the TP184098 selector cam removal tool as described on instruction label.
- (b) Remove the TP150040 mounting screw with lockwasher from selector clutch.
- (c) Remove selector clutch from main shaft by pulling clutch to left and rotating it back and forth.
- (d) From underside of base casting, remove the TP180798 mounting screw from bottom of left platen support post. Loosen the TP180798 screw in top of post and remove it and dashpot cylinder.
- (e) Loosen the TP181246 mounting screw in the TP180648 follower arm. Slide arm off trip shaft.
- (f) Loosen the TP180798 mounting screw and remove the TP180682 upstop bracket. Tighten screw to secure the TP181230 retaining plate.
- (g) Remove the three TP180675 mounting screws with the TP180676 speed nuts from selector plate.

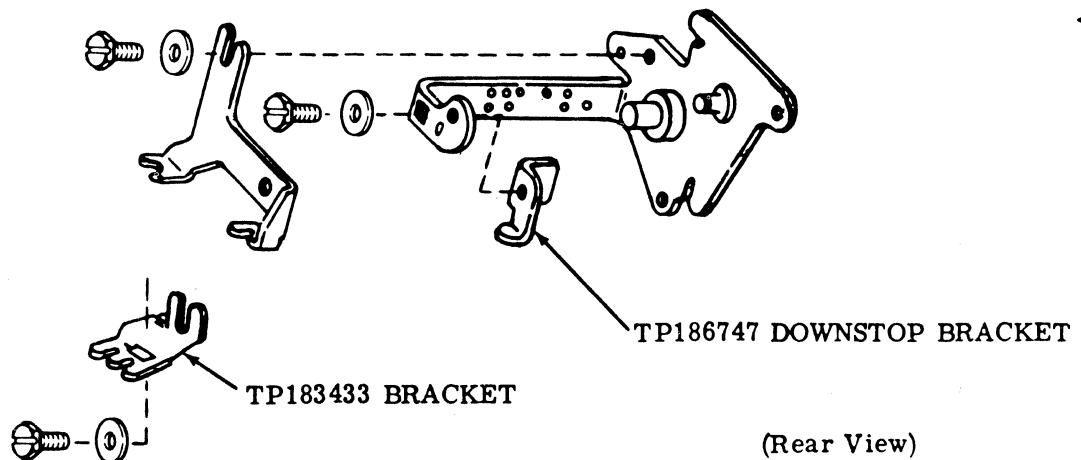
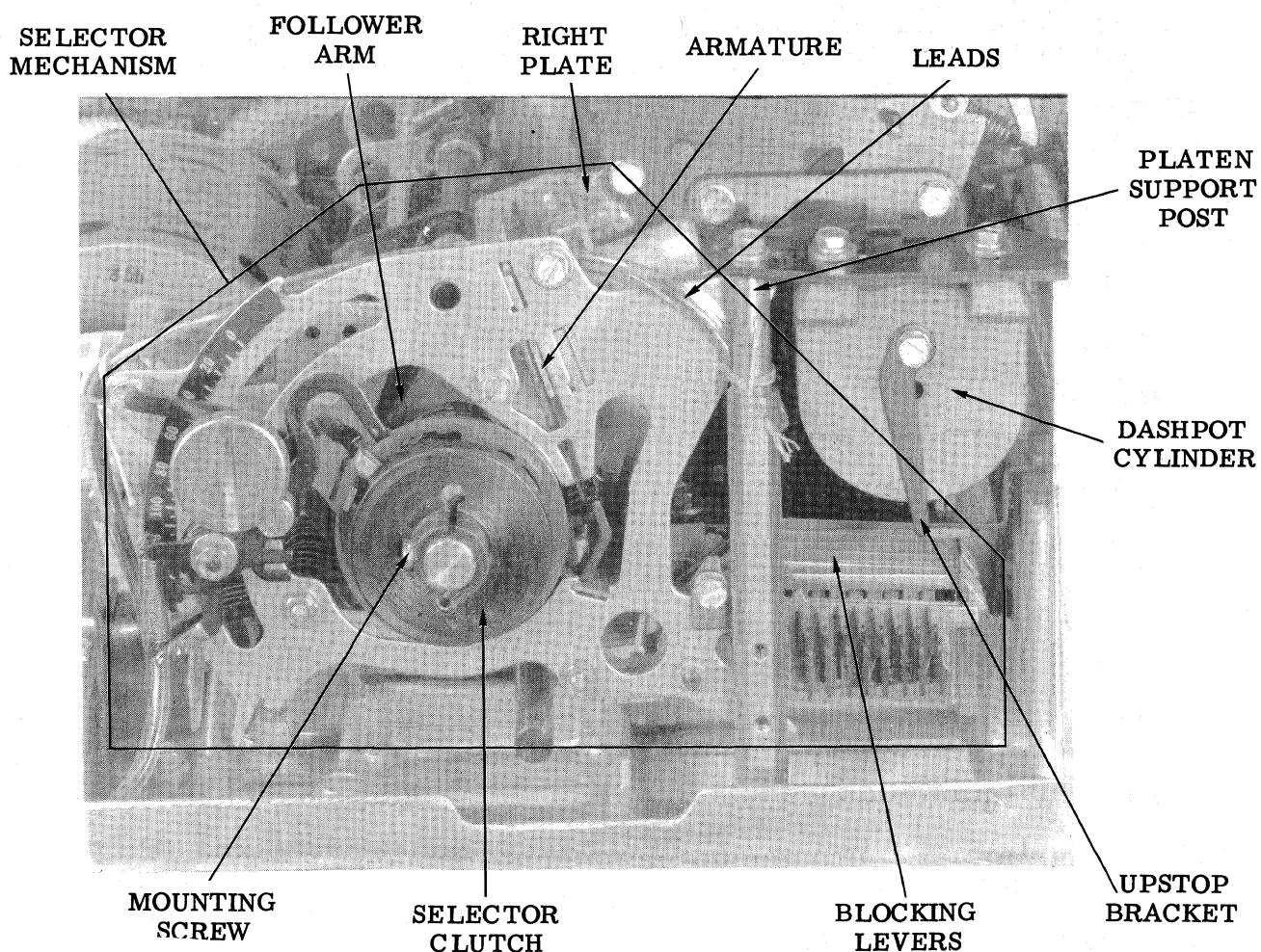


Figure 6 - Downstop Bracket on Form-Out Mechanism



(Left Side View)

Figure 7 - Selector Mechanism

- (h) Remove the two leads from the selector magnet.
- (i) Remove selector mechanism.
- (j) To replace selector mechanism, reverse the procedure used to remove it but with following precautions.
  - (1) Make sure blocking levers are properly seated to guide slots in the front TP180950 codebar tie bracket.
  - (2) To prevent right plate from bending, make sure it is properly fitted around the TP181006 bearing on main shaft.

#### MAIN SHAFT MECHANISM

- 2.18 To remove main shaft mechanism (Figure 8), proceed as follows.
  - (a) Remove trip shaft mechanism (2.16).
  - (b) Remove selector mechanism (2.17).
  - (c) Remove motor (2.19).
  - (d) Remove form-out mechanism (2.15).
  - (e) Remove the TP3598 nut and flat washer from the TP180546 pivot shaft on carriage drive bail. Disengage front end of the TP181005 drive link from pivot shaft.

- (f) Remove the TP119651 retaining ring from function rocker shaft TP180774 drive arm. Disengage the TP180746 arm on function rocker shaft from drive arm.
- (g) Position main shaft mechanism to the right and lift it from base casting.
- (h) To replace main shaft mechanism, reverse procedure used to remove it. Make sure distributor shaft is properly positioned to left against pressure of brush spring.

**MOTOR**

- 2.19** To remove motor (Figure 8), proceed as follows.

- (a) Remove the four TP180798 mounting screws and the two TP181383 motor clamps.
- (b) Disengage motor belt from gear pulley mounted on motor housing.
- (c) Loosen the TP180798 screw in motor start relay.
- (d) Remove motor, motor capacitor, start relay, and associated wiring.
- (e) To replace motor, reverse procedure used to remove it.

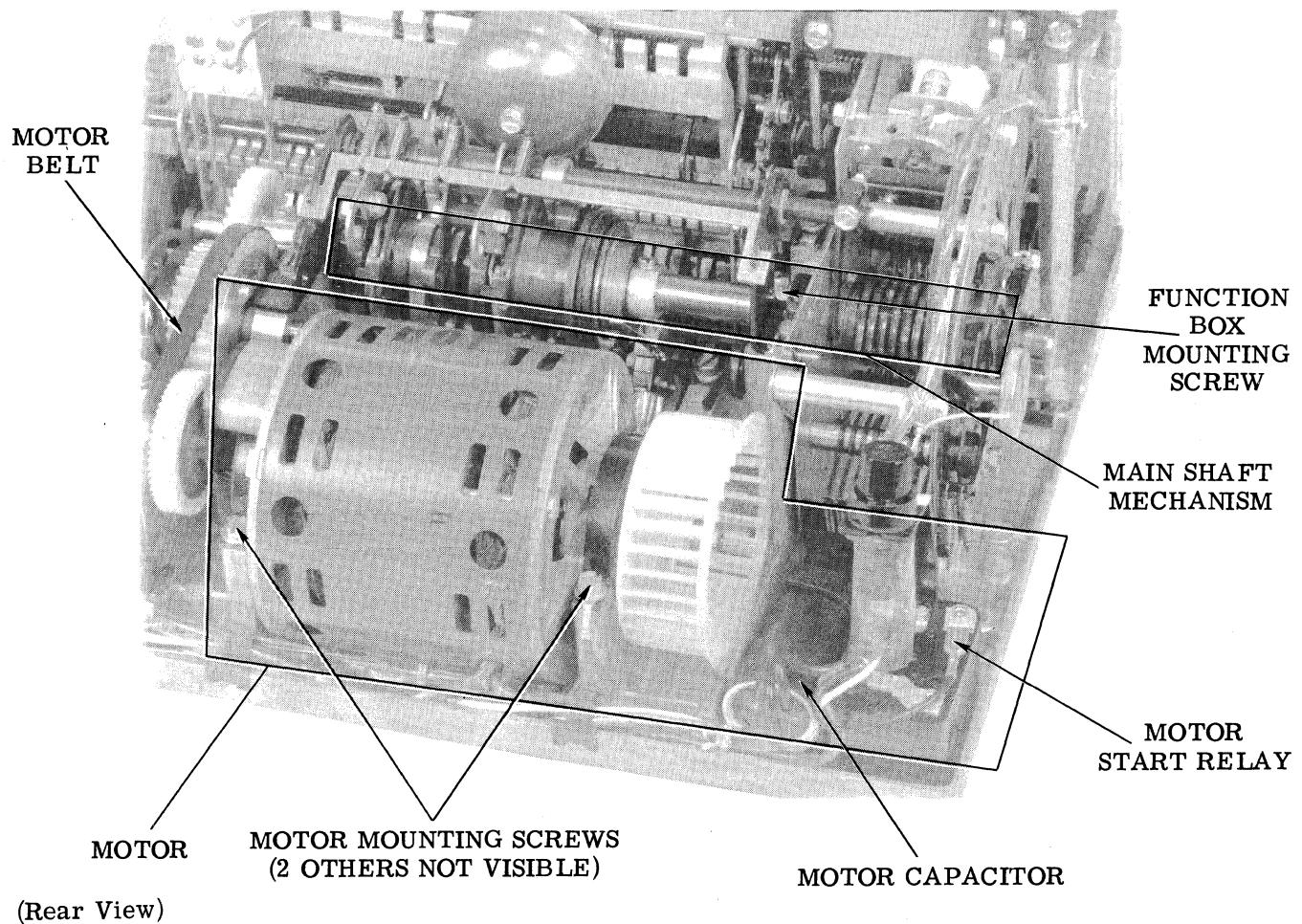


Figure 8 - Typing Unit

