28 TYPING REPERFORATOR

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

CONTENTS PAGE

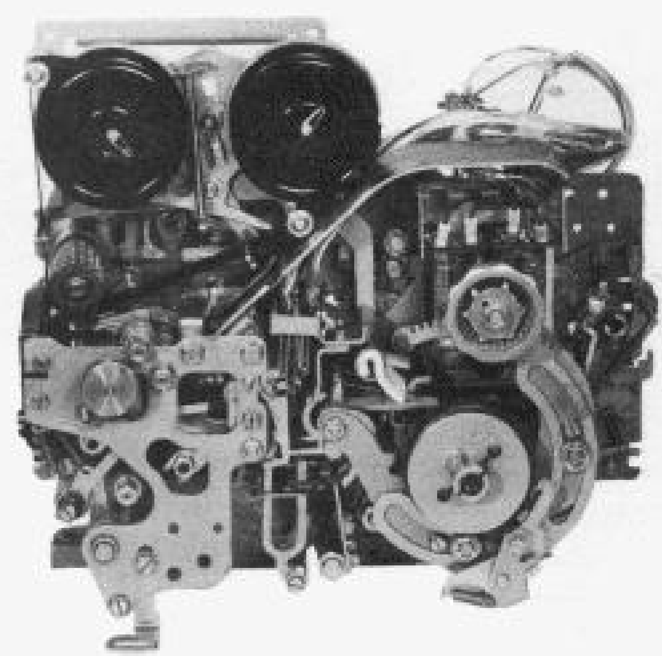


Figure 1 - 28 Typing Reperforator Unit

CONTENTS PAGE

CONTENTS PAGE

1. GENERAL

1.01 The 28 typing reperforator is an electromechanical unit which records information on tape, both as printed characters and as code perforations. The information is received from a signal line in the form of an electrical signaling code (teletypewriter code), which is translated into mechanical motions to type and perforate the tape. The typing reperforator is available in two variations: The fully-perforated tape unit (Fig. 4) and the chadless tape unit (Fig. 2). A number of variable features are also available.

1.02 Unless stated to the contrary, references in the text to "left" or "right" indicate the operator's right or left, facing the front of the unit, the selector mechanism at the right and the punch mechanism at the left. In illustrations, unless specifically labeled otherwise, it is assumed that the equipment is being viewed from the front. Pivot points are shown in the drawings by circles or elipses which are solid black to indicate fixed points and crosshatched to indicate floating points.

1.03 The unit is referred to as being in the idling condition when the main shaft is turning, the signal circuit is closed, so that no message is being received. The unit is referred to as running open when the main shaft is turning and no signal is applied to the selector magnets.

2. DESCRIPTION

GENERAL

2.01 The fully-perforated tape typing reperforator unit prepares fully punched tape and prints between the feed holes (Fig. 4). The chadless-tape typing reperforator prepares partially punched (hinged chad) tape and prints along the upper edge of the tape (Fig. 2). Except for these differences, the units are otherwise identical. The following paragraphs describe the mechanisms that comprise the units. Refer to Figures 2, 3, and 4.

ROTARY MOTION DISTRIBUTION

2.02 Rotary motion from an external source is received by a main shaft and distributed by two cam-clutch assemblies. External changes in speed of the driving power, through a gear shift mechanism or gear changes, permit changes from 60 to 75 or 100 words per minute in the typing reperforator operating speed. A rocker bail further distributes the motion to the mechanisms involved in printing and perforation.

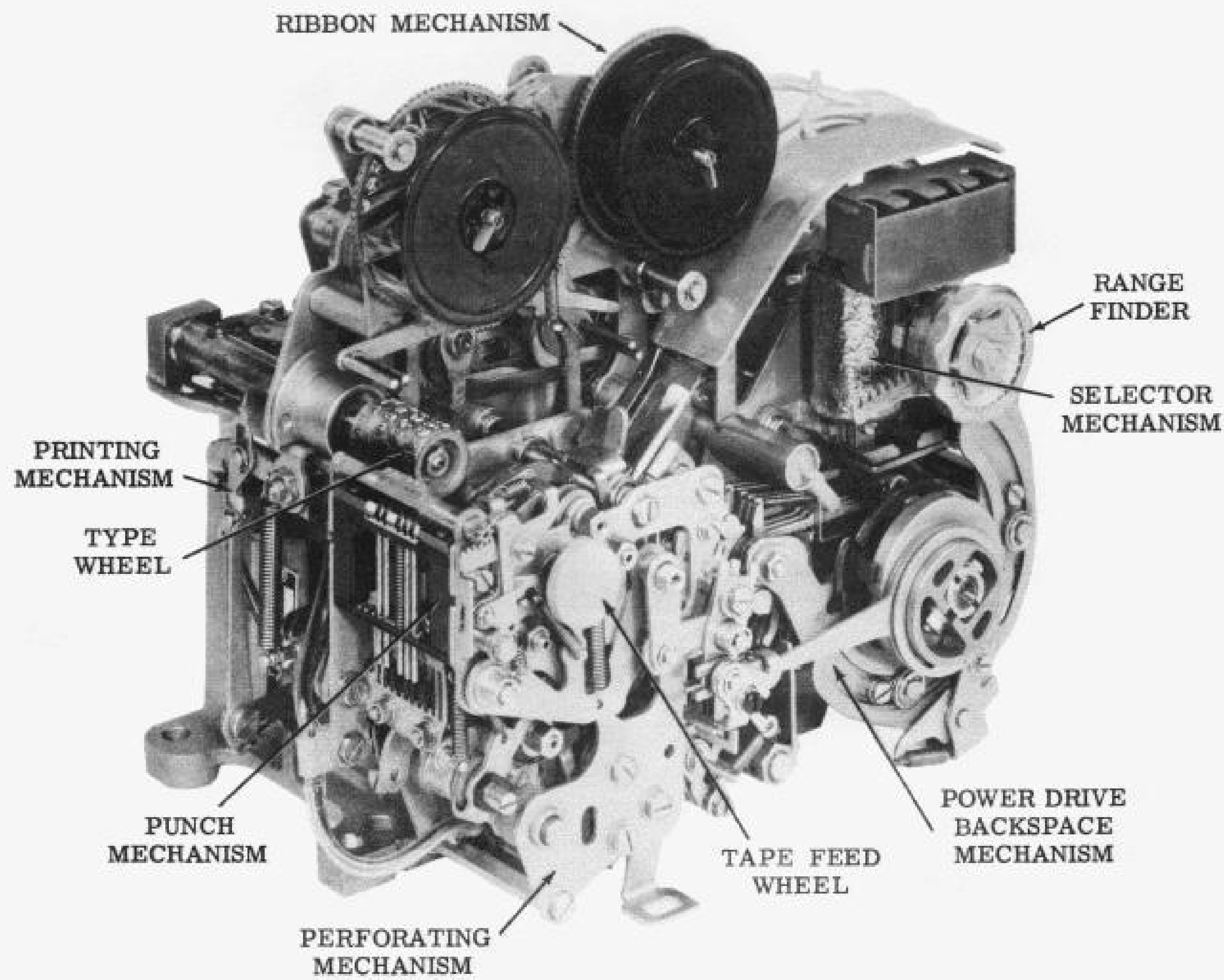


Figure 2 - 28 Typing Reperforator Unit - Chadless Tape (Left Front View)

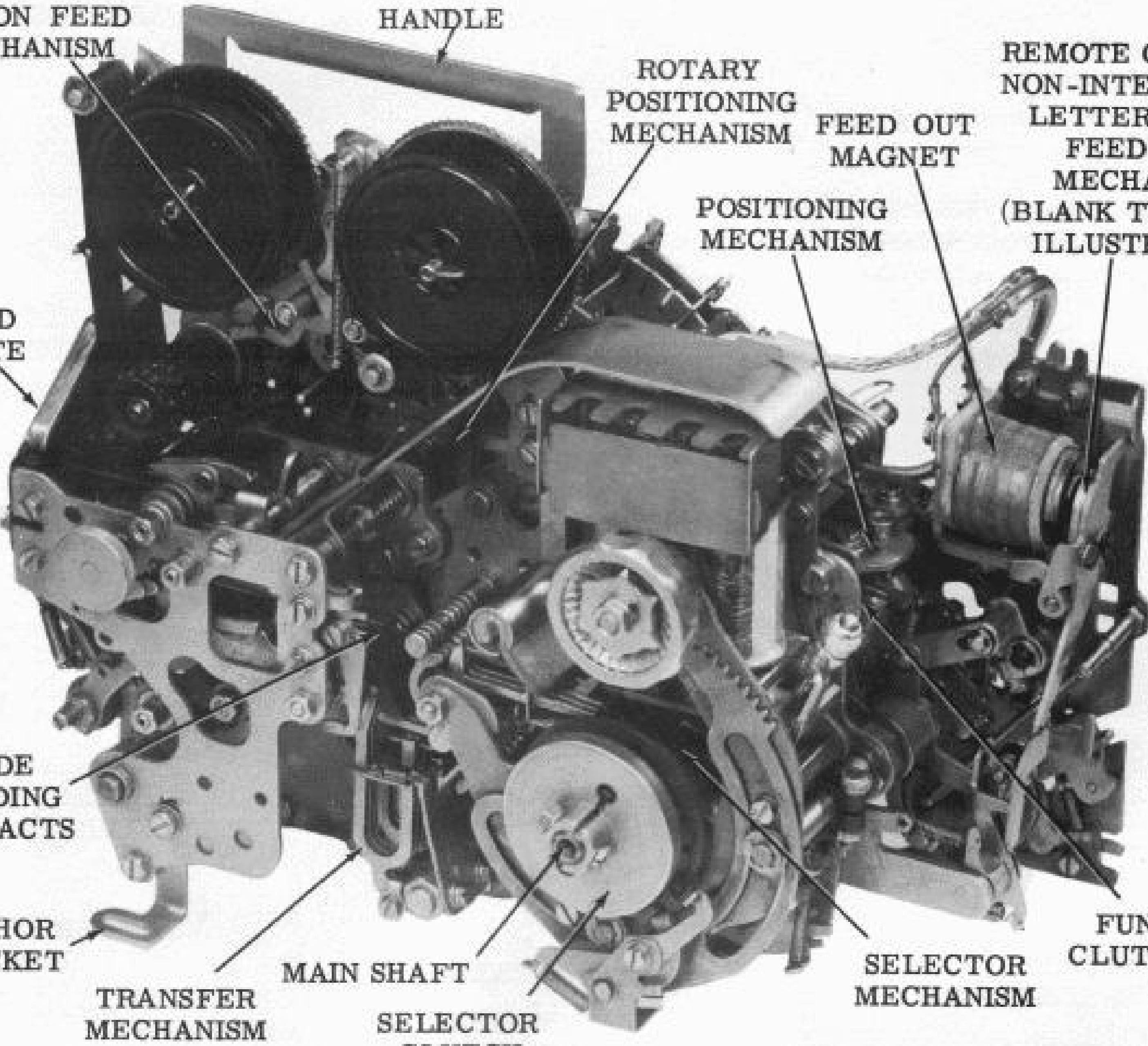


Figure 3 - 28 Typing Reperforator Unit - Fully Perforated Tape (Left Rear View)

SELECTING MECHANISM

2.03 A selecting mechanism, which includes a two-coil magnet wired to the signal line, converts the electrical code combinations into mechanical arrangements which govern the printing and perforation. The magnet may be wired in series for 0.020 ampere operation or in parallel for 0.060 ampere operation. A range finder permits adjustment of the selector in relation to the signaling code.

TYPEWHEEL AND POSITIONING MECHANISMS

2.04 The characters used in printing are embossed on a bakelite typewheel which may be replaced to obtain different type faces and character arrangements. Controlled by the selecting and transfer mechanisms, axial and rotary positioning mechanisms in conjunction with a correcting mechanism select the proper characters by moving the typewheel.

PRINTING, RIBBON FEED, AND PERFORATING MECHANISMS

2.05 A printing mechanism utilizes a hammer to drive the tape and inked ribbon against the typewheel and imprint the selected characters.

2.06 The ribbon is advanced by a ribbon-feed mechanism. A perforating mechanism steps the tape, punches feed holes and perforates chadless (or fully perforated) code holes corresponding to the code pulses received by the selecting mechanism. The tape is threaded by means of a handwheel.

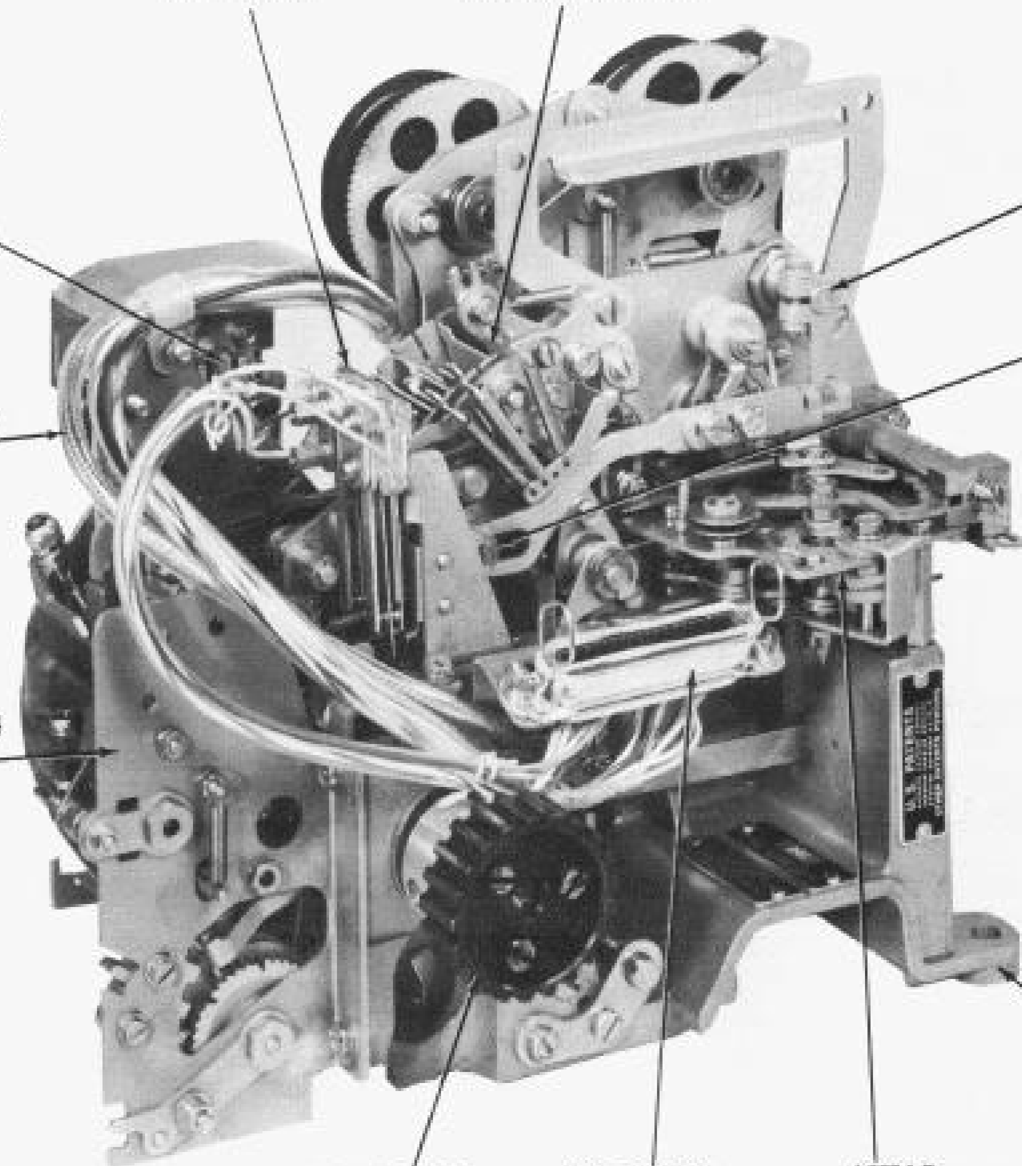


Figure 4 - 28 Typing Reperforator Unit (Front View)
(Fully-Perforated Tape)

2.07 Printing and perforating occur simultaneously at a punch block, but the characters are printed six spaces to the right of the corresponding code combinations. The typewheel is retracted at the end of each operation to make the last printed character visible.

FUNCTION BOX

2.08 A function box enables the unit to perform various auxiliary functions including the letters-figures shift, unshift on space and signal bell.

FRAME ASSEMBLY

2.09 A cast frame provides mounting facilities for the various mechanisms which comprise the typing reperforator. The frame is in turn mounted on associated equipment through which the necessary electrical and motive power connections are made. A 36-point connector for all electrical input requirements is provided.

VARIABLE FEATURES

2.10 A number of variable features are available with the typing reperforator. These features, some of which are described below and in par. 5, enable the unit to perform special operations and may be installed either at the factory or in the field.

(a) Contact Mechanisms - These mechanisms furnish electrical pulses for remote use. They include timing, code reading, and audible and visual indicator actuating contacts.

(b) Backspace Mechanisms - Two basic types are available: manual and power drive. They are used to retract the tape in order to erase (obliterate) an error.

(c) Tape Feed-Out Mechanisms - Several different methods permit the inclusion of a predetermined length of blank or letters-perforated tape following the perforation of a message. The extra length of tape facilitates tape handling. Normally, the interfering tape feed out mechanism operates at the end of a message. A message can not be received during the feed out period. The non-interfering tape feed out mechanisms have provisions for operating messages that are received during the feed-out period. The mechanisms may be operated automatically, manually, or by remote control.

(d) Print Suppression on Function - This feature prevents the printing of a predetermined character when the character or function is selected.

(e) Universal Function Blade - This blade contains removable tines so that it may be coded to accommodate any desired function box requirement.

2.11 A variation of the typing reperforator unit is a unit that contains an additional shaft that enables its perforator and typing mechanisms to be operated at a different speed from that of its selecting mechanism. It is used in applications such as the Automatic Send-Receive Set and is described in another publication.

3. TECHNICAL DATA

APPROXIMATE DIMENSIONS

Width . . . . 7-1/2 inches
Depth . . . . 6-1/2 inches
Height . . . . 8 inches
Weight . . . . 7-1/2 pounds

SIGNAL

Code . . . . Sequential, 5-level, start-stop
Current . . . . 0.020 or 0.060 ampere

TAPE

Type . . . . Standard communications
Width . . . . 11/16 inch
Perforations . . . . Five-level, chadless or fully perforated (determined by unit)
Holes/inch 10
Feed holes and code holes in line

PRINTED CHARACTERS

A. Chadless

Height
Standard. . . . . 0.120 inch
Maximum . . . . 0.193 inch
Width
Standard. . . . . 0.075 inch
Maximum . . . . 0.085 inch

B. Fully Perforated

Height . . . . 0.100 inch
Width. . . . . 0.450 inch

OPERATING SPEEDS

Unit Code	7.00	7.00	7.00	7.00	7.42	7.42	7.42	7.42	7.50	7.50	7.50
O.P.M.	390	428.6	636	643	368	404	460	600	364	400	600
Baud	45.5	50.0	74.2	75.0	45.5	50.0	56.9	74.2	45.5	50.0	75.0
Pulse Lgth	0.022	0.020	0.0135	0.0133	0.022	0.020	0.0175	0.0135	0.022	0.020	0.0133
Freq	22.75	25.0	37.1	37.5	22.75	25.0	28.45	37.1	22.75	25.0	37.5
Char. Per Sec.	6.5	7.1	10.6	10.7	6.0	6.7	7.7	10.0	6.1	6.7	10.0
Words Per Min.	65	71.4	106	107	60	67.3	75	100	60.6	66.6	100

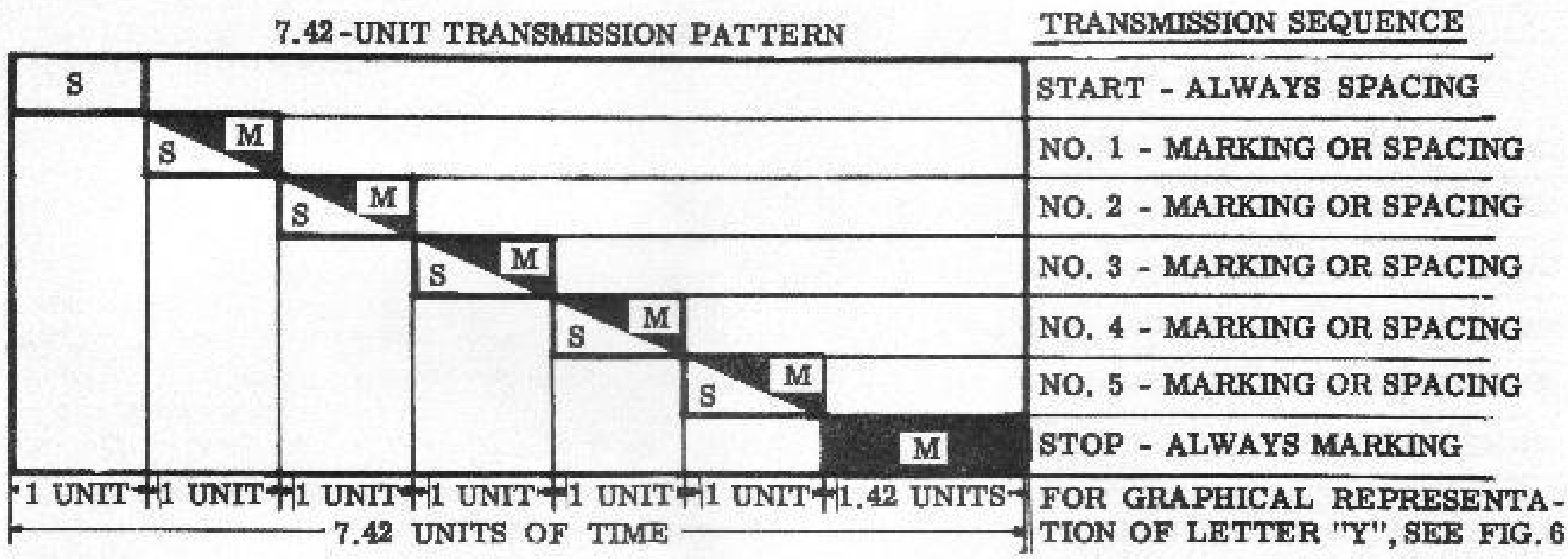
SIGNALING CODE (Fig. 5)

3.01 The typing reperforator operates on the principle of electromechanical conversion of message characters (see Fig. 5) in terms of a signal code. Teletypewriter equipment utilize the Baudot code, a five-unit start-stop signaling code, in which each character or function is represented by a combination of marking current and spacing current time intervals. In a polar signal circuit, intervals during which current flows in a positive direction are referred to as marking elements, and intervals during which current flows in the opposite direction as spacing elements. In a neutral signal circuit, intervals during which current flows in the circuit are referred to as marking elements, and intervals during which no current flows as spacing elements.

3.02 Every code combination includes five elements that carry the intelligence, each of which may be either marking or spacing. The intelligence elements are preceded by a start element (always spacing) and are followed by a stop element (always marking). The start and stop elements provide for mechanical synchronization between the transmitting and receiving equipment. A graphic illustration of the marking and spacing element in each sequence appears in Fig. 5. All five elements are marked in the letters code. The blank code is comprised of five spacing elements.

3.03 The total number of permutations of a five unit code is two to the fifth power, or 32. In order to transmit more than 32 characters and functions, a letters-figures shift operation is designed into the equipment. This permits each permutation, excluding those used to shift and unshift the apparatus, to represent two characters or functions.

3.04 The typing reperforator may operate with a 7.00, 7.42, or 7.50 unit transmission pattern (see Operating Speeds in par. 3). The signaling frequency is expressed in dot cycles per-second, one cycle consisting of a positive



a.

FIGURES	-	?	:	$	3	!	&	#	8	'	(	)	.	,	9	Ø	1	4	🔔	5	7	;	2	/	6	"	[illegible]	<	≡	[illegible]	∨	∧
LETTERS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR.	FIG.
1	●	●		●	●	●				●	●						●		●		●		●	●	●	●					●	●
2	●		●				●		●	●	●	●				●	●	●			●	●	●						●		●	●
FEED HOLES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
3			●			●		●	●		●		●	●		●	●		●		●	●		●	●					●	●	
4		●	●	●		●	●			●	●		●	●	●			●				●		●				●			●	●
5		●					●	●				●	●		●	●	●			●		●	●	●	●	●					●	●

(TYPICAL CHARACTER ARRANGEMENT) b.

Figure 5 - Signaling Code

current pulse followed by a negative current pulse. The equipment speed in baud is equal to twice the frequency. Speed in words per minute is roughly equivalent to one-sixth the operations per minute.

3.05 Marking elements in the intelligence code are represented by holes and spacing elements by the absence of holes. The row of smaller holes between the second and third levels are tape feed holes and do not enter into the code permutation.

4. GENERAL OUTLINE OF OPERATION

4.01 The relationship of the operating mechanisms of the 28 typing reperforator are illustrated in the block diagram (Fig. 6). Rotary motion from an external source is applied to the main shaft through a sprocket driven by a timing belt (Fig. 7). The main shaft rotates constantly as long as the unit is under power. An 0.020 or 0.060 ampere signal to the selector magnet is externally supplied. External electrical circuitry is supplied through a 36-point connector at the rear of the unit (see Fig. 3).

4.02 The signaling code combinations, such as the combination representing the graphic Y, plotted at the left of Fig. 6, are applied to the selecting mechanism. The start pulse of each code combination causes the selector, through a trip assembly, to trip the selecting cam-clutch. The main shaft then imparts motion to the cam-clutch throughout the selecting cycle. The cam-clutch mechanism, in turn, transfers timed motion to the selector, which converts the intelligence pulses of the code combination into a corresponding mechanical arrangement. Near the end of the selecting cycle, the cam-clutch actuates the function trip assembly. The latter trips the function cam-clutch to operate the printing and perforating mechanisms. The selecting cam-clutch is then disengaged and remains inoperative until the next code combination is received.

4.03 The function cam-clutch, driven by the main shaft, imparts motion to the rocker bail throughout the function cycle. The rocker bail transfers the motion to the perforating mechanism, the positioning mechanisms, the tape feed mechanism and the printing mechanism.

4.04 The transfer mechanism, having received their arrangement from the selector, causes positioning of the axial and rotary positioning mechanisms, which select the type-wheel character to be printed.

4.05 The punch slides, having received their arrangement from the selector, cause the punch pins to perforate code holes in the tape corresponding to the code pulses received by the selecting mechanism. Late in the function cycle, the tape feed parts advance the tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by the selecting cam-clutch or by a tape feed-out mechanism. The operations of the reperforator may overlap if the code combinations are being received fast enough. For example, while the perforating mechanism is punching the code combination, advancing the tape and the printing mechanism is printing, the selecting mechanism may be processing the next code combination.

5. SELECTION

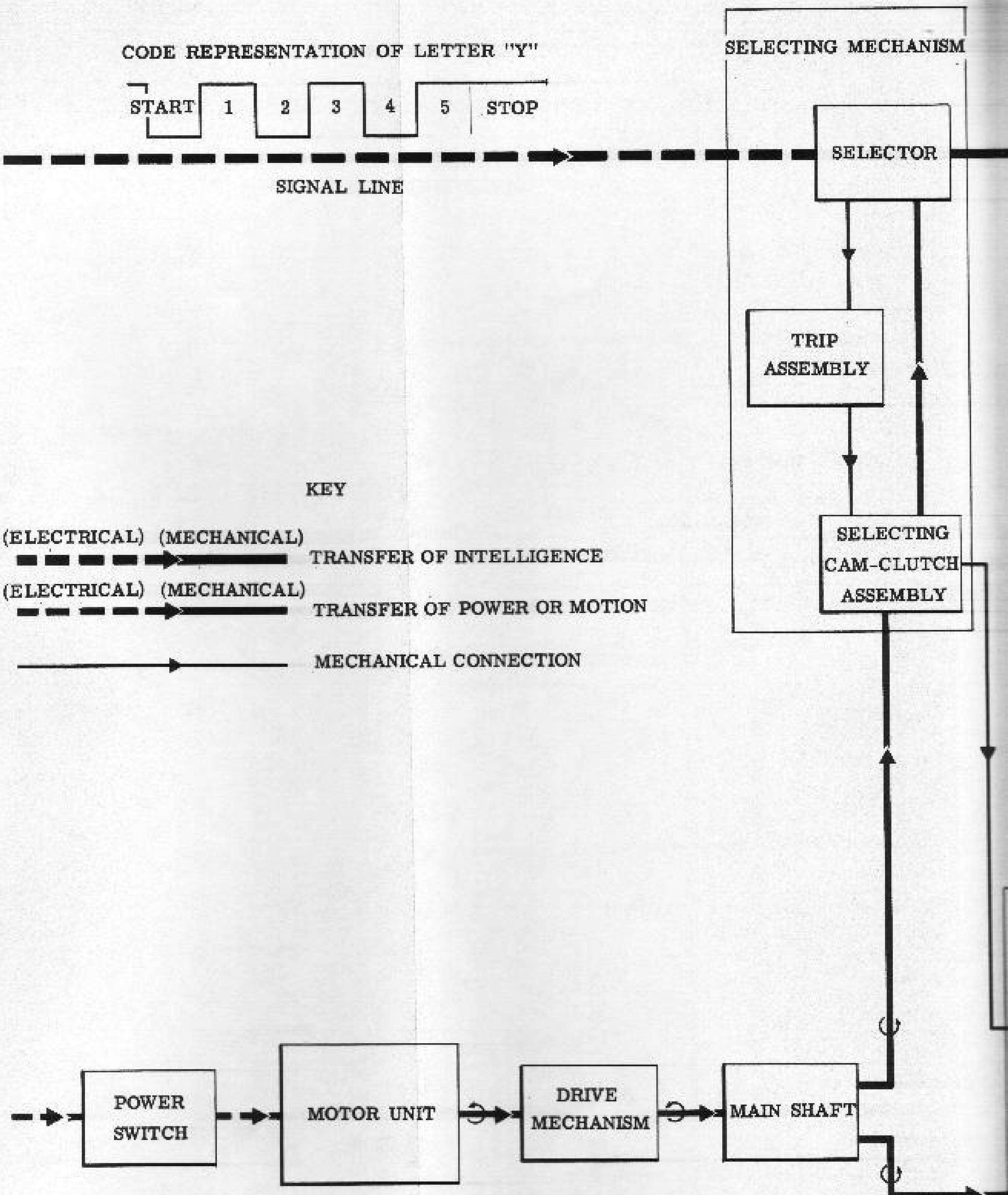
GENERAL

5.01 The selecting mechanism, made up of a selector (5.07), a clutch trip assembly (Fig. 8) and a cam-clutch (Fig. 7), translates the signaling code combinations into mechanical arrangements which govern tape printing and perforation. The electrical pulses comprising each code combination are applied to a magnet of the selector. The magnet, through an armature, controls the clutch trip assembly and the parts associated with translation. The cam-clutch transfers timed motion to the selector and also trips the function cam-clutch. By means of a range finder assembly (Fig. 8), the selecting mechanism can be adjusted to sample the code elements at the most favorable time for optimum operation. The mechanical arrangements produced by the selecting mechanism are passed on through the transfer mechanism to control the positioning and printing mechanisms (5.12) and through the punch slides to control the perforating mechanism (5.09).

RECEPTION AND TRANSLATION

A. Selecting Cam-Clutch and Trip Assembly (Fig. 7 and 8)

5.02 The selecting cam-clutch assembly includes (from right to left in Fig. 7) the clutch, the stop arm bail cam, the fifth, the fourth and the third selector cams, the cams for the spacing and the marking lock levers, the second and the first selector cams, the selector reset bail cam and the function trip cam. The


CODE REPRESENTATION OF LETTER "Y"
START
1
2
3
4
5
STOP
SIGNAL LINE
SELECTING MECHANISM
SELECTOR
TRIP ASSEMBLY
SELECTING CAM-CLUTCH ASSEMBLY
KEY
(ELECTRICAL) (MECHANICAL)
TRANSFER OF INTELLIGENCE
(ELECTRICAL) (MECHANICAL)
TRANSFER OF POWER OR MOTION
MECHANICAL CONNECTION
POWER SWITCH
MOTOR UNIT
DRIVE MECHANISM
MAIN SHAFT

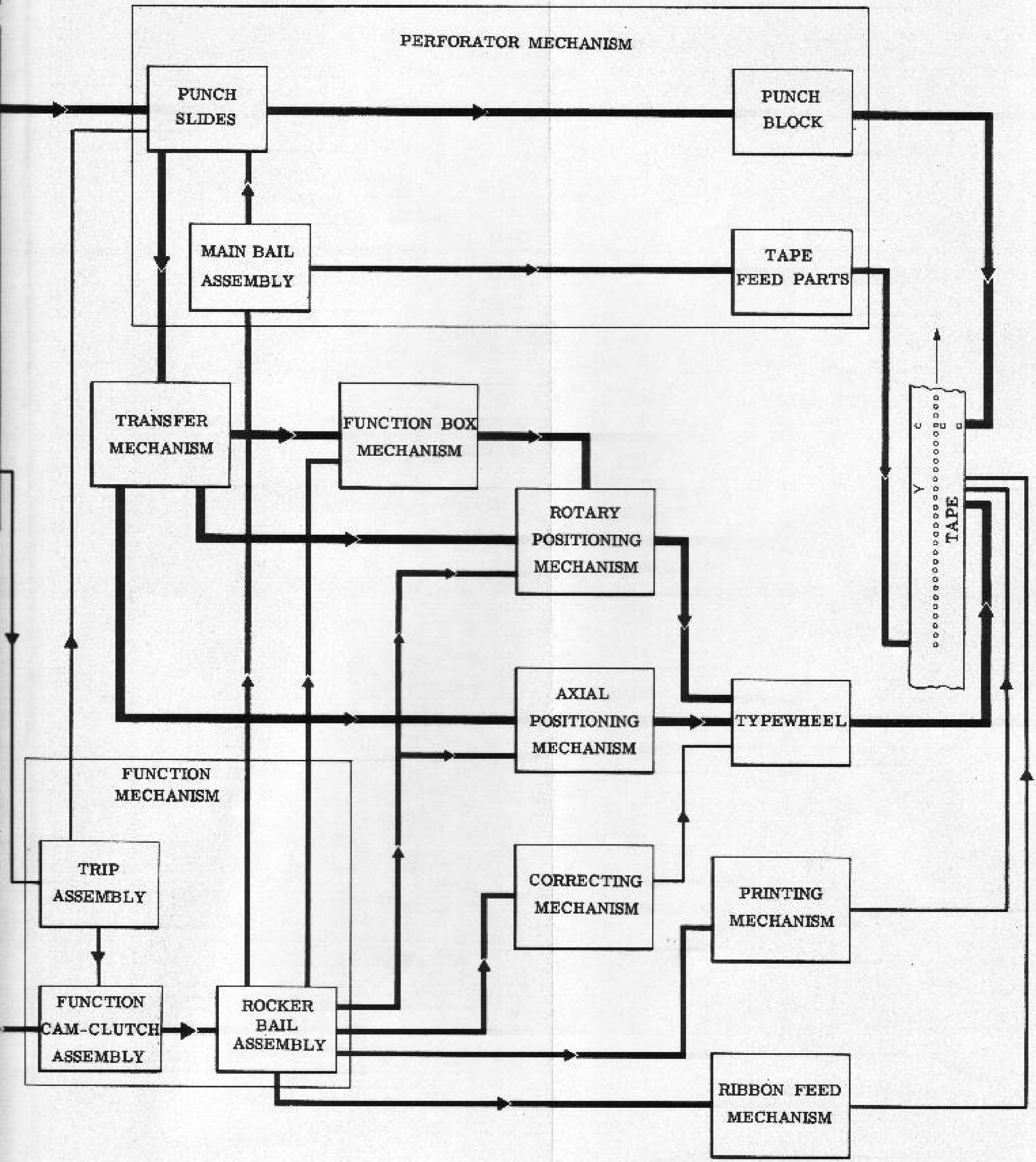


Figure 6 - 28 Typing Reperforator Unit, Block Diagram

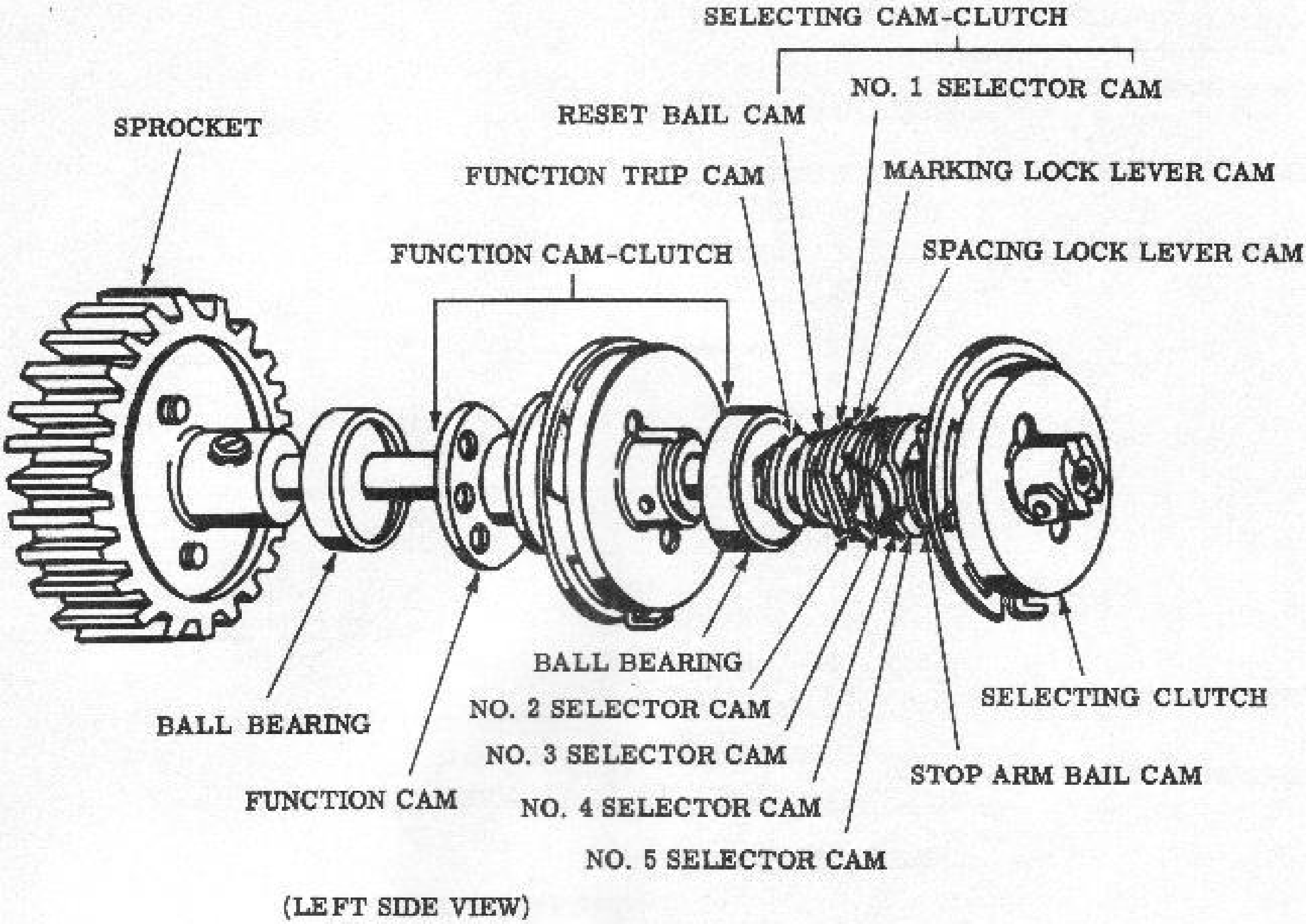


Figure 7 - Main Shaft

cam clutch is controlled by the selector through the clutch trip assembly (Fig. 8). During the time in which the signal circuit is closed (marking), the selector magnet coils are energized and hold the selector armature up against the magnet pole pieces. In this position, the armature blocks the start lever, and the cam-clutch is held stationary between the stop arm and latch lever.

5.03 When a code combination is received, the start element (spacing) de-energizes the magnet, and the selector armature under tension of its spring moves down out of the way of the start lever. The start lever turns clockwise under spring pressure and moves the stop arm bail into the indent of the start cam (Fig. 8). As the stop arm bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selecting cam-clutch engages and begins to rotate counterclockwise. The stop arm bail immediately rides to the high part of the cam, where it remains to hold the start lever away from the armature while the intelligence pulses of the code are received and processed by the selector (5.07 to 5.09).

5.04 When the stop element at the end of the code combination is received, the armature is pulled up and blocks the start lever. Thus the stop arm bail is prevented from dropping into the low part of its cam, and the attached stop arm is held in position to stop the clutch shoe lever. When the clutch shoe lever strikes the stop arm, the inertia of a cam disk causes it to continue to turn until its lug makes contact with the clutch shoe lever. At this point, a latch lever drops into an indent in the cam disk, and the clutch is held disengaged until the next code combination is received.

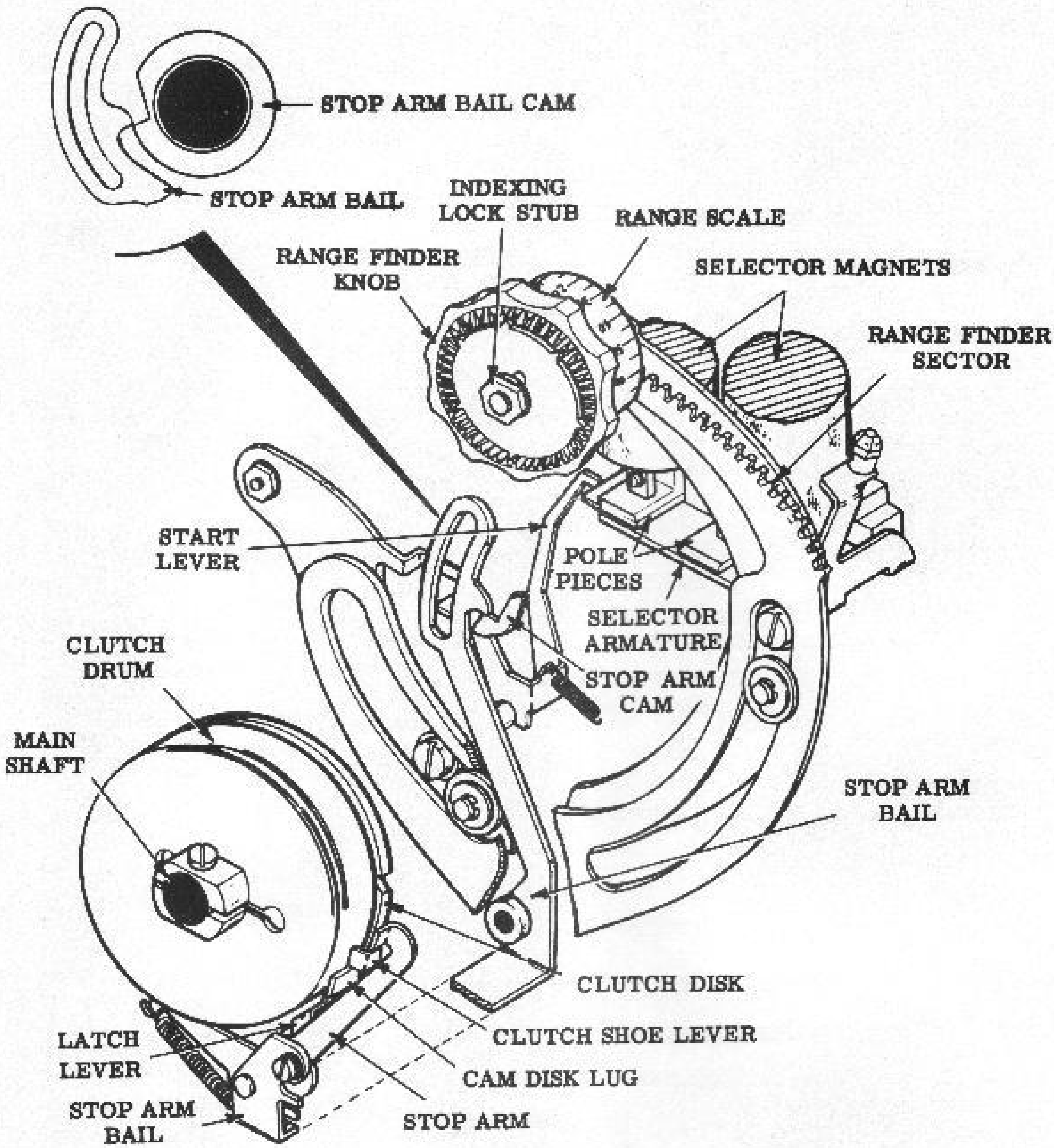


Figure 8 - Range Finder and Selecting Cam-Clutch Assembly

B. Clutch Operation (Fig. 9 and 10)

5.05 The clutch drum is attached to and rotates in unison with the main shaft (Fig. 7). In the disengaged position, as shown in Fig. 10, the clutch shoes do not contact the drum, and the shoes and cam disk are held stationary. Engagement is accomplished by moving the stop arm (Fig. 8) away from the clutch and thus releasing stop lug A and the lower end of shoe lever B (Fig. 9). The upper end of lever B pivots about its ear C, which bears against the upper end of the secondary shoe, and moves its ear D and the upper end of the primary shoe toward the left until the shoe makes contact with the notched inner surface of the rotating drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lever end of the secondary shoe then bears against the drum at point H. The drum drives this shoe upward so that it again makes contact with the drum at point I. The forces involved are multiplied at each of the preceding steps. The aggregate force is applied through the shoes to the lug J on the clutch cam disk, and the disk and attached cam turn in unison with the drum.

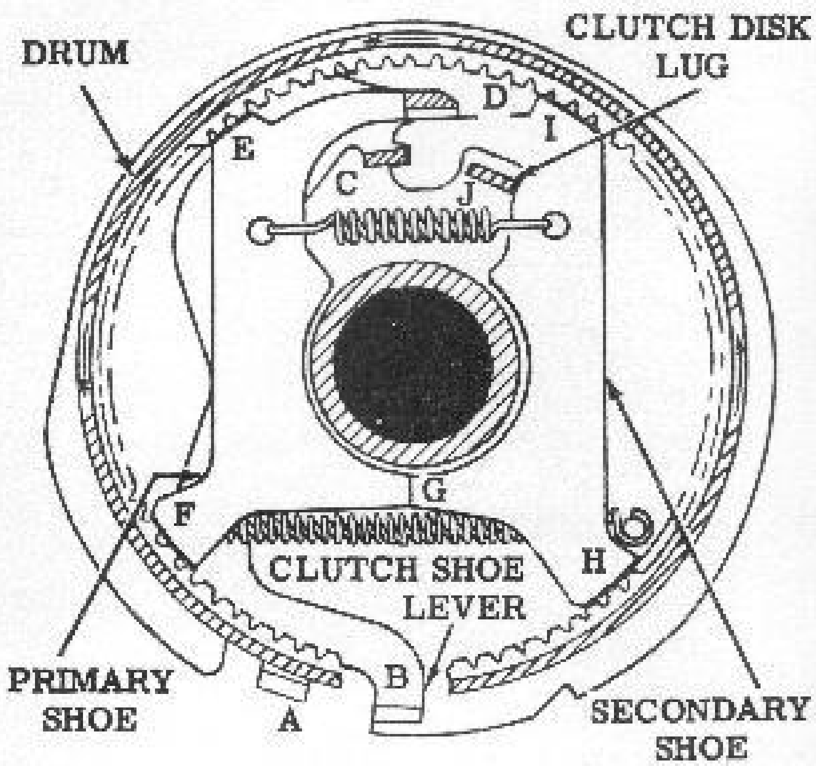


Figure 9 - Clutch, Engaged

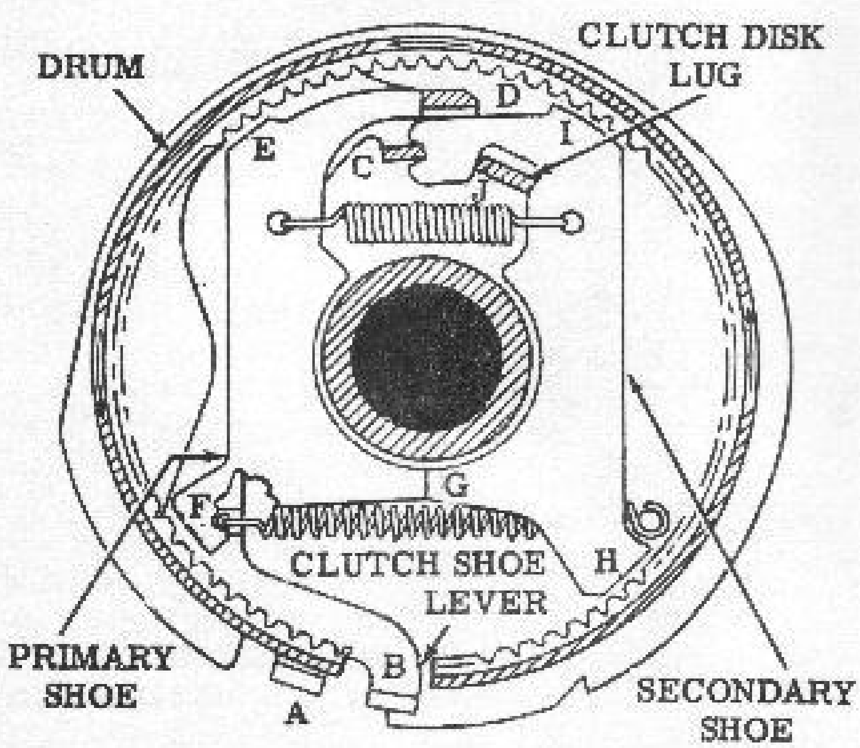


Figure 10 - Clutch, Disengaged

5.06 Disengagement is effected when the lower end of shoe lever B strikes the stop arm (Fig. 8). Lug A and the lower end of the shoe lever are brought together (Fig. 9), and the upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum. The latch lever seats in the indent in the cam disk (5.04) and the cam is held in its stop position until the clutch is again engaged.

C. Selector Operation (Fig. 7, 8 and 11)

5.07 The selector assembly consists primarily of two magnet coils (Fig. 8), an armature and associated bails, levers and latches (Fig. 11). Five linkages, each of which consists of a selecting lever, a push lever and a punch slide latch, link the selector cam with the punch slides. Since the linkages are identical, only the No. 4 is shown in its entirety in Fig. 11. As the selecting elements of the code combination are applied to the magnet, the cam actuates the selecting levers. When a spacing element is received, a marking lock lever is blocked by the end of the armature, and a spacing lock lever swings to the right above the armature and locks it in the spacing position until the next signal transition occurs. Extensions on the marking lock lever prevent the selecting levers from following their cams. When a marking element is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever swings to the right below the armature and locks it in the marking position until the next signal transition occurs. During this marking condition, the selecting levers are not blocked by the marking lock lever extensions, but are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam, while the armature maintains a marking condition, swings to the right, or selected, position, and the end of an associated push lever falls off a step on the selecting lever.

5.08 As the cam rotates, the selecting levers, together with any selected push levers, are moved to the left by the high part of their respective cams, where they remain until the next code combination is received. The unselected push levers remain to the right. When the next code combination is received, a selector reset bail, lifted by its cam (Fig. 11), strips the selected push levers from the selecting levers, and the push levers are returned to the right by their springs.

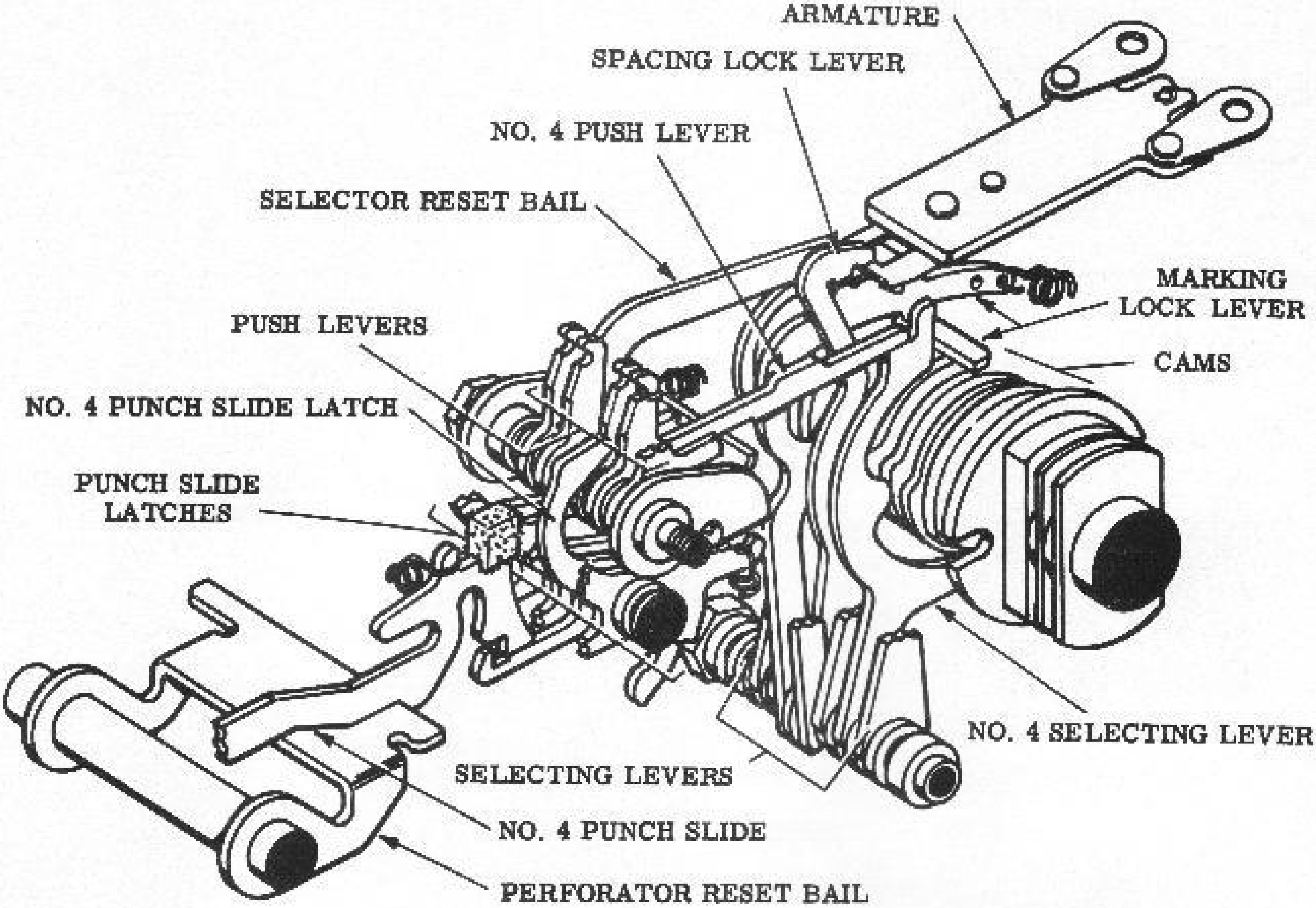


Figure 11 - Selector

5.09 The selected push levers, in moving to the left, rotate associated punch slide latches counterclockwise (Fig. 11). Just before the fifth push lever is selected, the selecting cam through the function trip assembly causes the perforator reset bail to release the punch slides (5.12). The unselected latches retain their associated slides to the right, while the selected latches permit their slides to move to the left under spring tension. During the latter part of the function cycle, the reset bail returns the punch slides to their unselected position (8.05). The latches under spring tension return to their unselected position when the push levers are repositioned at the beginning of the next selecting cycle.

ORIENTATION (Fig. 8)

5.10 For optimum performance, the selecting mechanism should be adjusted to sample the signaling code elements at the most favorable time. To make this adjustment, the operating margins are established through the range finder, which provides a means of varying the time of sampling. The obtaining of this optimum setting is referred to as orientation.

5.11 When the range finder knob (Fig. 8) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which supports the stop arm bail, stop arm and latch lever) either clockwise or counterclockwise about the selector cam-clutch. This changes the angular position at which the selector cam-clutch stops with respect to the marking and spacing lock levers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud and hold the range finder mechanism in position. The setting may be read on the range scale opposite a fixed index mark.

TRANSFER (Fig. 12)

5.12 Near the end of each selecting cycle the transfer mechanism moves the intelligence in the form of a mechanical arrangement from the punch slides to the function box and positioning mechanisms. Included in the mechanism are five linkages, each of which is associated with a punch slide. A linkage consists of a transfer lever, a pulse beam and a bell crank. Since the linkages are similar only the No. 4 is shown in its entirety in Fig. 12.

5.13 The linkages associated with the unselected punch slides (5.09) remain in their unselected position as shown in Fig. 11. However, the selected slides in moving to the left pivot the associated transfer levers which, in turn, move corresponding pulse beams clockwise (as viewed from above). The selected beams allow associated bell cranks under spring tension to pivot counterclockwise and lift attached push bars. The push bars, in turn, control the positioning mechanisms. In the period of the last half of the function cycle, the selected slides are moved back to the right (8.06) and return the linkages to their unselected position.

5.14 Slotted upper arms of the bell cranks extend up into the function box and control its operation as described in (7.18). An additional bell crank, not associated with a transfer linkage, is specifically concerned with the letters-figures shift.

6. MOTION FOR TYPING AND PERFORATING

GENERAL

6.01 The motion of the main shaft is conveyed to the mechanisms concerned with typing and perforation by the function mechanism, which is comprised of a cam-clutch (Fig. 7), a clutch trip assembly (Fig. 13) and a rocker bail (Fig. 14).

FUNCTION CAM-CLUTCH AND CLUTCH TRIP ASSEMBLY (Fig. 13)

6.02 The trip assembly is shown in its unoperated condition in Fig. 13. A follower lever rides on a function trip cam which is part of the selecting cam-clutch (Fig. 7). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever (Fig. 13) which, through an attached adjusting arm, rotates a main trip lever counterclockwise. A reset bail

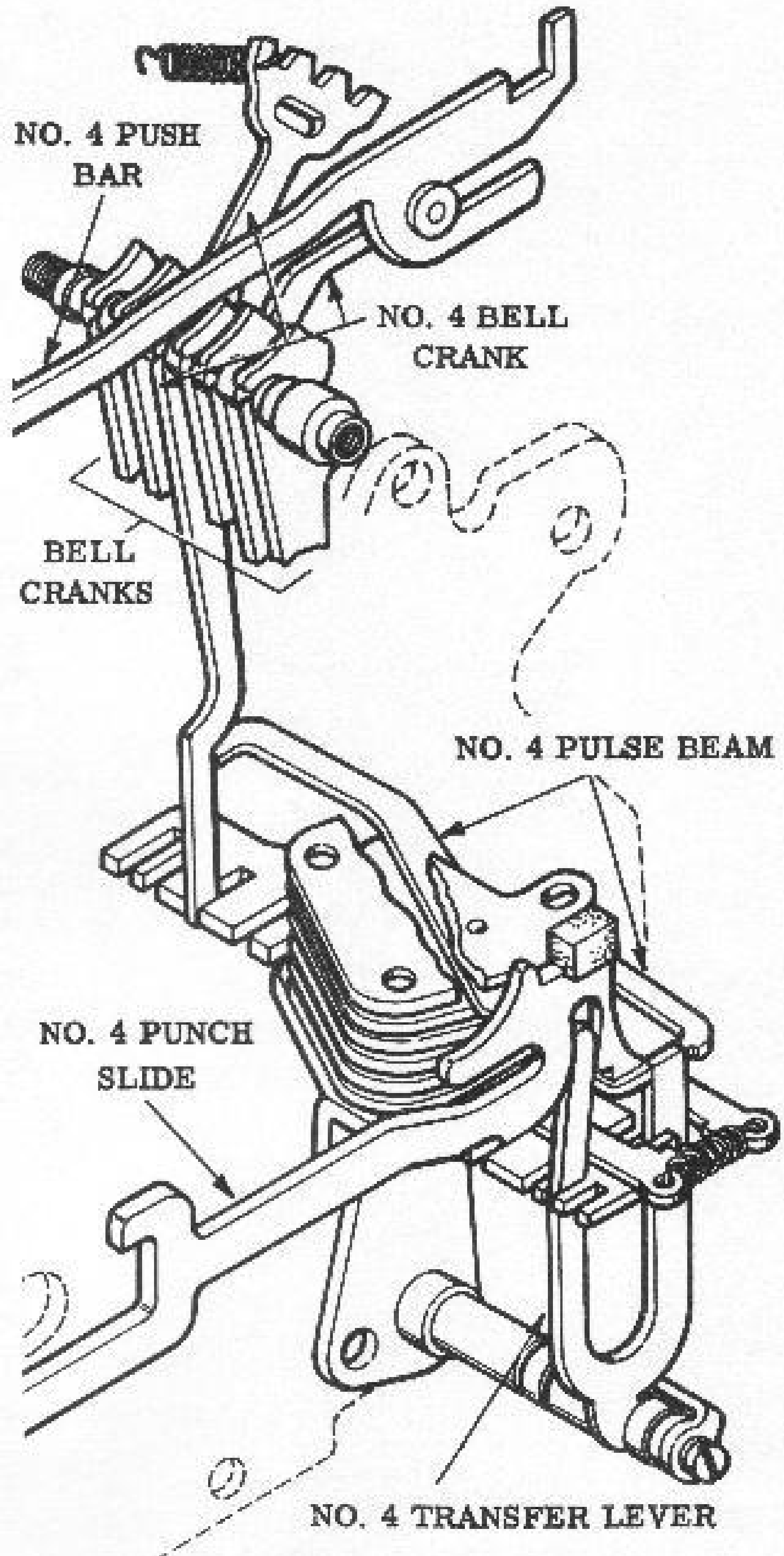


Figure 12 - Transfer Mechanism

trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (8.02); and an upper arm of the main trip lever moves out of the way of a clutch release, which falls against a down-stop and rotates a trip shaft counterclockwise. Immediately, the low part of the trip cam allows the follower lever to return to its unoperated position, and the upper arm of the main trip lever moves down against the release. When the trip shaft

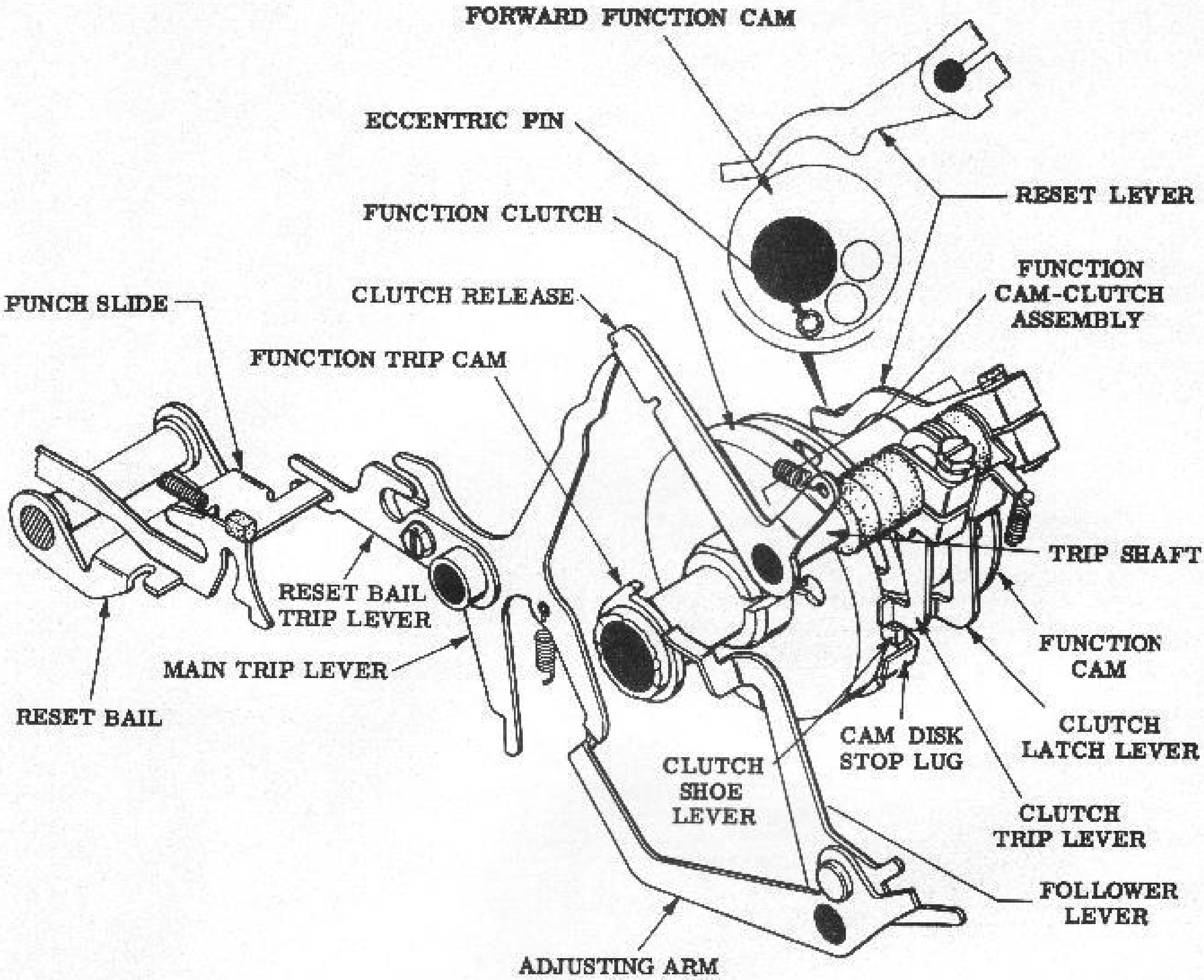


Figure 13 - Function Cam-Clutch and Clutch Trip Assembly

is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam-clutch begins its cycle. The internal operation of the clutch is the same as that of the selector clutch, described in (5.05 and 5.06).

6.03 About midway through the function cycle, an eccentric pin on the function cam lifts a reset arm, which rotates the trip shaft clockwise. The release is moved up and allows the main trip lever to fall against the adjusting arm and raise the reset bail. The eccentric pin then moves out from under the reset arm, and the release is permitted to return to its unoperated position against the main trip lever. When the cam-clutch assembly completes its cycle, the clutch shoe lever strikes the trip lever, and the clutch is disengaged.

ROCKER BAIL (Fig. 14)

6.04 The function cam and the rocker bail translate the rotation of the main shaft into simple harmonic motion, which the bail distributes to the following:

(a) Ribbon feed mechanism

(b) Perforator

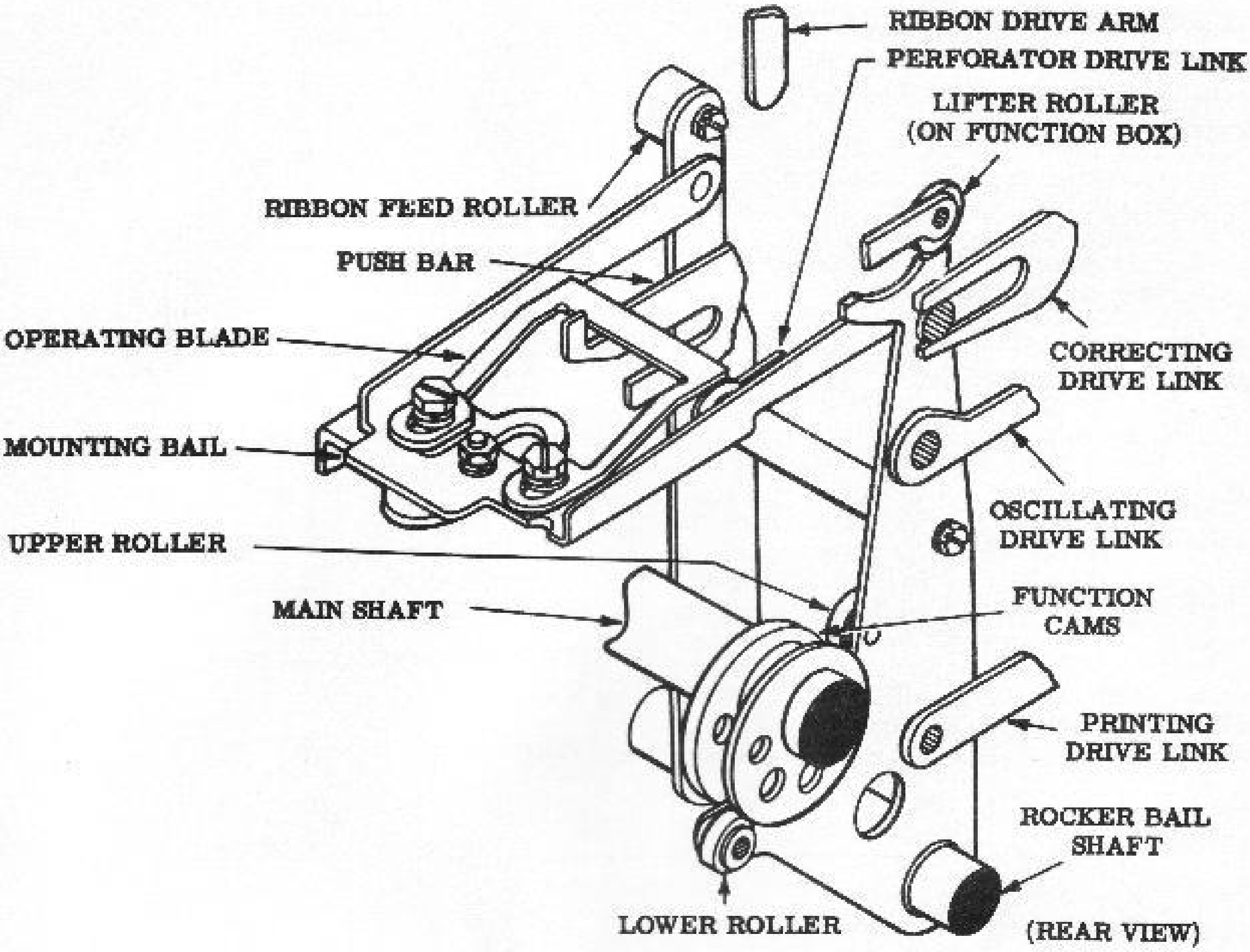


Figure 14 - Rocker Bail Assembly

(c) Correcting mechanism

(d) Function box

(e) Printing mechanism

(f) Oscillating assembly

(g) Push bars of the axial and rotary positioning mechanisms.

The bail is shown in its home position in Fig. 14. Each function cycle, the function cams bear against the rollers and cause the bail to rock to the right (as viewed from the rear in Fig. 14) during the first part of the cycle and then back to the home position during the latter part of the cycle.

7. TYPING

GENERAL

7.01 The characters used to type the received intelligence – letters, figures, and symbols representing various functions – are embossed on the cylindrical surface of the metal typewheel (Fig. 15). During the function cycle, the axial and rotary positioning mechanisms (Fig. 16 and 18), having received the intelligence from the transfer mechanism, position the wheel so that the character represented by the received code combination is selected. Following typewheel positioning the correcting mechanism (Fig. 16 and 18) accurately aligns the selected character. Then the printing mechanism (Fig. 20), by means of a hammer, drives the tape and inked ribbon against the wheel and imprints the character. A ribbon feed mechanism (Fig. 21) advances the ribbon and reverses its direction of feed when one of two ribbon spools is depleted. Near the end of the function cycle the axial positioning mechanism retracts the typewheel and a ribbon guide so that the last printed character is visible. The letters or the figures code combination sets up an arrangement in the transfer mechanism which permits the function box (Fig. 19) to operate and cause the rotary positioning mechanism to shift the typewheel through 180 degrees of rotation.

TYPEWHEEL POSITIONING

A. General

7.02 A typical typewheel character arrangement is shown in Fig. 15 in which the wheel's cylindrical surface is shown rolled out into a plane. There are 16 longitudinal rows, each of which is made up of four characters numbered 0 to 4 from front to rear. The surface is divided into two sections, a letters and a figures, each containing eight rows. The fifth row counterclockwise from the division line in both sections is numbered 0, and there are four

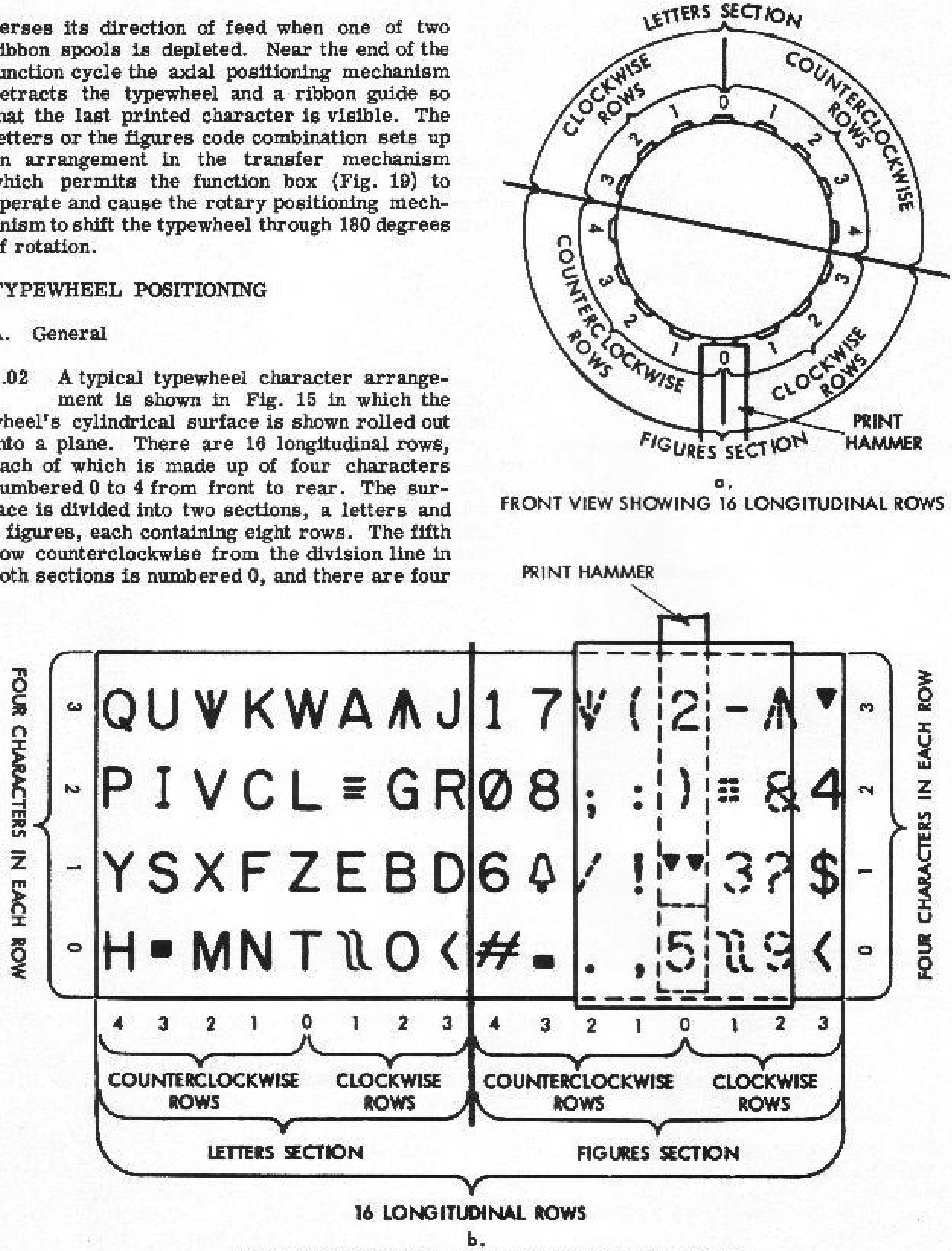


Figure 15 - Typical Typewheel Character Arrangement

rows in one direction from 0 numbered 1 to 4 and designated as counterclockwise rows, and three rows in the other direction numbered 1 to 3 and designated as clockwise rows. It should be noted that the clockwise and counterclockwise modifiers refer to the direction of rotation of the wheel to select the rows and not to their position on the wheel.

7.03 Each printing operation (excluding those devoted to the letters-figures shift) begins and ends with the typewheel in the home position of the section containing the character to be printed, i.e., with the No. 0 character of the No. 0 row at the point of contact of the print hammer. (Actually, inasmuch as the wheel is retracted to show the last printed character (7.11), the No. 0 character is slightly to the rear, but for this discussion it will be assumed that is at the point of contact.) During the printing operation the axial and rotary positioning mechanisms, transferring separate but simultaneous motions to the wheel, position it so that the character represented by the received code combination is at the point of contact of the hammer at the time of printing. The rotary mechanism, which is controlled by the No. 3, 4 and 5 selecting elements of the code, revolves the wheel so as to select the proper row; and the axial mechanism, which is governed by the No. 1 and 2 elements, moves it forward and rearward along its axis so as to select the

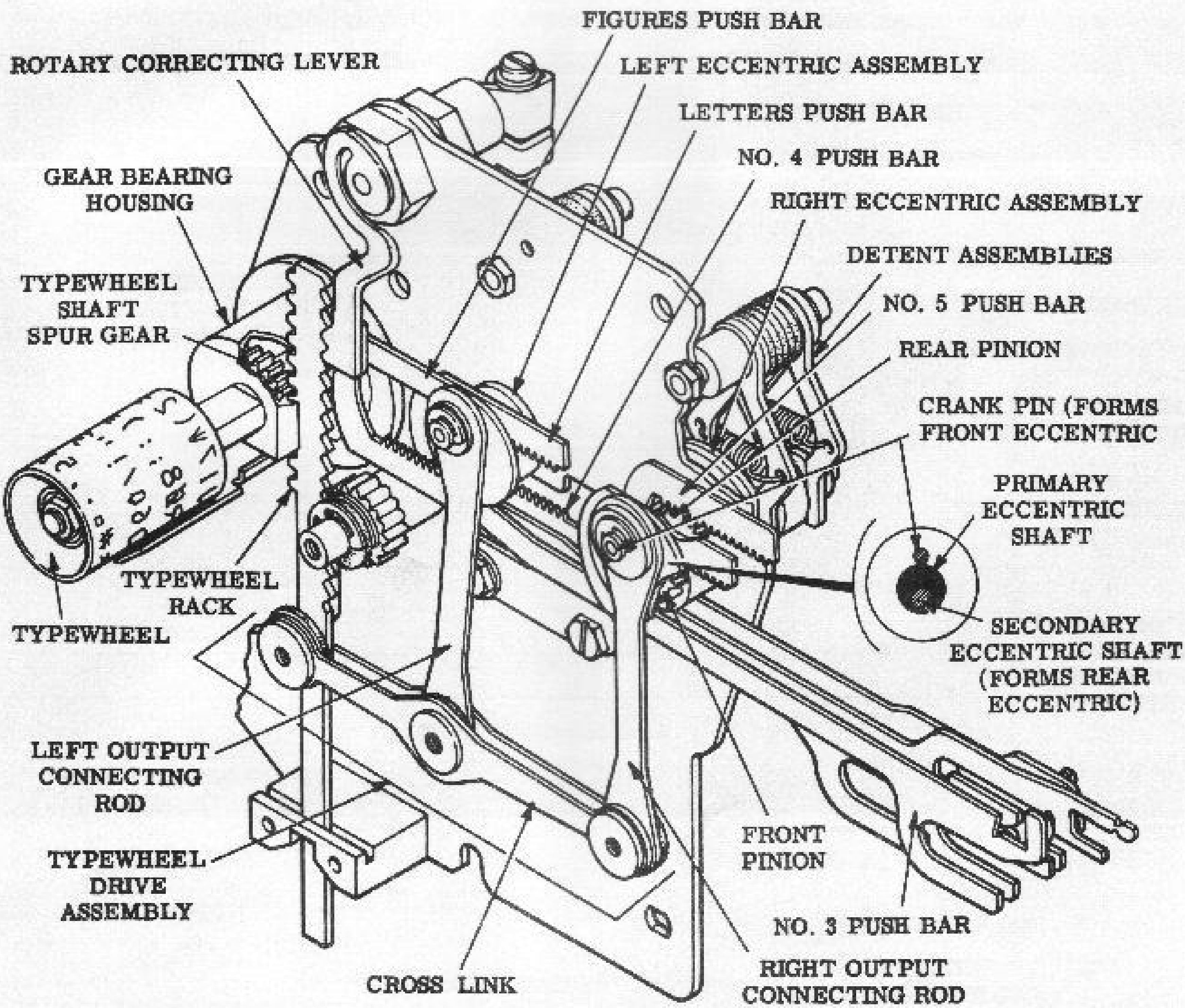


Figure 16 - Rotary Positioning Mechanism

proper character in the row. Rotation of the typewheel to print in either the letters or the figures section is controlled by the No. 7 element of the code. The letters-figures shift (7.17), which consists of rotating the wheel eight rows from the home position of one section to that of the other, requires a separate operation of the equipment and results in the printing of the letters or figures symbol.

7.04 To illustrate the above, if the wheel is in the figures condition, as shown in Fig. 16, and the numeral "5" is to be printed, there is no movement of the wheel during the printing operation, because "5" is already at the point of contact of the hammer. However, if the letter "I" is to be printed, the signaling code for letters must first be viewed to shift the typewheel eight rows to the letters home position. Then during the next operation it is rotated three rows counterclockwise and moved forward two characters so that "I" is at the point of contact of the hammer. Printing takes place, and the wheel is then returned to the letters home position.

B. Rotary Positioning (Figs. 16 and 17)

7.05 The rotary positioning mechanism revolves the typewheel so that the row containing the character to be printed is aligned with the print hammer at the time of printing. Mounted on the front plate, the mechanism includes two eccentric assemblies as shown in Figs. 16 and 17. Each assembly includes a primary shaft, a section of which is formed into a pinion. A secondary shaft, mounted in the primary and offset from its center, forms an eccentric, referred to as the rear eccentric. A portion of the secondary shaft is also a pinion, and a crank pin mounted on its disk-like forward surface forms a secondary, or front, eccentric. Each of the four pinions of the two eccentric assemblies is engaged by the rack of

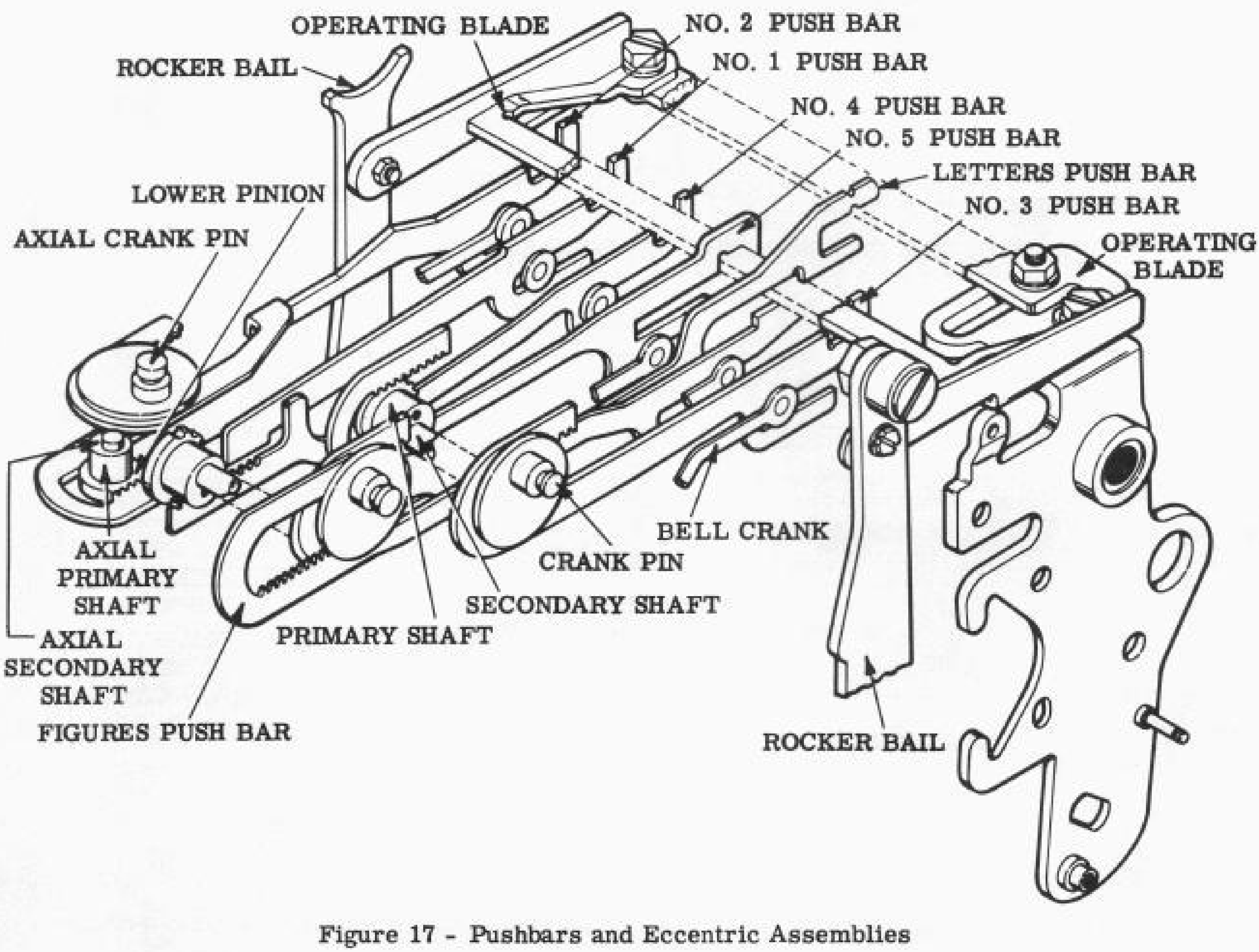


Figure 17 - Pushbars and Eccentric Assemblies

a pushbar: the No. 3 bar engages the rear pinion, and the No. 5 engages the right pinion. The left front pinion is engaged by both the letters and the figures pushbar.

7.06 The eccentric assemblies are linked to a typewheel shaft by a drive assembly as shown in Fig. 16. The typewheel is secured to the front of the shaft which is supported by a bearing housing mounted at the left rear of the front plate (Fig. 18). A spur gear which meshes with a typewheel rack rides on the shaft in a bearing housing. The shaft is free to move axially in the housings and the spur gear, but flats in its circumference which bear against flats in the gear ensure its rotating when the gear rotates.

7.07 When in response to a marking pulse a push bar is lifted by its bell crank, as described in 5.13, the rocker bail operating blade (see Fig. 14 and 17) engages a slot in the bar and moves it to the left during the first part of the function cycle. The bar, by means of its rack and the mating pinion, rotates the associated eccentric one-half revolution where it is locked in position by a detent assembly while printing takes place. When the bail rocks back to the right during the latter part of the cycle, it returns the bar and eccentric to their home position where the eccentric is again detented. The preceding does not apply to the No. 5 push bar which is designed so that it is selected - moved to the left - on spacing rather than on marking, nor to the left - front eccentric which affects the letters-figures shift (7.17). In both assemblies one-half revolution of the rear eccentric results in its maximum vertical displacement which is transferred through the front eccentric to a crank pin. Similarly, one-half revolution of the front eccentric results in its maximum displacement being transferred to the crank pin. If both eccentrics are rotated, the displacement of the crank pin is equal to the algebraic sum of the two displacements which may be in either the same or opposite directions. Both assemblies are so designed that, if the displacement of the rear eccentric is taken to be one unit, the displacement of the front eccentric is four units. Four permutations are thus available: zero (neither eccentric displaced), one unit (rear eccentric displaced), four units (front eccentric displaced) and five or three units depending on how the assembly is set up (both eccentrics displaced).

7.08 In the right assembly the home position of the rear eccentric is down and the home position of front eccentric is up (Fig. 17). Thus their displacements are in opposite directions - up for the rear and down for the front — and their aggregate displacement is three units downward. Any displacement occurring in the right assembly is imparted to the typewheel rack in equal quantity but opposite direction. For example, if the No. 5 pushbar is selected, it causes the right-rear eccentric to be displaced, and one unit of upward motion is transferred through a right output connecting rod to the right end of a cross link (Fig. 16). The cross link pivots about a left output connecting rod and at its left end imparts one unit of downward displacement to the typewheel rack. The rack rotates the spur gear, shaft and typewheel one row of characters clockwise from the home position, and the No. 1 clockwise row (Fig. 15) is presented to the print hammer at the time of printing. On its right stroke the No. 5 pushbar returns the eccentric and the typewheel to their home positions. In a similar manner, selection of the No. 3 pushbar results in a four unit downward displacement of the right front eccentric and a four-row, counterclockwise rotation of the typewheel. Selection of both the three and five type bars results in a three-row, counterclockwise rotation of the typewheel.

7.09 The home position of the left-rear eccentric is up, and any displacement appearing in the left assembly is transferred to the typewheel rack in double quantity in the same direction. When the No. 5 pushbar is selected, the left-rear eccentric is displaced one unit downward. This movement is conveyed through the left-output connecting rod to the approximate mid-point of the cross link. The cross link pivots about the right output connecting rod and its left end imparts two units of downward movement to the typewheel rack which rotates the typewheel two rows clockwise from its home position.

7.10 When both eccentric assemblies are displaced, the motion occurring in the typewheel rack is equal to the algebraic sum of the motions resulting from each assembly. For example, if the No. 3, 4 and 5 pushbars are all selected, three units of upward displacement from the right assembly and two units of downward displacement from the left assembly occur as one unit (3-2 = 1) of upward displacement in the rack and a counterclockwise rotation of one row in the typewheel. If neither the No. 3, 4 nor 5 pushbar is selected, the mechanism remains inactive and printing takes place in the No. 0 row. Excluding the left-front eccentric, which is only used for the letters-figures shift, there are eight permutations available in the other

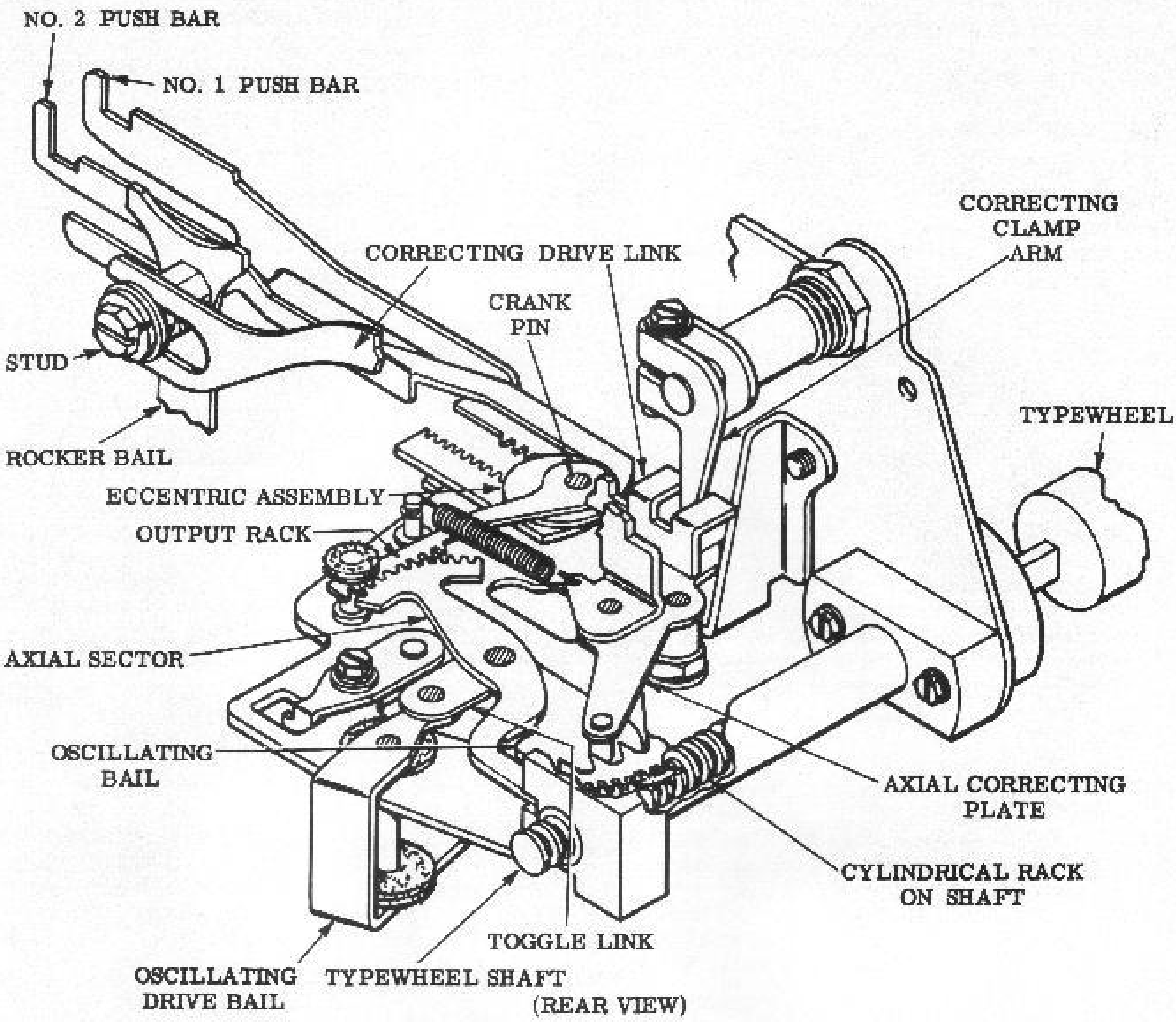


Figure 18 - Axial Positioning Mechanism

three eccentrics, making it possible to select any of the eight rows in a given section (Fig. 15).

C. Axial Positioning (Figs. 17, 18 and 20)

7.11 The functions of the axial positioning mechanism are to position the typewheel so that the proper character in the selected row is aligned with the hammer at the time of printing and to retract the typewheel and ribbon guide at the end of the function cycle so that the last-typed character is visible. The mechanism mounts on an axial bracket supported by the frame and the front plate and includes an eccentric assembly similar to those of the rotary positioning mechanism (Figs. 17 and 18). Two eccentrics, a lower whose pinion is driven by the No. 1 pushbar and upper whose pinion is driven by the No. 2 pushbar, rotate in a horizontal plane in bearing housings attached to the bracket. The eccentric assembly is linked to the typewheel shaft by an axial output rack and sector as shown in Fig. 18.

7.12 The selection of either the No. 1 or No. 2 pushbar results in the maximum displacement toward the rear of the associated eccentric, and the eccentrics are so designed that, if the displacement of the lower is taken

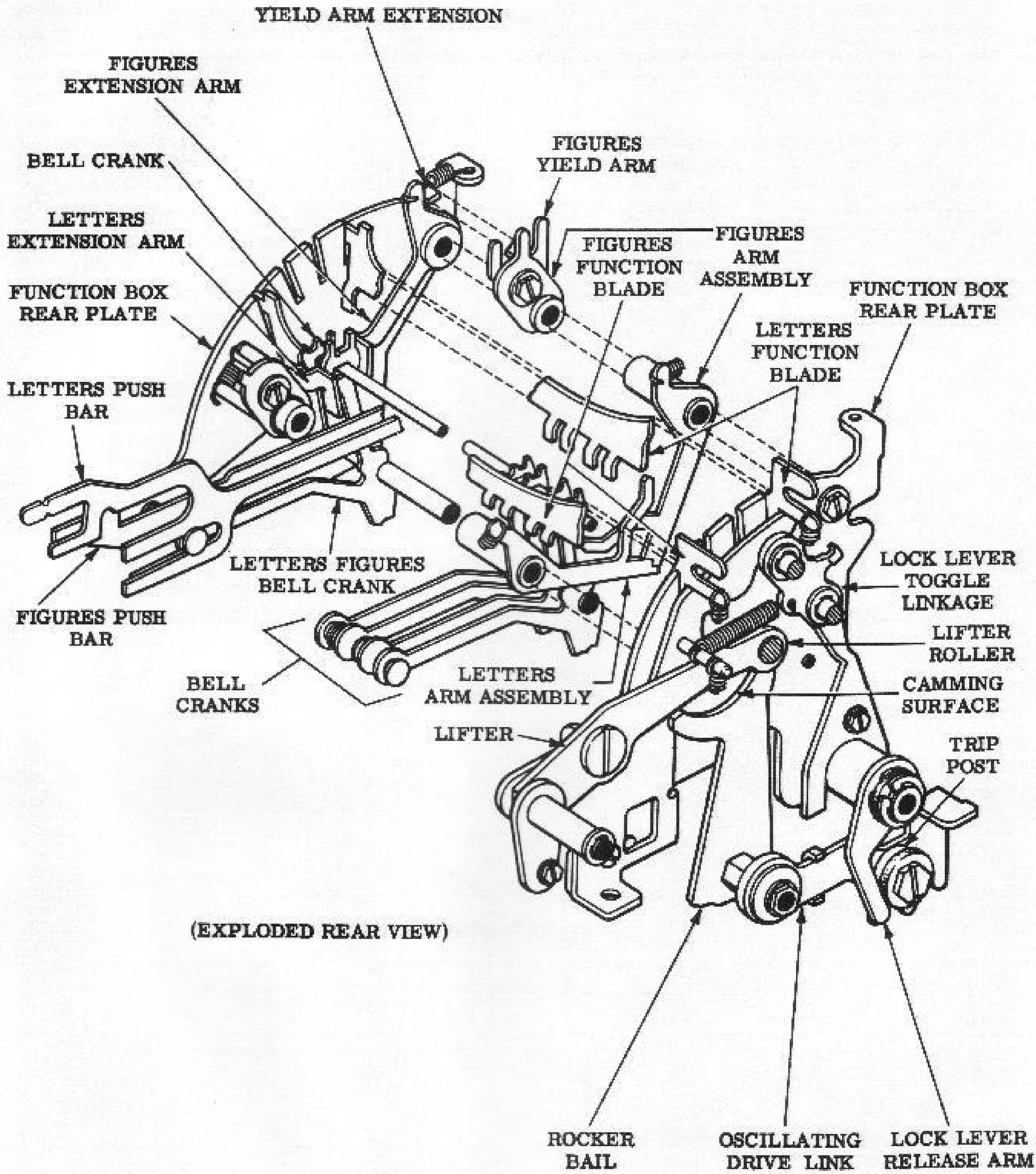


Figure 19 - Function Box

to be one unit, that of the upper is two units. Again four permutations are available at the crank pin: zero (neither eccentric displaced), one unit (lower eccentric displaced), two units (upper eccentric displaced) and three units (both eccentrics displaced).

7.13 If during a function cycle neither pushbar is selected, no motion occurs in the axial positioning mechanism with the exception of that resulting from the oscillating assembly (7.14), and the No. 0 character of the selected row is aligned with the hammer at the time of printing (Fig. 15). On the other hand, if the No. 1 pushbar is selected, it causes the lower eccentric to revolve and one unit of displacement to be transferred by the crank pin to the axial output rack. The rack moves to the rear and passes the motion to the axial sector which pivots counterclockwise (as viewed from above). The right end of the sector, by means of a cylindrical rack in the typewheel shaft, moves the

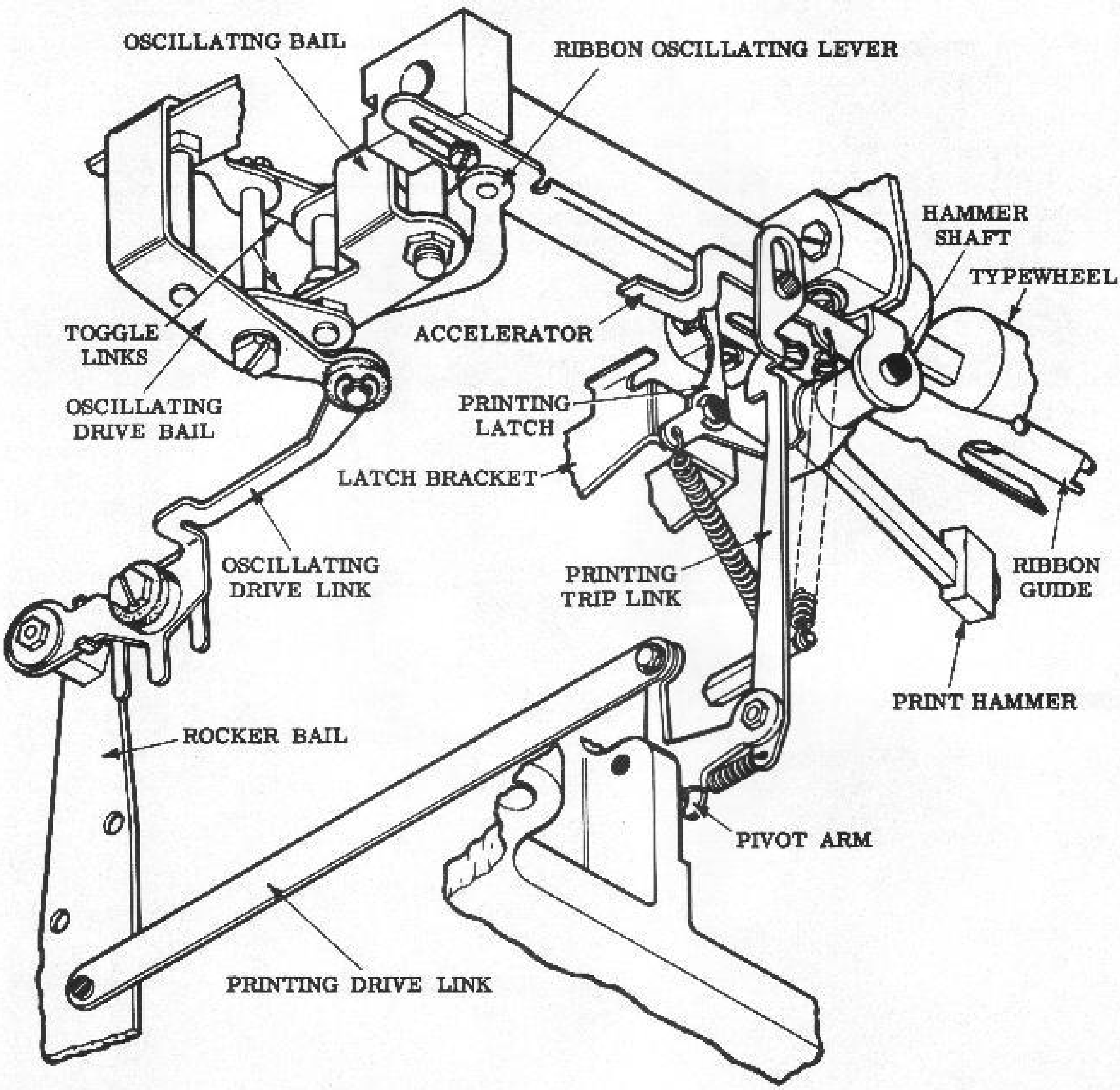


Figure 20 - Printing Mechanism

typewheel one character forward from its home position. The No. 1 character is printed, and when the push bar reverts to its unselected position it returns the axial linkage and typewheel to their home position. If the No. 2 push bar is selected the No. 2 character is printed, and if both push bars are selected, the No. 3 character is printed. The cylindrical rack has no lead, and the shaft can thus be rotated while being moved axially.

7.14 With each cycle of the function clutch, an oscillating drive link transfers from the rocker bail an unselected motion to an oscillating drive bail (Figs. 18 and 20). This movement is passed by toggle links to an oscillating bail and the sector pivot. The effect of this action is to introduce a separate motion to the sector tending to cause it to pivot about the teeth on the output rack. During the fore part of the function cycle, if no axial push bar is selected, the right end of the sector is moved forward slightly and positions the No. 0 character for printing. At the end of any cycle the sector retracts the typewheel slightly so that the last printed character is visible. Concurrent with the above operation, a ribbon oscillating lever is made to pivot about its left end and with each cycle project and retract the ribbon guide which would obstruct the view of the character (Fig. 20).

D. Correction (Figs. 16 and 18).

7.15 After the typewheel has been positioned by the axial and rotary positioning mechanisms, the selected character is more accurately aligned for printing by the correcting mechanism which compensates for any play and backlash in the positioning linkages. Each function cycle the rocker bail transfers motion through a correcting drive link to a correcting clamp and shaft (Fig. 18). The shaft pivots a rotary correcting lever (Fig. 16) which is equipped with an indentation that engages a tooth in a typewheel rack. There is a tooth in the rack for each row of characters (16 in all), and they are so correlated with the typewheel that when a tooth is engaged by the corrector its row is accurately aligned with the print hammer. Axial correction, which is accomplished simultaneously, is similar to rotary correction: the drive link rotates an axial correcting plate counterclockwise (as viewed from the above), and a roller mounted on the plate engages a notch in the axial sector (Fig. 18). Thus the typewheel is accurately aligned in both fields of motion just before printing takes place. During the latter part of the function cycle, a correcting drive link spring returns the correcting mechanism to its home position.

7.16 Since the rocker bail is the source of motion for both the push bars and the positioning mechanisms, correction must take place at a point near enough to the extreme travel of the bail that it does not interfere with the movement of the typewheel rack or axial sector. In addition, because the rocker bail controls the tripping of the print hammer, which occurs very late in the bail's stroke, it becomes necessary to utilize the time between the tripping of the hammer and its striking the paper to accomplish correction. The delay in actuating the correcting mechanism is effected by allowing a drive stud on the rocker bail to slide in an elongated slot in the correcting drive link during the early part of the cycle.

E. Letters-Figures Shift (Figs. 16 and 19)

7.17 The purpose of the letters-figures shift is to rotate the typewheel from the home position of one section to that of the other (Fig. 15). It is effected by means of the function box mechanism which is made up of a number of assemblies mounted on two plates located at the upper rear of the typing reperforator (Fig. 19). When the unit is in the letters condition, as shown in Figures 16 and 19, and the figures code combination (12-45) is received, the transfer mechanism sets up the figures arrangement in the bell cranks during the selecting cycle (5.12). Then, as the rocker bail moves from its home position during the first part of the function cycle, a lifter roller under spring pressure follows a camming surface on the rear arm of the bail (Fig. 19), and the lifter allows letters and figures function blades to move down and, by means of tines on their lower surface, feel for an opening in the slotted upper arms of the bell cranks.

7.18 The slot arrangement of the No. 1, 2, 4 and 5 bell cranks are identical and permit the entry of both function blades when all are selected. However, on receipt of the figures code combination, the No. 3 bell crank permits entry of the figures blade while blocking the letters blade. In moving all the way down, the figures blade encounters a projection of a figures arm assembly and causes the arm assemblies to shift from their letters to figures position. A yield arm extension attached to the figures arm assembly pivots a figures extention arm away from the letters-figures bell crank. A letters extension arm under spring tension rotates the bell crank clockwise (Fig. 19) and the bell crank lifts the letters and figures push bars. As the bail reaches its extreme position, the lifter is cammed up and raises the function blades.

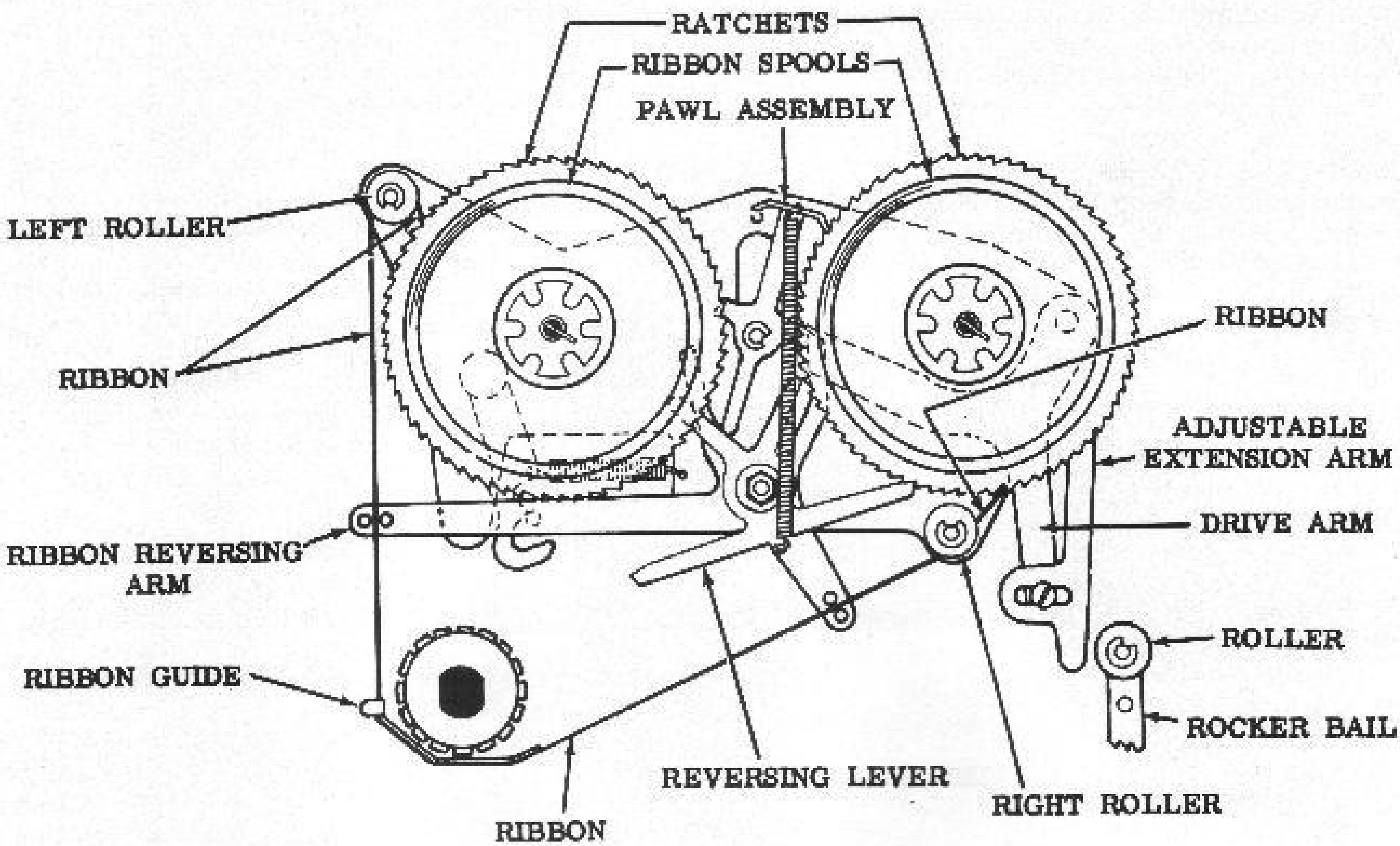


Figure 21 - Ribbon Feed Mechanism

7.19 While the letters-figures bell crank is being positioned by the function box, the No. 1, 2 and 4 push bars are selected, the typewheel is moved two rows clockwise and three characters forward, and the figures symbol is printed (7.05 - 7.11). On its return stroke, the rocker bail operating blade encounters a shoulder on the figures push bar (which was lifted as described above) and moves the bar to the right as viewed from the front in Figures 16 and 17. The common pinion moves the letters push bar to the left, and the left-front eccentric shifts from its up to down position. Since the typewheel has been displaced two rows clockwise during the first part of the cycle, it is rotated six more rows to the figures home position. As the bail returns to its home position during the last half of the cycle, a lock lever toggle linkage (Fig. 19) prevents the lifter roller from following its camming surface, and the lifter holds the function blades up so they do not drop onto the bell cranks. As the bail nears its home position, a trip post riding on the oscillating drive link strikes a lock release arm, buckling the toggle linkage and permitting the lifter roller to again fall on the bail camming surface.

7.20 In a manner similar to that described above, when the letters code combination (12345) is received, the function box causes the letters-figures bell crank to lower the letters and figures push bars. The wheel is rotated two rows counterclockwise during the first part of the cycle and six more rows to the letters home position during the last part of the cycle, and the letters bar is moved to the right. The preliminary two-row rotation of the typewheel, which is made possible by selecting the No. 5 push bar on spacing rather than marking, provides less throw and smoother operation than would be possible if the complete eight-row displacement were effected during the latter part of the cycle. Each operation the lifter permits the function blades to move down and feel for an opening, but except for the shift operations they are blocked by slotted arms of the bell cranks.

PRINTING (Fig. 20)

7.21 After the typewheel has been positioned and corrected, the printing mechanism supplies the impact which drives the paper and ribbon against the selected character. It effects this operation by means of a print hammer which is mounted on a shaft supported by a bracket attached to the typewheel bearing housing. In its unoperated condition, as illustrated in Fig. 20, the hammer is held against an accelerator by a relatively weak spring. The accelerator is mounted on the hammer shaft and is retained by a printing latch in its upper position against the tension of a relatively strong spring.

7.22 The rocker bail, during the fore part of the function cycle, moves a printing drive link to the right (as viewed from the rear in Fig. 20) and causes a pivot arm to rotate clockwise. The arm lowers a trip link which slides in an elongated slot. Near the end of the rocker bail's travel, the trip link pivots the latch which releases the accelerator. Under the spring tension, the accelerator snaps down and impels the hammer upward. The face of the hammer drives the tape and inked ribbon up against the typewheel and imprints the selected character on the tape. The accelerator does not follow the hammer through the complete printing stroke. Near the end of its travel, the accelerator encounters a projection on a latch bracket, and inertia carries the hammer the rest of the way. As the rocker bail returns to its home position, it causes the trip link to move up, release the latch and return the accelerator to its latched position.

RIBBON FEEDING (Fig. 21)

7.23 The characters are typed in ink supplied by an inked ribbon which is held between the tape and the typewheel by a guide and advanced by the ribbon feed mechanism (Fig. 21). The path of the ribbon is down to the right off the top of a right spool, under a right roller, through right pins on the reversing arm, through the guide, up through left pins on the reversing arm, over a left roller, and to the right over the top of a left spool.

7.24 Each function cycle, as the rocker bail nears the end of its left travel, a roller mounted on its forward arm pivots a drive arm clockwise. The drive arm lifts a feed pawl which advances the ribbon by rotating a ratchet on one of the ribbon spools one tooth. A retaining pawl under spring tension detents the ratchet while the feed pawl, during the latter part of the function cycle, is lowered so as to engage the next tooth. Each operation, the ribbon is advanced in this manner until the ribbon feed mechanism is reversed.

7.25 When a spool is almost depleted, a rivet in the ribbon encounters pins on the reversing arm, and the stress applied through the ribbon as it is rolled on the other spool pivots the arm. As the pawl assembly is lowered at the end of the next operation, an extension strikes the reversing arm, and the pawl is shifted against the other ribbon spool ratchet. The pawl's rounded lower extension pivots a reversing lever which shifts the retaining pawl so that it engages the opposite ratchet. The ribbon will then feed in the opposite direction until again reversed. A detent holds the reversing arm in position until its next reversal.

8. TAPE PERFORATING AND FEEDING

GENERAL

8.01 The perforating mechanism punches feed holes, advances the tape and perforates combinations of code holes corresponding to the code combinations received from the selector. Intelligence is received from the selector by the punch slides, which select proper pins in a punch block assembly (Figs. 22 and 23). Motion from the rocker bail is distributed to the pins and the tape feeding parts by a main bail assembly which includes a toggle bail, a toggle shaft, a slide post, toggle links, drag links, and the punch slide reset bail.

PERFORATING - FULLY-PERFORATED UNITS (Fig. 22)

8.02 As described in 6.02, near the end of the selecting cycle, the reset bail is lowered and releases the five punch slides (Fig. 23). The selected slides move to the left, and the unselected slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. Since a feed hole is perforated every operation, the punch slide associated with the feed-hole punch pin is designed so that it is always in a selected position. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

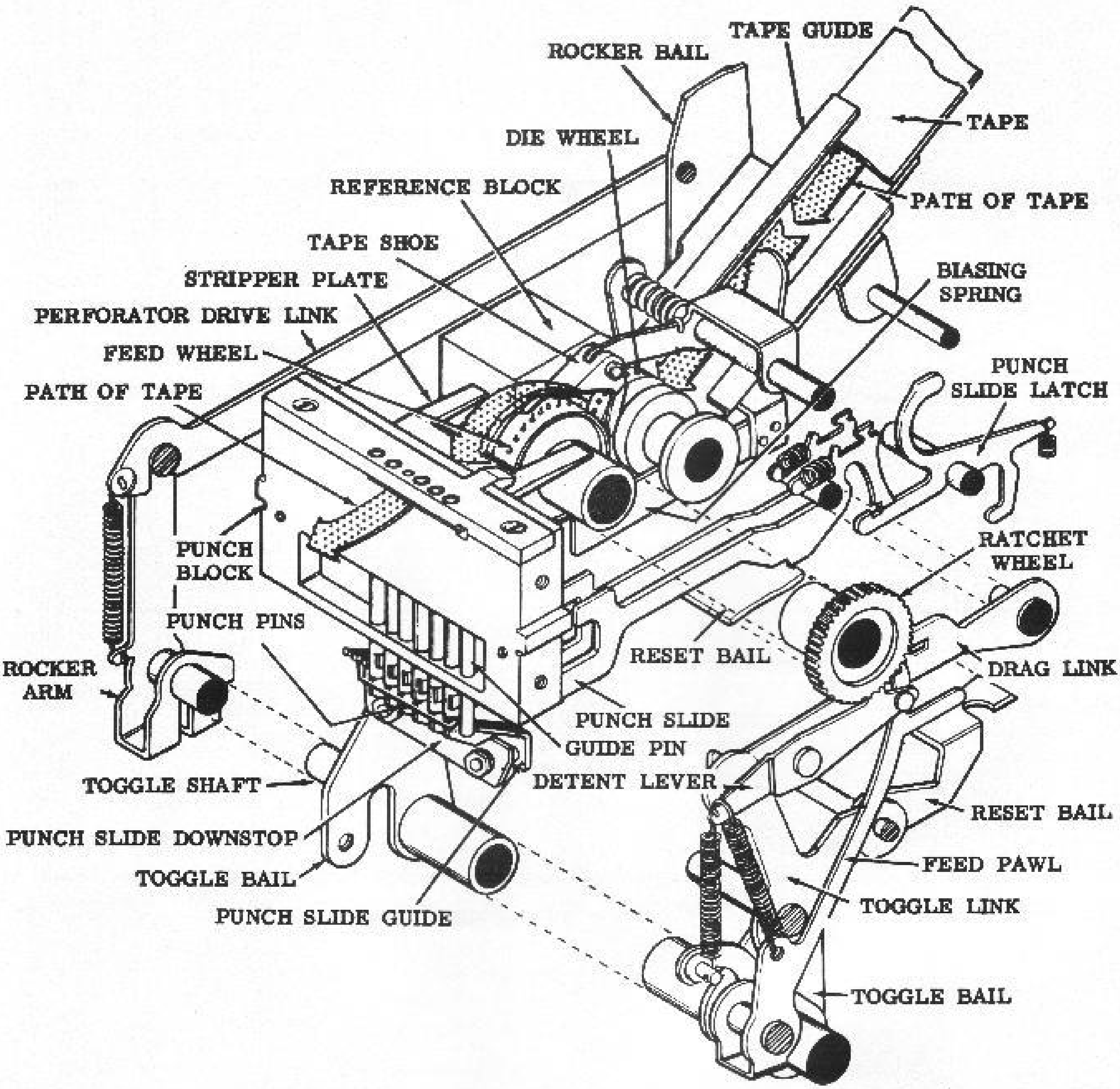


Figure 22 - Perforating Mechanism - Fully Perforated Unit

8.03 During the last half of the cycle, the toggle bail is rotated clockwise pulling the slide post down and lowering the selected punch slides. The punch slides, which engage notches in their respective punch pins, pull the punch pins down below the tape. The main bail assembly and the selected punch slides and their associated punch pins move as a unit during the perforating stroke. The opening in the die block above the tape, through which the pins protrude, are circular so that the entire hole is punched.

8.04 A chad chute, mounted on the reperforator punch block, mates with a chute on the base, and carries the chad punched from the tape into a chad container.

PERFORATING - CHADLESS UNITS (Fig. 23)

8.05 As described in 6.02, near the end of the selecting cycle, the reset bail is lowered and releases the five punch slides (Fig. 23). The selected slides move to the left, and the unselec-

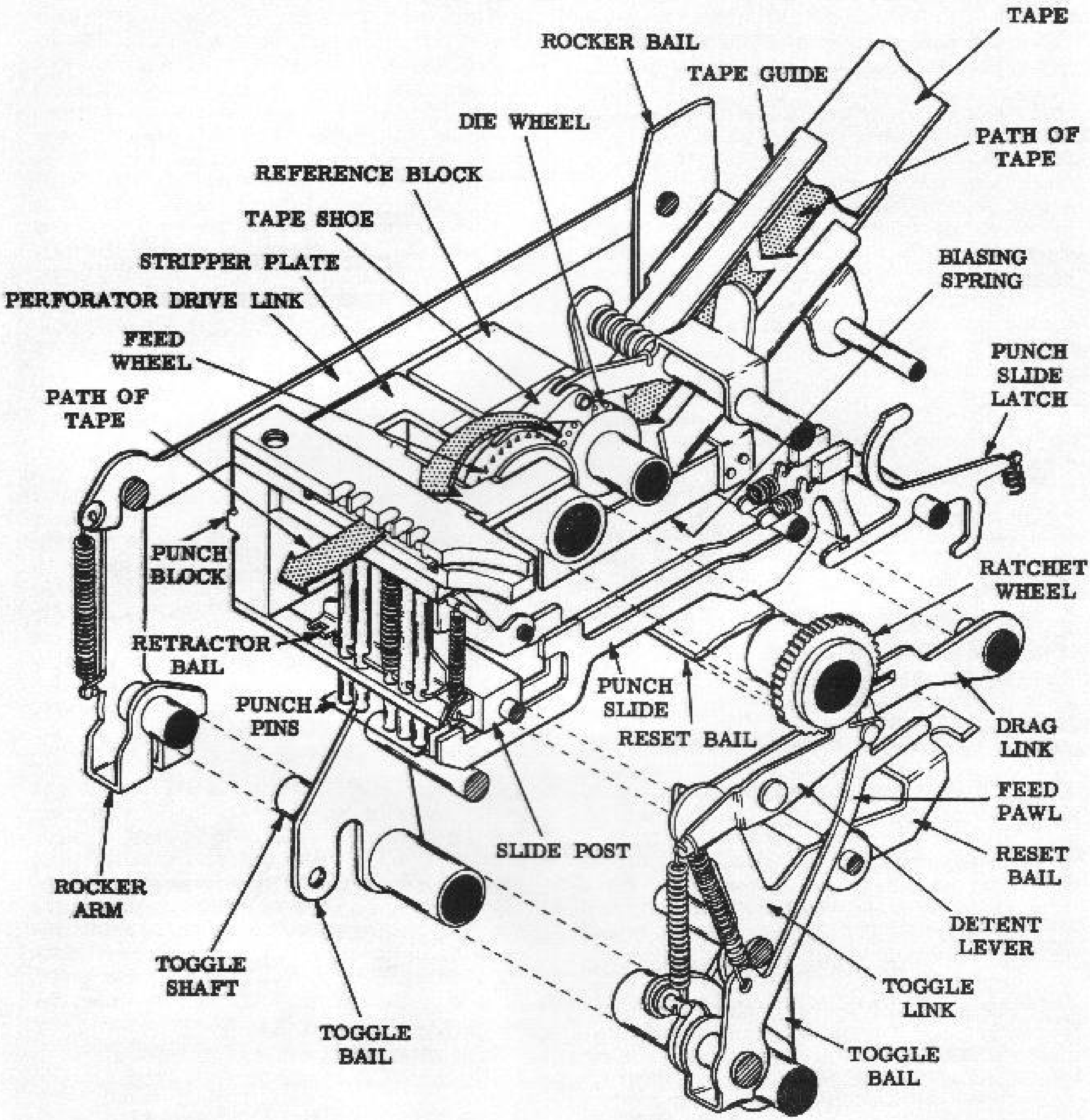


Figure 23 - Perforating Mechanism - Chadless Tape Unit

ted slides are retained to the right by their latches. In the selected position, a projection of each slide extends over the slide post. During the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides pivot about the same point as the drag links, and thus become an integral part of the main bail assembly during the perforating stroke. A retractor bail, which engages notches in the punch pins, is pivoted clockwise as the pins move up through the tape. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

8.06 During the last half of the cycle, the toggle bail is rotated clockwise and lowers the punch slides. The reset bail, moved to the right by the toggle links, drives the slides back to their unselected positions, where it holds them until the next operation. The retractor bail, under spring pressure, holds the punch pins down against the slides until the pins are retracted below the tape. The notches in the pins are long enough to allow the retractor bail to pivot its full amount without lifting the unselected pins against the tape, but are short enough to permit the bail to serve as a downstop for the pins, and thus hold them in the block. A compression spring is mounted on the No. 3 punch pin, and four tension springs are hooked to the slide post and the retractor bail. The main bail assembly, the retractor bail, and the selected slides and punch pins move as a unit during the perforating stroke, and the retractor bail tension springs are not part of the load on the toggle shaft. The openings in the block above the tape, through which the selected pins protrude, are semi-circular, so that only the rear portion of the hole is severed.

FEEDING - FULLY-PERFORATED AND CHADLESS UNITS

8.07 Tape feeding is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape guide and then up between a feed wheel and die wheel (Figures 22 and 23). A feed pawl driven by the toggle bail acts upon a ratchet and rotates the feed wheel which, by means of pins and a slot in the die wheel, advances the tape one character at a time. A detent with a roller that rides on the ratchet holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high during the first half of the cycle (to hold the tape in position during perforation), but is low during idling and the last half of the cycle, to facilitate tape threading and feeding. A tape shoe retains the tape on the feed wheel, and a guide spring holds it back against a reference block so that the feed holes are punched a uniform distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is printed and perforated, and finally emerges at the left. A guide spring, by holding the tape back against a reference surface on the block, maintains a uniform relationship between the code perforations and the edge of the tape.

9. VARIABLE FEATURES

CONTACT ASSEMBLIES

A. Selector Mechanism Timing Contacts (Fig. 24)

9.01 Operating in conjunction with an additional cam mounted on the selector cam assembly, this timing contact set (break-make transfer) operates each cycle of selection. The actuating lever maintains a relationship with the rest position of the selector cam, because its pivot point is on the range scale selector rack. Therefore, the contact set is used to signal that the selector cam is in the rest position.

B. Letters-Figures Contacts

9.02 The letters-figures contact assembly is mounted on the rear of the selector mechanism and is operated by the upper extension of the letters push bar. Its purpose is to give a remote signal to indicate whether the typing reperforator is in the letters or the figures condition. When the unit is in the letters condition, the letters push bar is positioned towards the right and in contact with the operating lever. In this position (rotated counterclockwise) the operating lever is not in contact with the center contact spring and the center and upper contact points are made.

9.03 When the figures code combination is received, the letters pushbar is moved to the left and permits the operating lever to rotate clockwise and engage the center contact spring and break the contact between the center and upper contact points. As the operating lever rotates further, contact is made between the center and lower contact points.

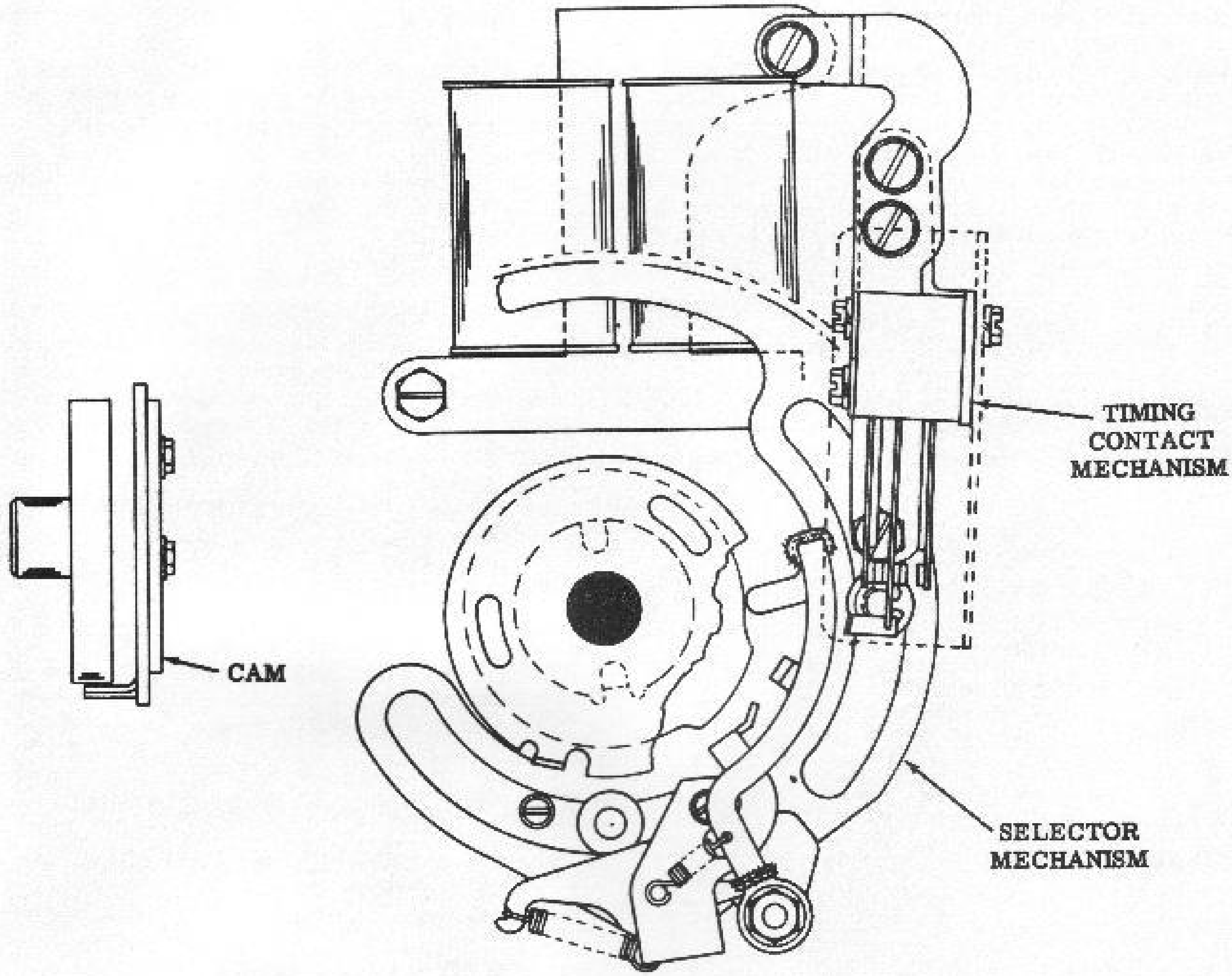


Figure 24 - Selector Magnet Timing Contacts

C. Signal Bell Contacts (Figs. 19 and 25)

9.04 Mounted on and controlled by the function box, these contacts provide an electrical pulse to actuate an audible alarm when the typing reperforator receives the signal bell code combination.

9.05 With the unit in the figures condition and the signal bell code combination (1-3--) received at the selector mechanism, the number 1 and 3 bell cranks rotate in response to the marking pulses, and the number 5 bell crank rotates in response to a spacing pulse. In this position, the slotted arms at the top of the bell crank permit the signal bell function blade to drop under spring tension. The normally-open signal bell contacts, fixed to the function blade drops with the blade, and the contacts close. In the letters condition, the figures bell crank blocks the signal bell function blade.

D. End of Feed Out Timing Contacts

9.06 Used in conjunction with the non-interfering letters (or blank) tape feed out mechanism, this contact assembly furnishes an electrical pulse to indicate the termination of feed out. The contacts are actuated by a bail extension that receives its motion from the tape length adjusting plate (Fig. 28). When the feed out operation terminates, the plate engages and rotates the bail arm, causing the normally-open contact to close and the normally closed contact to open.

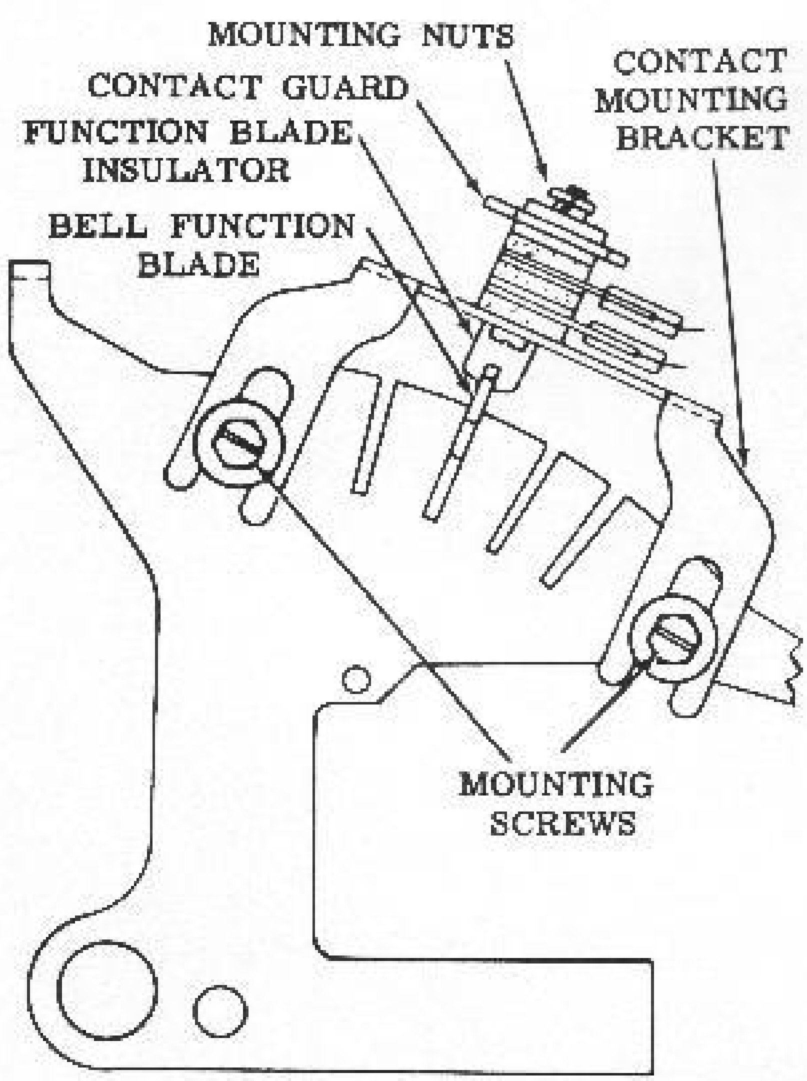


Figure 25 - Signal Bell Contacts

E. Code Reading Contacts

9.07 Consisting of a bank of five contacts, each of which is actuated by a punch slide, the code reading contacts read the code combinations perforated by the typing reperforator and establish circuits corresponding to the five elements. Either transfer or make contacts are available. Applications include error checking and parallel code output.

F. Timing Contacts

9.08 When connected to external circuits, the contacts provide electrical pulses which may be synchronized with the code reading contacts (9.07) for circuitry control purposes. Either single- or double-contact mechanisms are available. The contacts, which are of the transfer type, are actuated by bails which receive motion from the typing reperforator function cam.

UNIVERSAL FUNCTION BLADE (Fig. 26)

9.09 This function blade may be coded for any desired character or shift condition by removing tines. The function blade has removable tines in the marking and spacing positions for all levels.

PRINT SUPPRESSION ON FUNCTION

9.10 This feature utilizes a print hammer stop that permits the hammer to strike the top of the characters on the type wheel but not the base surface. Therefore, if a character or function symbol is relocated in the base surface, printing will not occur when this character or function is selected.

INTERFERING LETTERS TAPE FEED OUT

A. General

9.11 This feature enables the typing reperforator to step out tape containing successive letters code combinations. The feed-out operation may be actuated locally by a hand lever or, with the addition of a separate set of parts, it may be controlled remotely by ener-

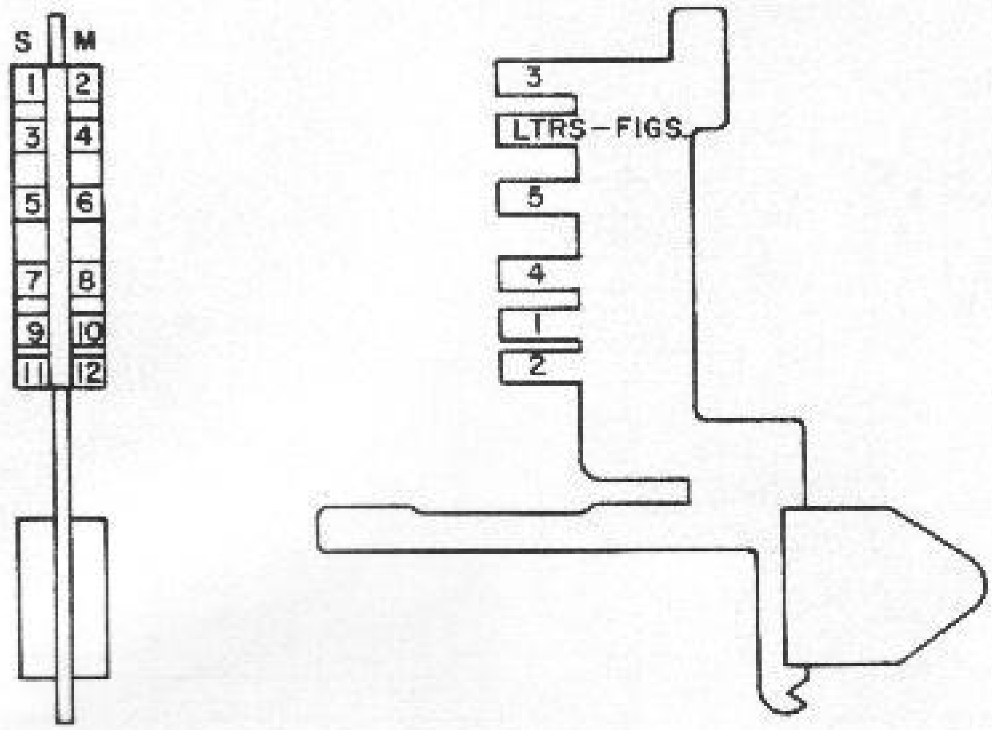


Figure 26 - Universal Function Blade

gizing a solenoid. Letters feed out will continue as long as the hand lever or solenoid is actuated. Since the mechanism's operation involves tripping the selector clutch while retaining the armature in its marking position, a message can not be received during the feed-out period. The mechanism is shown operated in Fig. 27.

B. Initiation

9.12 When the typing reperforator is in the idling condition, the selector magnet is energized and the start lever is blocked as shown in Fig. 8. Feed out is initiated by moving a hand lever to the left (Fig. 27). A drive shaft affixed to the hand lever rotates a trip lever which lifts the start lever. The latter clears the armature and under spring tension rotates clockwise. The selecting cam-clutch engages and the unit undergoes a complete cycle of operation. Since the selector remains energized, it is equivalent to all intelligence elements of the signaling code being marking. As a result, the letters symbols is printed, the letters code combination (12345) is perforated and the tape is advanced one feed hole. As long as the hand lever is retained to the left, the start lever will trip the selecting cam-clutch and feed out will continue.

C. Termination

9.13 Feed out is terminated by releasing the hand lever. The driver shaft and trip lever rotate clockwise under spring tension and lower the start lever. When the stop arm bail and start lever are moved to the left by the stop arm bail cam (5.03), the start lever is blocked by the armature, the selecting cam-clutch is disengaged and the typing reperforator is returned to its idling condition. A message received during feed out will be garbled.

D. Solenoid Operation

9.14 By the use of an additional set of parts, the letters feed out operation can be initiated by an electrical pulse from an external source. When the solenoid (Fig. 27) is energized by the pulse, it pulls a plunger to the left. The plunger through a stop arm and the drive shaft causes the trip lever to lift the start lever, and feed out is effected as described in 9.12. Feed out will continue until the solenoid is deenergized at which time the plunger moves back to the right, the start lever is lowered, and feed out is terminated as described in 9.13.

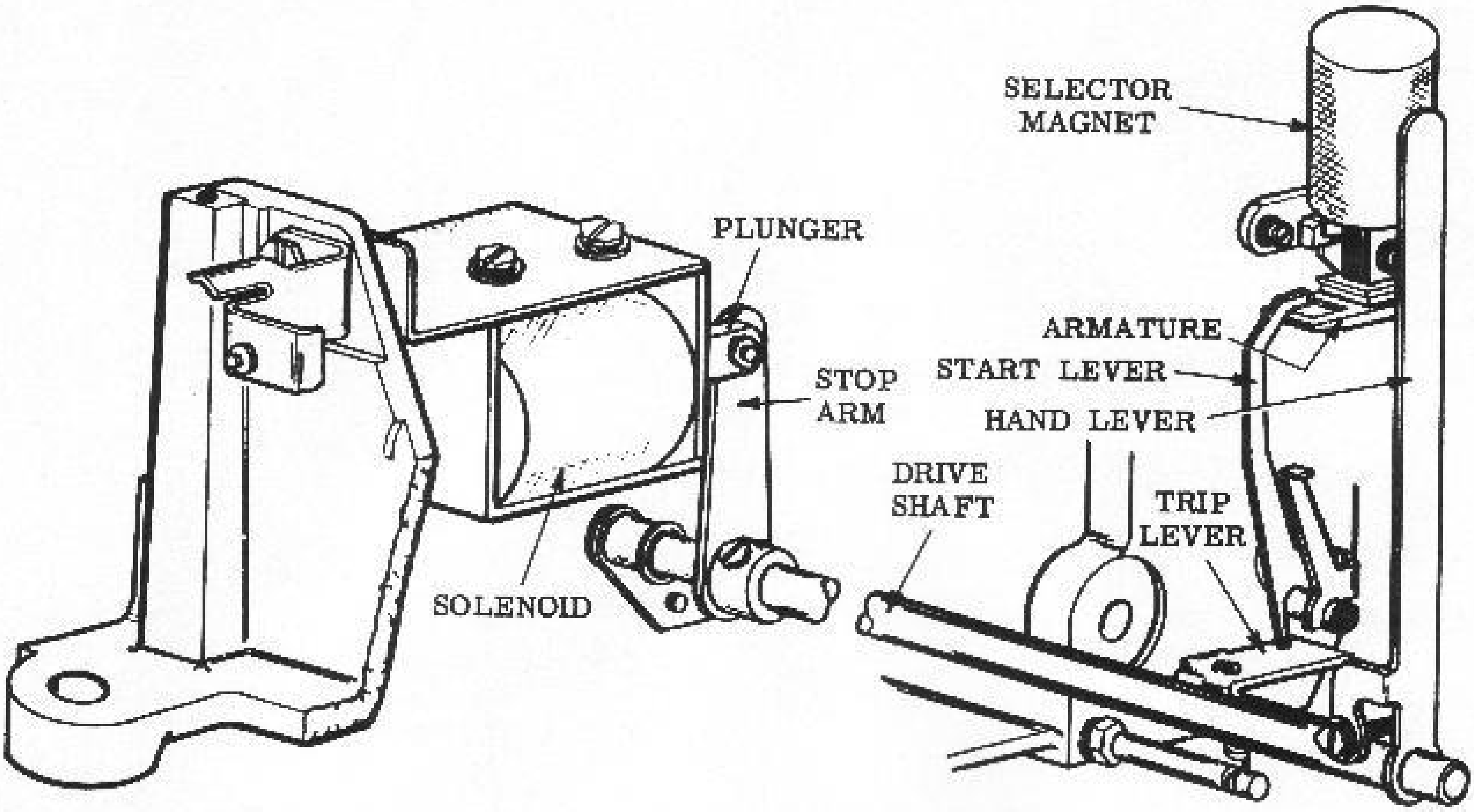


Figure 27 - Manual Interfering Letters Tape Feed Out Mechanism

REMOTE CONTROL NON-INTERFERING BLANK TAPE FEED OUT (Fig. 28)

A. General

9.15 This feature steps out a predetermined length of blank (unperforated) tape at the end of each message by remote control. The operation is initiated by an electrical pulse from a remote source that is applied to a tape feed-out magnet. The feed out is adjustable in steps of 0.6 inch, up to 18 inches. Messages received during any part of the feed out cycle will be processed without interference or loss of content. A non-repeat latch prevents successive tape feed-out operation from being initiated until the first feed-out sequence has been completed. At the end of the feed-out operation the mechanism stops and remains inactive until another cycle is initiated.

B. Initiation

9.16 The feed-out operation is initiated when an electrical pulse is applied to the feed-out magnet with the typing reperforator in the idle condition. With the magnet energized, the armature bail moves the blocking bail out of engagement with the drive bail assembly. The spring loaded drive bail falls into the indent of its cam and the connecting link positions the release lever on the lower step of the latch lever. The non-repeat latch is delayed one cycle by the spring loaded blocking latch on the drive bail. (If the start magnet is held energized longer than one cycle, the non-repeat latch prevents the drive bail from again falling into the indent of its cam.) As the drive bail reaches the indent of its cam, the blocking latch rides over the non-repeat latch. The drive bail then reaches the high part of its cam and the non-repeat latch falls into engagement with the drive bail. When the start magnet is de-energized, the spring loaded blocking bail again engages the drive bail and, simultaneously, disengages the non-repeat latch.

C. Metering

9.17 When the drive bail positions the release levers on the lower step of the latch lever as described above (9.16), metering takes place. The release lever has now permitted the check pawl and feed pawl to engage two adjacent ratchets. One of the ratchets is fed continually by the feed pawl. This ratchet

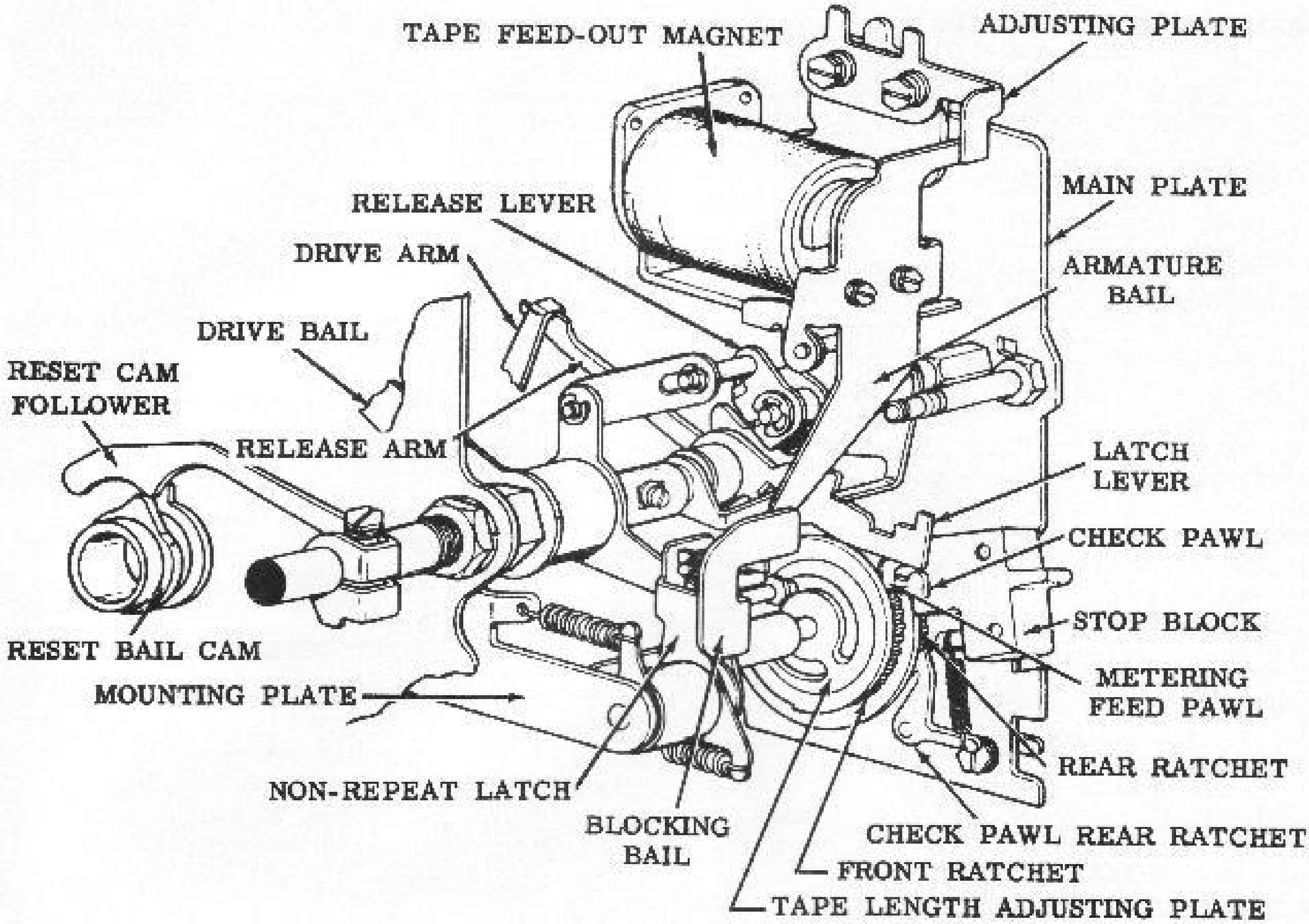


Figure 28 - Remote Control Non-Interfering Letters Tape Feed Out Mechanism

has a deeper notch at every sixth tooth, so that the pawl engages the second ratchet on every sixth cycle. After the second ratchet has rotated an amount equivalent to two teeth, a follower, riding a cam attached to the ratchet, drops off its peak and unblocks the tripping mechanism. After a predetermined length of tape has been fed (as measured by the second ratchet), the latch lever is actuated, as it would be by the selector cam on receipt of a message, and the tripping mechanism is blocked to prevent further feeding. Simultaneously, the feed pawls are lifted off the ratchets, and the ratchets return to their zero position.

D. Tripping and Punch Blocking

9.18 A bail that follows a cam attached to the main shaft engages the function clutch trip lever. When the cam follower enters the indent of its cam, an operating spring causes the bail to operate the clutch trip lever. The perforating and printing mechanisms are then allowed to punch and print the character stored in the selector. However, to insure that only blank tape will be advanced, a blocking link is connected to the selector stripper cam follower shaft. When the magnet is energized and the drive bail positions the release lever on the lower step of the latch lever as described in 9.17, the left end of the blocking link moves to the left and under the punch slide reset bail. Now, when the function clutch is tripped, the marking punch slides are blocked by the punch slide reset bail. The slide post on the front toggle links clears the punch slide projection on its upward movement. The punch slide reset bail then falls off the blocking link, but the punch slides cannot move forward into the marking position because they are blocked by the slide post.

9.19 Each time the main shaft rotates one revolution, a blank tape feed-out cycle is initiated, provided the function clutch trip lever bail is not blocked by the metering mechanism. Should an incoming message trip the metering mechanism, the tripping mechanism is immediately blocked from any further operation and the blocking link is pulled out of engagement with the punch slide reset bail.

E. Storage

9.20 The purpose of the storage is to hold the reset bail (perforating mechanism) in engagement with the punch slides until the slides are fully reset, so that they may recognize the first character set up in the punch slide latches by the selecting mechanism. This mechanism consists of a latch that is operated by a link attached to the punch slide reset bail toggle. During reception of an incoming message, the toggle mechanism pushes the latch out of the way of the reset bail prior to its being stripped by the clutch trip lever.

REMOTE CONTROL NON-INTERFERING LETTERS TAPE FEED OUT (Fig. 28)

9.21 The operation of this mechanism is essentially the same as that of the remote-control non-interfering blank tape feed out mechanism (9.15). This feature, however, does not contain a blocking link on the stripper cam follower shaft (9.18). The tape output, therefore, is perforated in the letters code combination (1-2-3-4-5).

AUTOMATIC NON-INTERFERING LETTERS FEED OUT (Fig. 29)

A. General

9.22 This feature automatically initiates the feed out of a predetermined length of letters perforated tape at the end of each message, following a fixed period of signal line idle time. The duration of delay between the termination of the message and the initiation of feed out is determined by one of several available cams. (At 100 words per minute operation, for example, delays of approximately 4 seconds and 16 seconds are available.) The length of tape feed out is also variable in increments of .6 inch up to 3.6 inches or 18 inches. The mechanism may be controlled remotely with the addition of a separate set of parts. Messages received during any part of the feed out cycle are processed without interference or loss of content.

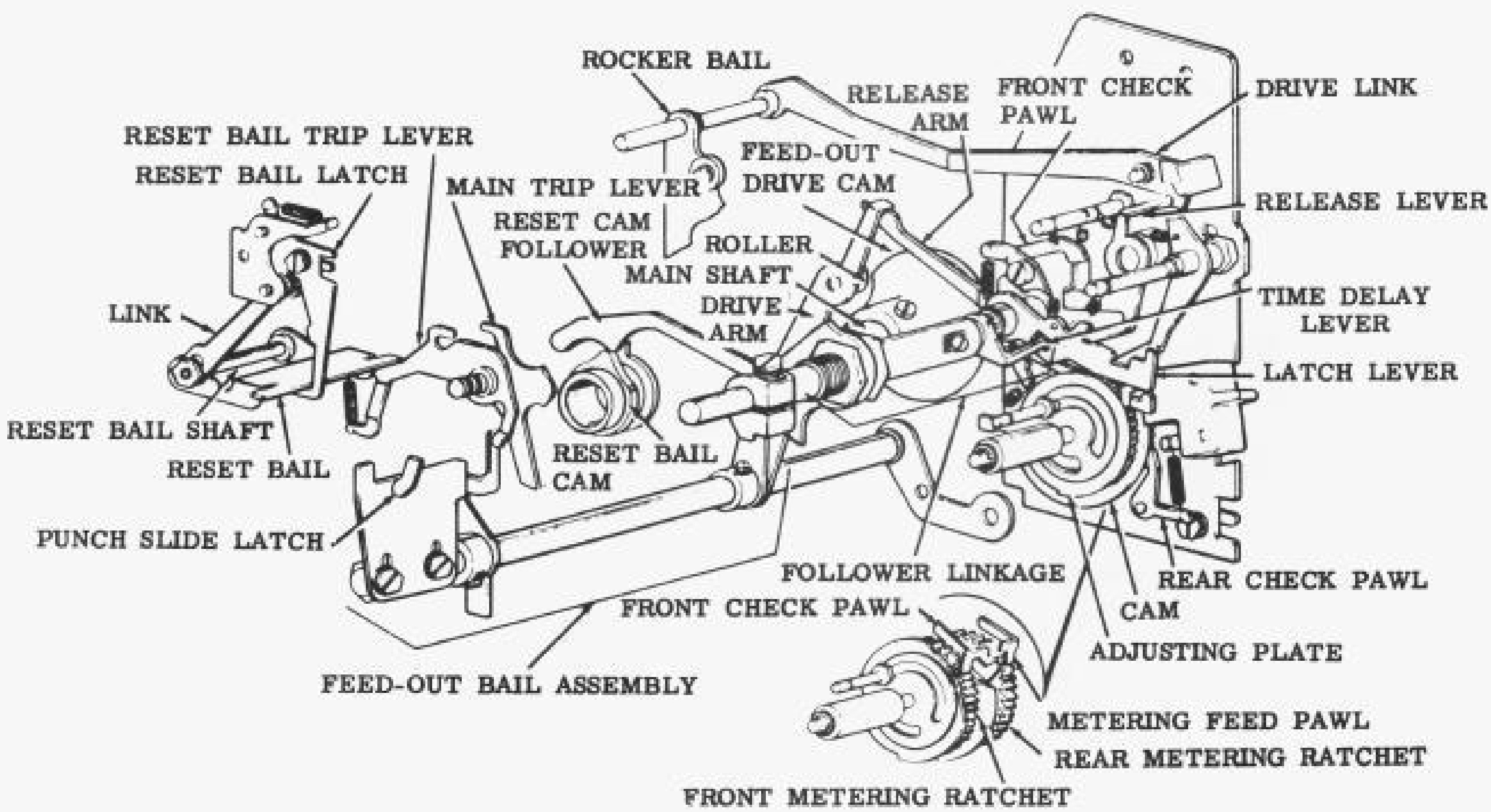


Figure 29 - Automatic Non-Interfering Letters Tape Feed Out Mechanism

B. Initiation

9.23 The feed-out operation is automatically initiated by a fixed period of idle signal line. Through the interaction of a drive link operated by the rocker bail and a follower activated by the reset bail cam in the selector, the mechanism recognizes the end of a message. The timing of the selector while receiving a message is such that the reset bail cam raises its follower during the first part of the selector cycle. The follower, through a linkage, lowers a latch lever which permits a release lever to rotate clockwise. When the release lever is in its clockwise position, the mechanism is in its unoperated condition, as explained below. When the rocker bail goes to its extreme left position during the middle of the function cycle, the attached drive link rotates the release lever counterclockwise and places the mechanism in its operated condition, as explained in 9.27. Each time a new character is received, the above sequence occurs.

9.24 End of message recognition is obtained when the release lever is rotated counterclockwise by the rocker bail and then is not permitted to rotate clockwise by the follower.

C. Metering and Feed Out

9.25 When the release lever rotates counterclockwise, it lowers a front check pawl onto two metering ratchets. These function as described in 9.23 above.

9.26 A time delay lever rides on a cam attached to the front ratchet. When the front ratchet rotates, the time delay lever rides to the low part of the cam and causes a release arm to release the drive arm of a feed out bail assembly. A roller on the drive arm then rides, under spring pressure, on a feed out drive cam on the main shaft. As the shaft rotates, each time the roller rides to the low part of the cam, the feed out bail assembly does two things: 1) rotates the main trip lever counterclockwise and trips the function clutch, and 2) rotates the punch slide latches counterclockwise and sets up a letters code combination. Thus, the reperforator feeds out letters tape in the same manner as if the function clutch and punch slides had been actuated by the selector.

9.27 As the ratchets are rotated as described above, an adjusting plate on the front ratchet reaches the position where it rotates the latch lever clockwise. The latch lever, in turn, performs two actions: 1) through the time delay lever causes the release arm to latch the drive arm and terminate feed out, and 2) permits the release lever to move to its clockwise position and lift the metering feed pawl and front check pawl off the ratchets. A spring returns the front ratchet to its start position. The mechanism remains in its unoperated condition until the next code combination is received. The adjusting plate is adjustable for varying lengths of tape feed out.

D. Non-Interference

9.28 When the first character of an incoming message is received during feed out, the selector clutch is tripped and the reset cam follower causes the release lever to rotate clockwise. Feed-out is terminated, as described in 9.25 . The incoming message is perforated.

9.29 When the first character is received during feed out, the relationship between the selector cam and the function cam could be such that the reset bail would release the punch slides before the slides are fully reset. In this case, the first character of the incoming message would be lost. The purpose of the storage assembly is to prevent this. The storage assembly consists of a reset bail latch that is moved by a link attached to the reset bail shaft. During normal reception of messages, the link pushes the latch out of the way of the reset bail prior to the bail's being lowered by the main trip lever. Whenever the condition described above occurs, the latch holds the bail in engagement with the slides until they are fully reset, so that they may recognize the first character set up in the punch slide latches by the selector.

BACK SPACE MECHANISMS (Fig. 30)

A. General

9.30 The back space mechanism steps the tape back through the punch block in order to delete perforated errors. The erroneously perforated code combination in the retracted tape is then obliterated by perforating the letters code combination in its place. The back space mechanism may be operated manually or it may include power drive. The mechanism used with chadless tape differs from that used with fully perforated tape in that it contains a tape rake for depressing the chad. The mechanisms are shown in Figure 30.

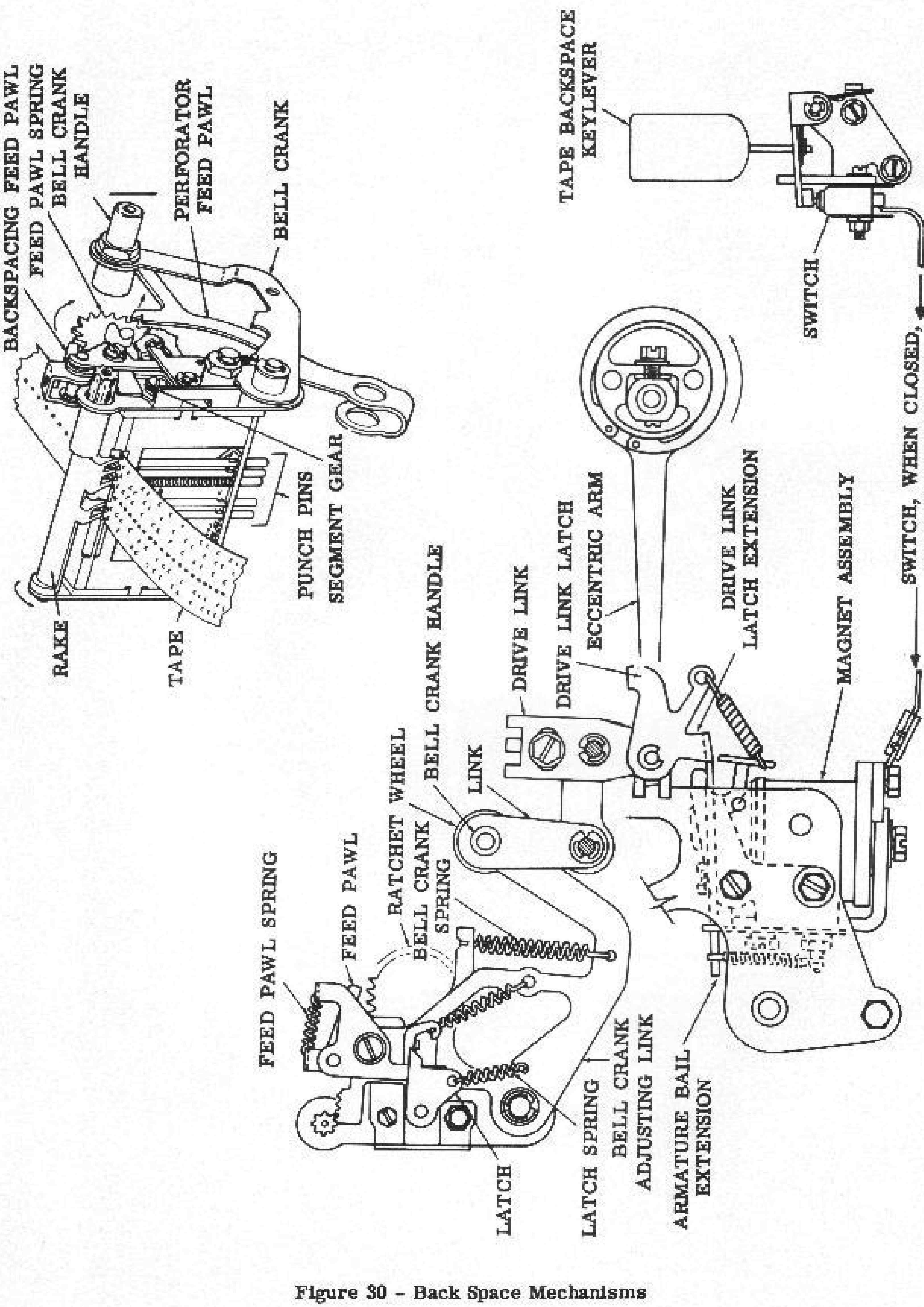


Figure 30 - Back Space Mechanisms

B. Manual Back Space (Fully Perforated Tape)

9.31 Depressing the handle of the back-spacing bell crank disengages the perforator feed pawl from the feed wheel ratchet. The back-spacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, back-spacing the tape to the next row of perforations.

C. Manual Back Space (Chadless Tape)

9.32 Depressing the handle of the back-spacing bell crank disengages the perforator feed pawl from the speed wheel ratchet and simultaneously rotates the rake to depress the chads. The back spacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, back-spacing the tape to the next row of perforations.

D. Power Drive Back Space

9.33 A start magnet in the power drive mechanism is energized by a remote source. When energized, the armature bail is pulled downward. An extension of the bail disengages the drive link latch, which drops and engages a notch in the eccentric arm. The eccentric arm, driven by the perforator main shaft, moves to the right. This action causes the bell crank handle to be depressed through a system of linkages between the drive link latch and the bell crank. The subsequent operation is as described in paragraphs 9.31 and 9.32 .