35 TYPING REPERFORATOR (LPR)

DESCRIPTION AND PRINCIPLES OF OPERATION

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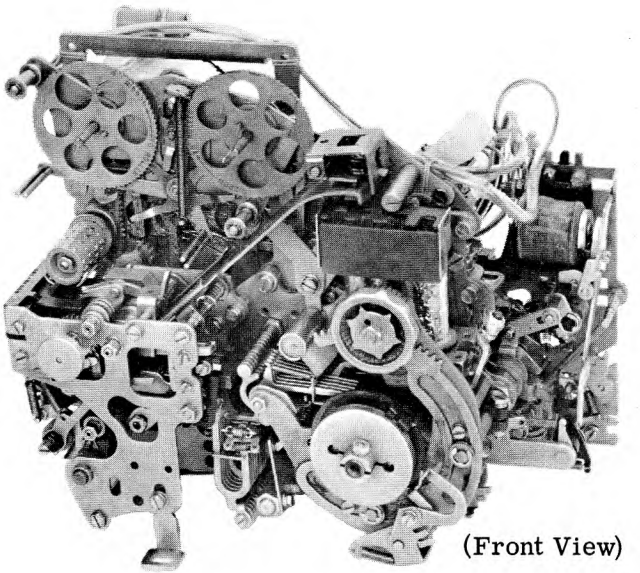

(Front View)

Figure 1 - 35 Typing Reperforator

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1. GENERAL

1.01 This section contains description and principles of operation for the 35 typing reperforator (Figures 1, 2, and 3). The section has been revised to include recent engineering changes and additions, and to rearrange the text, so as to bring the section generally up-to-date. Since this is an extensive revision, marginal arrows ordinarily used to indicate changes have been omitted.

1.02 The 35 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 print and perforate. External gears permit operation at signaling speeds up to 100 wpm. Code and tape feed holes are fully perforated. The characters are printed between the feed holes. A number of variable features are available with the unit.

1.03 The unit is equipped to receive information transmitted in the eight level American Standard Code for Information Interchange (ASCII). See the applicable section for a detailed explanation of this code.

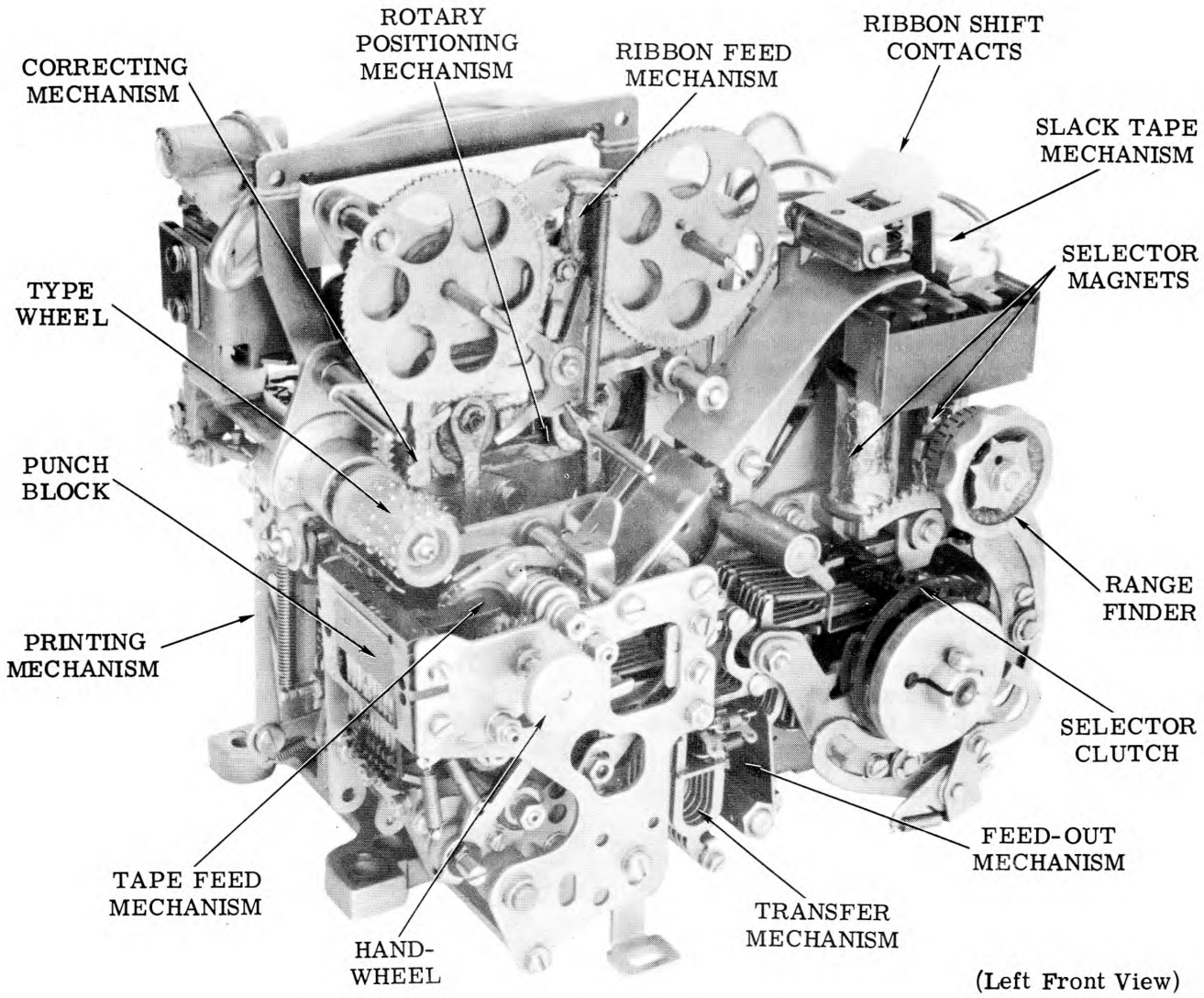


Figure 2 - Typical 35 Typing Reperforator (Without Chad Chute)

1.04 The characters perforated in the tape are six positions in advance of the printed characters. This should be considered when preparing the tape for transmission. The end of the tape should include all of the printed characters in the message, and the first printed character of the message must be preceded by at least six sets of code perforations.

1.05 For most applications the unit is equipped with a black-inked ribbon. All graphic characters (such as A, B, C, 1, 2, 3, #, *, %) are printed. Printing is suppressed when the code combination for a control function is received (eg, BELL, EOA, EOT). For special applications which require printing on receipt of control functions, the typing reperforator is equipped with a two-color ribbon (black and red). The graphic characters are printed in black; control functions are indicated by printing of their complementary graphic symbol in red. See Figure 4.

1.06 Perforated code holes correspond to the marking bits and unperforated code positions correspond to spacing bits. Reading from the rear as the tape feeds from the punch block, the code positions in the tape are: 1, 2, and 3, the feed hole, and the 4, 5, 6, 7, and 8 bits.

1.07 Unless stated otherwise, references in this section to left or right indicate the operators left or right, facing the front of the unit

(selector mechanism at the right, punch mechanism at the left). In illustrations, unless noted otherwise, the views show the equipment as viewed from the front. Pivot points are shown by circles or elipses and are drawn solid black to indicate fixed points and crosshatched to indicate floating points.

2. DESCRIPTION

GENERAL

2.01 The following paragraphs describe the mechanisms that comprise the typing reperforator and discuss the differences between the several variations of the unit. Refer to Figures 2 and 3.

DRIVE MECHANISM (Figure 2)

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 source, through a gear shift mechanism or change gears, 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.

SELECTING MECHANISM (Figure 2)

2.03 A selecting mechanism, which includes a two-coil magnet wired to the signal line, converts the electrical signaling code combinations into mechanical arrangements which govern the printing and perforation operations. The magnets may be wired for 0.500 ampere line current furnished by an external selector magnet driver or, depending on the unit, they 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.

TYPE WHEEL AND POSITIONING MECHANISMS (Figure 2)

2.04 The characters used in printing are embossed on a metal type wheel which may be easily 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 type wheel.

PRINTING MECHANISM (Figure 2)

2.05 A printing mechanism utilizes a hammer to drive the tape and inked ribbon against the type wheel and imprint the selected character. Printing and perforating occur simultaneously at the punch block, but the characters are printed six positions to the right of the corresponding code combinations. On units equipped with the last character visibility feature, the type wheel is retracted at the end of each operating cycle to expose the last printed character.

RIBBON FEED MECHANISM (Figure 2)

2.06 The ribbon feed mechanism has two circular ratchets on which the ribbon spools are mounted. A feed pawl, which receives its motion from the rocker bail, advances the ribbon by rotating a ratchet once each cycle of operation. The direction of ribbon travel is automatically reversed when the supply spool is nearly depleted.

PERFORATING MECHANISM (Figure 2)

2.07 The perforating mechanism contains a punch block, punch pins, and drive parts. The punch pins, contained within the punch block, punch fully perforated code holes in the tape in response to mechanical arrangements received from the selector mechanism via punch slides and punch slide latches. A feed hole is perforated each cycle of operation. The mechanism receives its drive from a main bail assembly.

RIBBON SHIFT — PRINT SUPPRESSION MECHANISMS (Figure 3)

2.08 A ribbon shift mechanism is actuated by ribbon shift contacts associated with the function box. This mechanism permits the ribbon to advance fully to print graphics in black. When the signal code combinations for control functions are received, the ribbon shift mechanism will either actuate the print suppression mechanism to prevent printing (units with one color ribbons) or retard the advance of the ribbon to print the control function's complementary graphic in red (units with two color ribbons).

FUNCTION BOX (Figure 3)

2.09 A function box enables the typing reperforator to perform various auxiliary functions, such as the actuation of signal bell and EOT contacts.

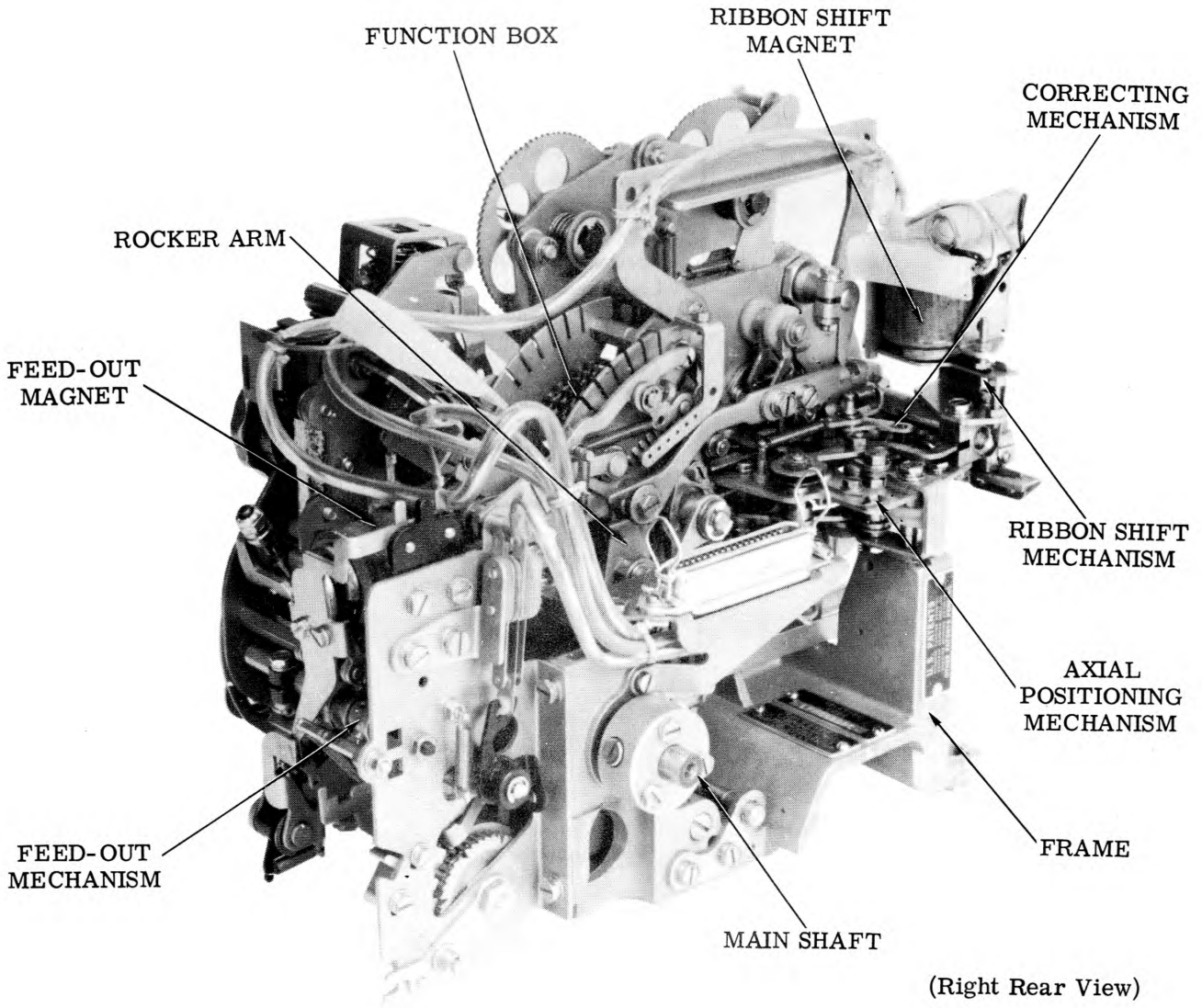


Figure 3 - Typical 35 Typing Reperforator

FRAME ASSEMBLY (Figures 2 and 3)

2.10 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 connector for all electrical input requirements is provided.

2.11 A variation of the typing reperforator contains an additional shaft that enables the 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 (ASR) Set and is described in another publication.

VARIABLE FEATURES

2.12 A number of variable features are available with the typing reperforator. These features, some of which are described below, 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 external use and include the following types:

(1) Timing contacts for timed control of external equipment. For example, the selector mechanism may be equipped

CODE 1 2 3 4 5 6 7 8 *	CHARACTER REPRESENTATION	MEANING OF CHARACTER	CHARACTER PRINTED	COLOR
0 0 0 0 0 0 0 0	§ NULL	Blank (All bits spacing)	□	Red
● 0 0 0 0 0 0 ●	SOH	Start of Heading	!	Red
0 ● 0 0 0 0 0 ●	STX	Start of Text	"	Red
● ● 0 0 0 0 0 0	ETX	End of Text	#	Red
0 0 ● 0 0 0 0 ●	EOT	End of Transmission	$	Red
● 0 ● 0 0 0 0 0	WRU(ENQ)	Who Are You or Enquiry	%	Red
0 ● ● 0 0 0 0 0	§ ACK	Acknowledge	&	Red
● ● ● 0 0 0 0 ●	BELL	Bell	'	Red
0 0 0 ● 0 0 0 ●	BS	Backspace	(	Red
● 0 0 ● 0 0 0 0	TAB	Horizontal Tabulation	)	Red
0 ● 0 ● 0 0 0 0	LF	Line Feed	*	Red
● ● 0 ● 0 0 0 ●	VT	Vertical Tabulation	+	Red
0 0 ● ● 0 0 0 0	FORM	Form Feed	,	Red
● 0 ● ● 0 0 0 ●	RETURN	Carriage Return	-	Red
0 ● ● ● 0 0 0 ●	§ SO	Shift Out	.	Red
● ● ● ● 0 0 0 0	§ SI	Shift In	/	Red
0 0 0 0 ● 0 0 ●	§ DLE	Data Link Escape	0	Red
● 0 0 0 ● 0 0 0	X ON	Transmitter On	1	Red
0 ● 0 0 ● 0 0 0	TAPE	Receiver On	2	Red
● ● 0 0 ● 0 0 ●	X OFF	Transmitter Off	3	Red
0 0 ● 0 ● 0 0 0	~~TAPE~~	Receiver Off	4	Red
● 0 ● 0 ● 0 0 ●	§ NAK	Negative Acknowledge	5	Red
0 ● ● 0 ● 0 0 ●	§ SYN	Synchronization Idle	6	Red
● ● ● 0 ● 0 0 0	§ ETB	End of Text Block	7	Red
0 0 0 ● ● 0 0 0	§ CAN	Cancel	8	Red
● 0 0 ● ● 0 0 ●	§ EM	End of Media	9	Red
0 ● 0 ● ● 0 0 ●	§ SS	Start of Spl. Seq.	:	Red
● ● 0 ● ● 0 0 0	ESC	Escape (For Data Proc.)	;	Red
0 0 ● ● ● 0 0 ●	§ FS	Field Separator	<	Red
● 0 ● ● ● 0 0 0	§ GS	Groups Separator	=	Red
0 ● ● ● ● 0 0 0	§ RS	Record Separator	>	Red
● ● ● ● ● 0 0 ●	§ US	Unit Separator	?	Red
0 0 ● ● ● ● ● ●			\	Red
● 0 ● ● ● ● ● 0			]	Red
0 ● ● ● ● ● ● 0			↑	Red
● ● ● ● ● ● ● ●	RUB OUT	Delete (All bits marking)	←	Red

NOTE: Characters marked § have no associated keytop on 35 keyboards.

*The above chart indicates the code arrangement for even parity. When even parity is not used, the 8th bit is always marking.

Figure 4 - 8-Level ASCII Code Language (Controls) for Two-Color Typing Reperforators

with contacts which provide a signal each time the selector reaches its rest position.

(2) Letters-figures contacts which signal whether the typing reperforator is in the letters or figures condition.

(3) Code reading contacts enable the typing reperforator to convert the received serial data into parallel form.

(4) Several types of audible and visual indicator actuating contacts are available, such as the signal bell and end of transmission (EOT) contacts which are operated by the function box when their code combinations are received.

(b) Backspace Mechanism: Two 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 rubout perforated tape following the end of a message. The extra length of tape facilitates tape han-

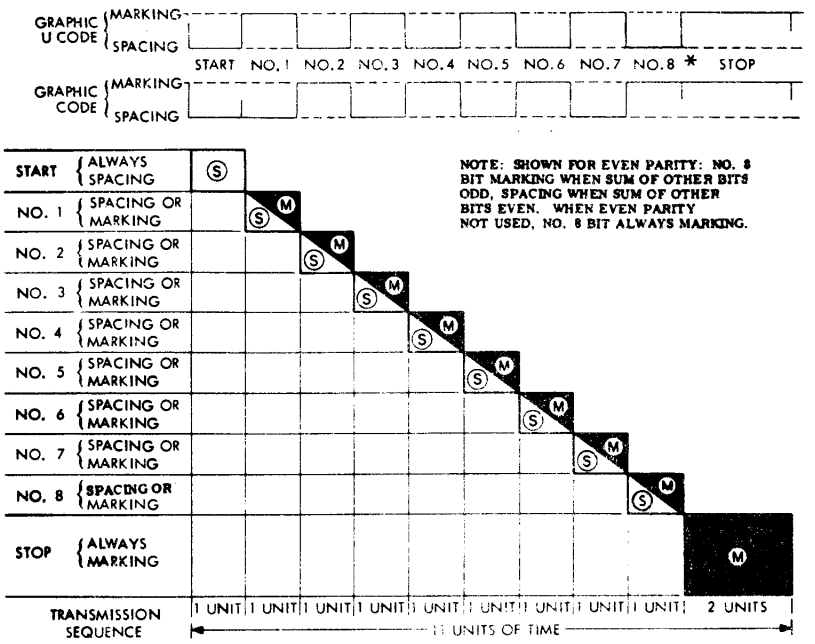


Figure 5 - Signaling Code

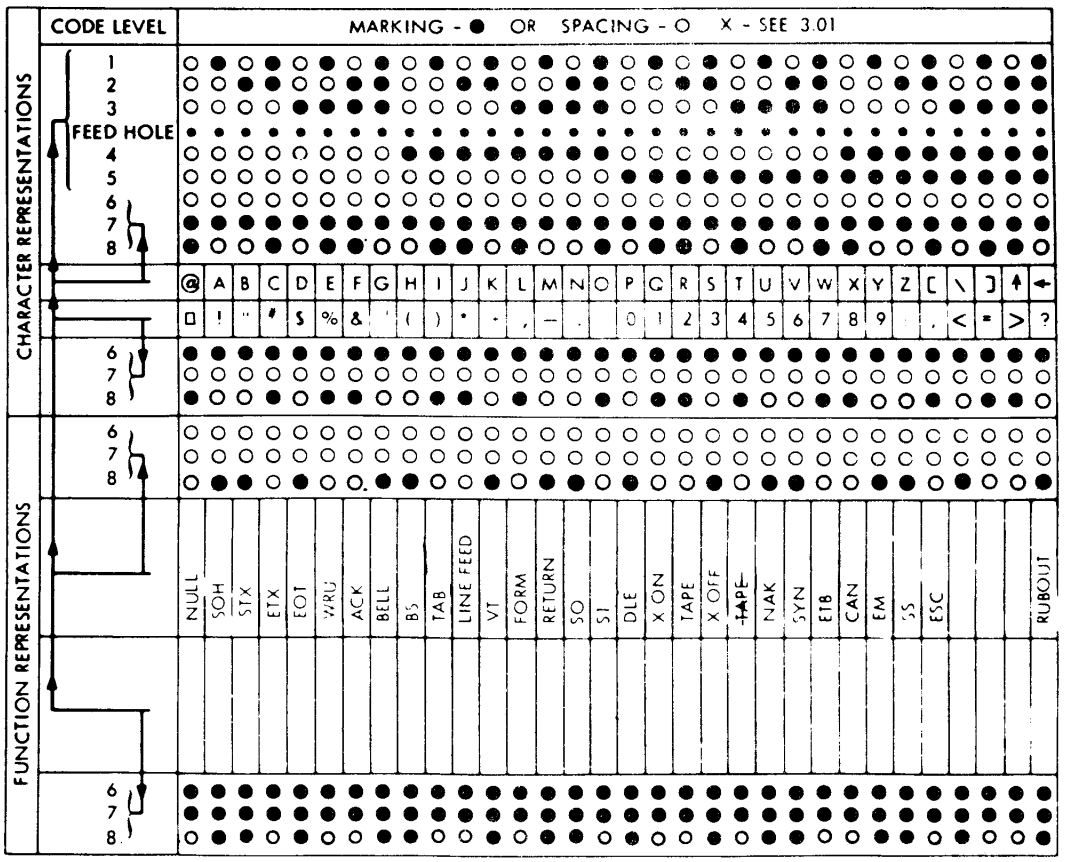


Figure 6 - Code Representations of Characters (Graphics) and Functions

dling. Normally, the interfering tape feed-out mechanism operates at the end of a message. A message cannot be received during a feed-out period. The noninterfering tape feed-out mechanisms have provisions for copying messages received during the feed-out period. The mechanisms may be operated manually, automatically, or by remote control.

(d) Print Suppression on Function: This feature is a standard on one-color ribbon units and is available with two-color ribbon units to prevent printing when control functions are received.

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

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, 11-unit start-stop (3.01)
Current	0.500 ampere with selector magnet driver. (Other units available to operate on either 0.020 or 0.060 ampere signal)

TAPE

Type	Standard communications and ASCII
Width	1 inch
Perforations	8-level, fully perforated
Holes/inch	10
Feed holes and code holes in line	

PRINTED CHARACTERS

Height	
Standard	0.100 inch
Maximum (Fractions)	0.130 inch
Width	0.050 inch

Type style and character arrangement variable.

SIGNALING CODE (Figure 5)

3.01 Information is received by the reperforator in the form of an eleven-bit start-stop signaling code in which each character (graphic) or function is represented by a sequential combination of current and no-current time intervals. Intervals during which current flows in the signal circuit are referred to as marking and during which no current flows as spacing. Every combination includes eight bits that carry the intelligence, each of which may be either marking or spacing. In present applications, the eighth bit is always marking. For even parity code transmission, the eighth bit may be either marking or spacing, so that the number of marking bits in the transmitted code is always an even number (Figure 5). The intelligence bits are preceded by a start bit (always spacing) and are followed by two stop bits (always marking). Thus each combination consists of 11.0 units of time (referred to as an 11.0 unit transmission pattern). The start and stop bits ensure synchronization between the transmitting and receiving equipment by bringing the receiving equipment to a complete stop at the end of each combination. The marking condition of the eighth bit further enlarges the marking interval at the end of each code combination transmitted.

3.02 The code representations for the graphics U and * are illustrated in Figure 5. In these combinations, alternate marking and spacing condition for the intelligence bits are required.

4. GENERAL OUTLINE OF OPERATION

4.01 The relationship of the operating mechanisms of the 35 typing reperforator are illustrated in the pictorial schematic diagram (Figure 7). Rotary motion from an external source is applied to the main shaft through a sprocket. The main shaft rotates constantly as long as the unit is under power. An externally supplied 115 v ac circuit is used to pulse the tape feed-out magnet and operate the ribbon shift magnet. The ribbon shift magnet is controlled by function box contacts to permit printing in black or red or, for one color ribbon units, to operate the print suppression mechanism which prevents printing on functions. The selector magnet coils usually operate on a 0.500 ampere circuit through a selector magnet driver. However, there are models available which are not used in conjunction with a selector magnet driver and these require 0.060 ampere to operate the selector magnet coils.

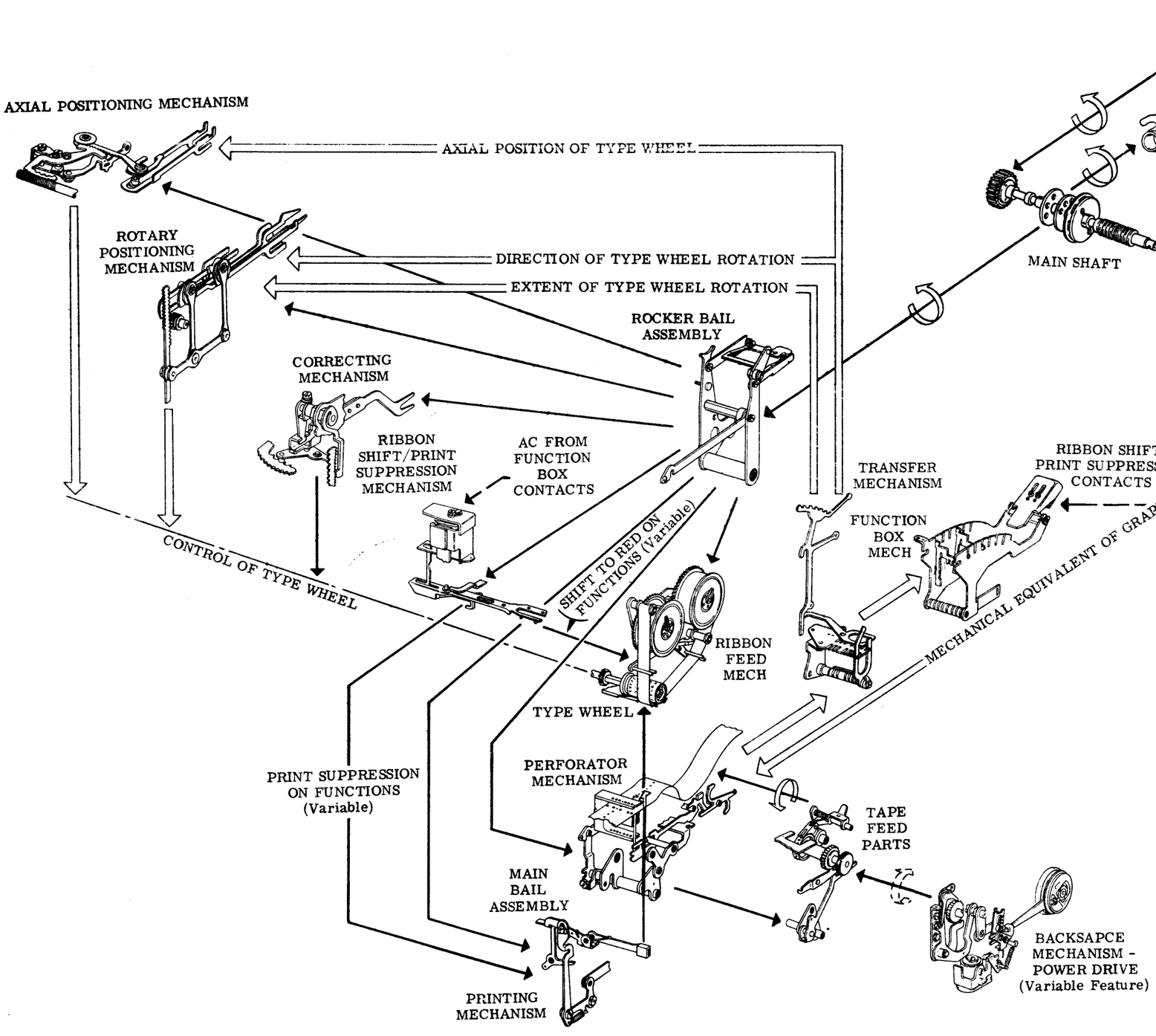


Figure 7 - Pictorial Diagram of Typical 35 Typing Reperforator

OUTLINE OF OPERATION

INFORMATION IS APPLIED TO SELECTOR MECHANISM ELECTRICALLY.

EXTERNAL POWER DRIVES THE MAIN SHAFT. ROCKER BAIL DISTRIBUTES THIS MOTION TO PERFORATING, POSITIONING TAPE FEED, RIBBON FEED AND PRINTING MECHANISMS.

SELECTOR MECHANISM CONVERTS THE ELECTRICAL SIGNAL INTO ITS MECHANICAL EQUIVALENT. PUNCH SLIDES, IN THE PERFORATOR MECHANISM, RECEIVE THE INTELLIGENCE AND SET UP PUNCH PINS AND TRANSFER MECHANISM.

TRANSFER MECHANISM GUIDES AXIAL AND ROTARY POSITIONING MECHANISMS. THESE AND THE CORRECTING MECHANISM POSITION TYPE WHEEL ABOVE INKED RIBBON TO PRINT SELECTED CHARACTER.

PERFORATION AND PRINTING OCCUR SIMULTANEOUSLY BUT PRINTED CHARACTERS LAG CODE HOLES BY 6 SPACES.

KEY

INTELLIGENCE	MECHANICAL	ELECTRICAL
ENERGY		

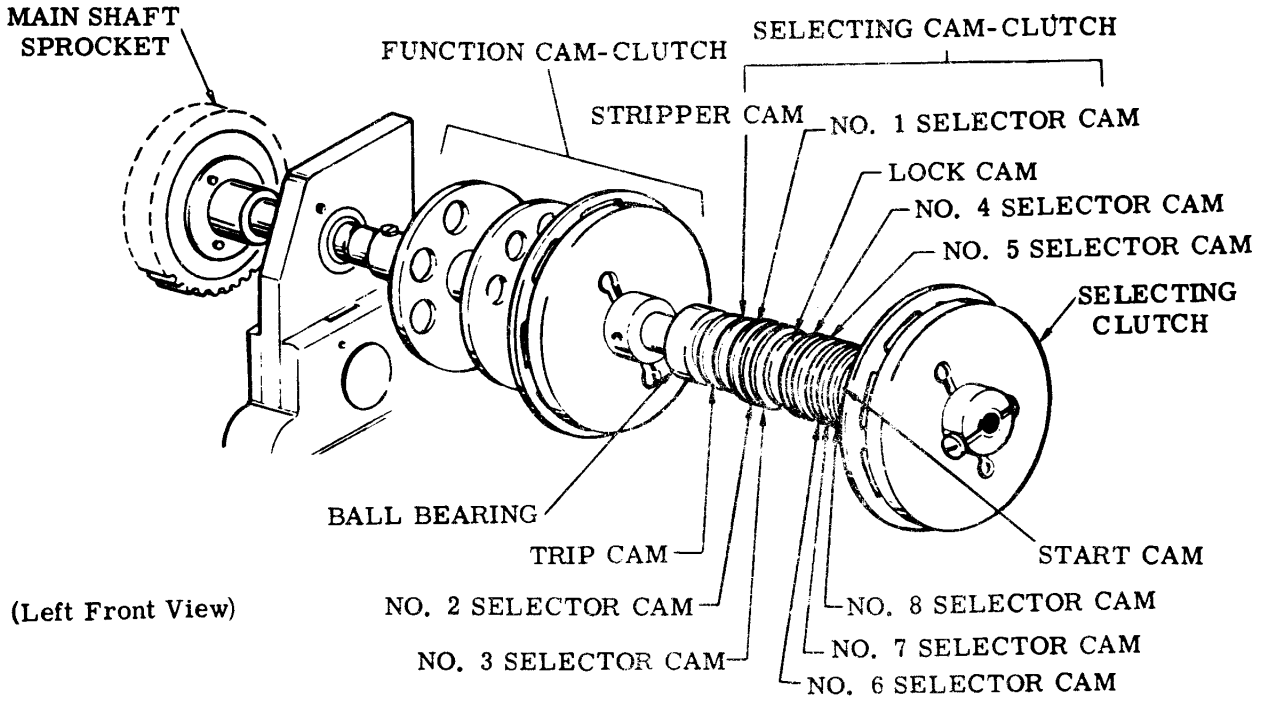


Figure 8 - Main Shaft

4.02 The signaling code combinations, such as the combination representing the graphic U, plotted at the left of Figure 7, are applied to the selecting mechanism. The start bit 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 bits 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 its arrangement from the selector, causes positioning of the axial and rotary positioning mechanisms, which select the type wheel character to be printed.

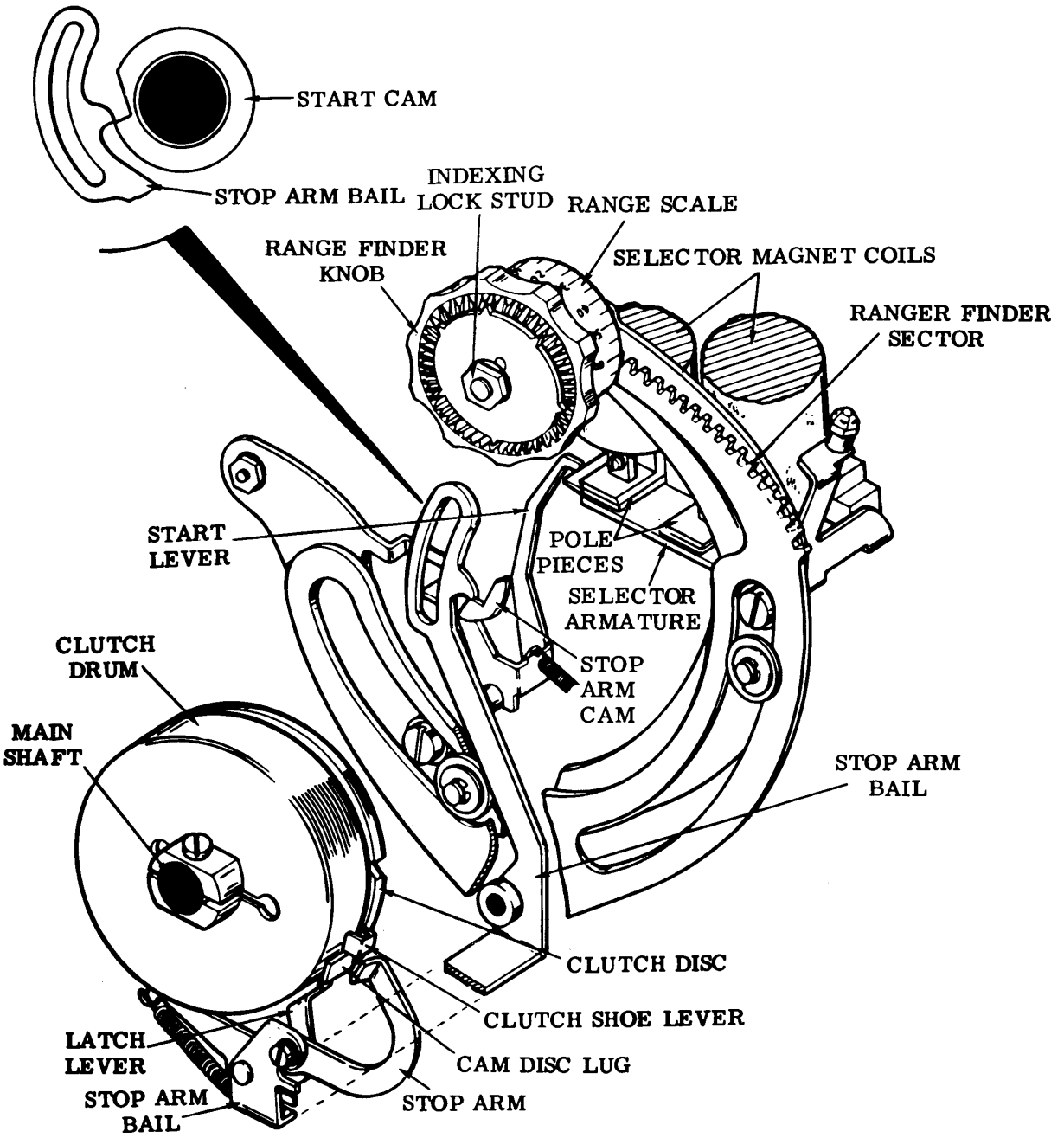
4.05 The punch slides, having received their arrangement from the selector, cause the punch pins to perforate code holes in the tape corresponding to the code bits received by the selecting mechanism. Late in the function cycle, the tape feed parts advance the tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by the selecting cam-clutch or by the 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.

4.06 The backspace mechanism is operated manually or it receives its drive from the typing reperforator main shaft via an eccentric arm. It reverses the rotation of the tape feed wheel to retract the tape in the punch block.

5. SELECTION

GENERAL

5.01 The selecting mechanism, made up of a selector (5.07), a clutch trip assembly (Figure 9), and a cam-clutch (Figure 8), translates signaling code combinations into mechanical arrangements which govern tape printing and perforations. The electrical pulses com-



(Front View)

Figure 9 - Range Finder and Selecting Cam-Clutch Assembly

prising 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 (Figure 9), the selecting mechanism can be adjusted to sample the code bits 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 (5.13) and through the punch slides to control the perforating mechanism (5.09).

RECEPTION AND TRANSLATION

A. Selecting Cam-Clutch and Trip Assembly (Figures 8 and 9)

5.02 The selecting cam-clutch includes (from right to left in Figure 8) the clutch, the start cam, the eighth, seventh, sixth, fifth, and fourth pulse cams, the lock cam, the third, second, and first pulse cams, the stripper cam, and the trip cam. During the time in which the signal line current is closed (marking), the selector magnet coils are energized and hold the selector armature up against the magnet pole pieces (Figure 9). In this position, the armature blocks the start lever, and the cam-clutch is held stationary between the stop arm and latchlever.

5.03 When a code combination is received, the start bit (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 (Figure 9). 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 bits of the code are received and processed by the selector (5.07 to 5.09).

5.04 When the stop bit 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 stop lever. When the clutch shoe lever strikes the stop arm, the inertia of a cam disc causes it to continue to turn until its lug makes contact

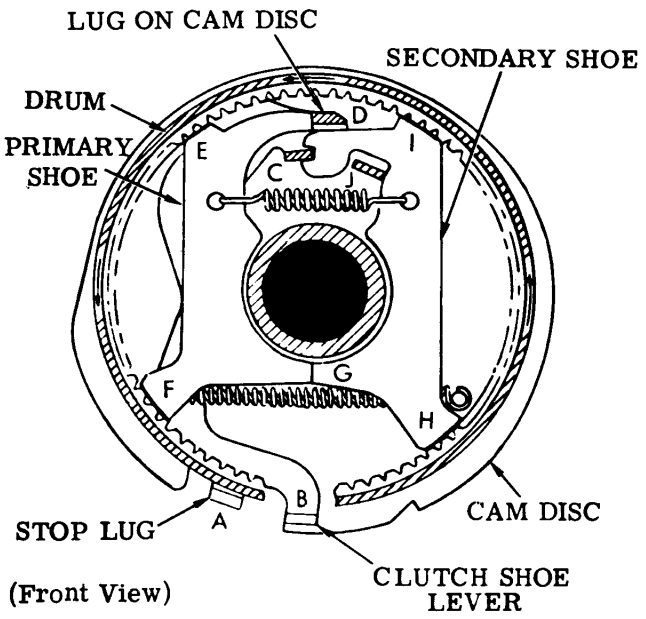


Figure 10 - Clutch, Engaged

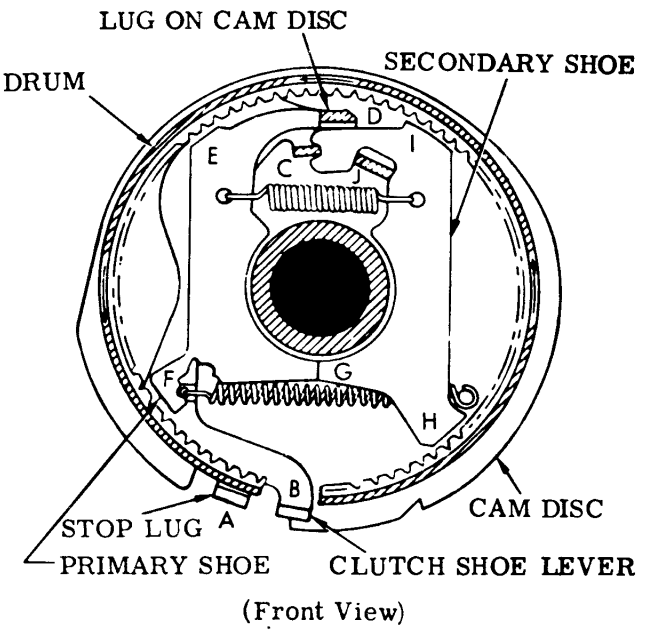


Figure 11 - Clutch, Disengaged

with the clutch shoe lever. At this point, a latchlever drops into an indent in the cam disc, and the clutch is held disengaged until the next code combination is received.

B. Clutch Operation (Figures 10 and 11)

5.05 The clutch drum is attached to and rotates in unison with the main shaft (Figure 8). In the disengaged position, as shown in Figure 11, the clutch shoes do not contact the drum, and the shoes and cam disc are held stationary. Engagement is accomplished by moving the stop arm (Figure 9) away from the clutch and thus releasing stop lug A and the lower end of shoe lever B (Figure 10). 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 disc, and the disc and attached cam turn in unison with the drum.

5.06 Disengagement is effected when the lower end of shoe lever B strikes the stop arm (Figure 9). Lug A and the lower end of the shoe lever are brought together (Figure 10), 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 latchlever seats in the indent in the cam disc (5.04) and the cam is held in its stop position until the clutch is again engaged.

C. Selector Operation (Figures 8, 9, and 12)

5.07 The selector assembly consists primarily of two magnet coils (Figure 9), an armature and associated bails, levers, and latches (Figure 12). Eight linkages, each of which consists of a selecting lever, a pushlever, and a puneh 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 Figure 12. As the selecting bits of the code combination are applied to the magnet, the cam actuates the selecting levers. When a spacing bit is received, a marking locklever is blocked by the end of the armature, and a spacing locklever swings to the right above the armature and locks it in the spacing position until the next signal transition occurs. Extensions on the marking locklever prevent the selecting levers from following their cams. When a marking bit is received, the spacing locklever is blocked by the end of the armature, and the marking locklever 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 locklever 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 pushlever falls off a step on the selecting lever.

5.08 As the cam rotates, the selecting levers, together with any selected pushlevers, 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 pushlevers remain to the right. When the next code combination is received, a selector reset bail, lifted by its cam (Figure 12), strips the selected pushlevers from the selecting levers, and the pushlevers are returned to the right by their springs.

5.09 The selected pushlevers, in moving to the left, rotate associated punch slide latches counterclockwise (Figure 12). Just before the eighth pushlever is selected, the selecting cam, through the function trip assembly, causes the perforator reset bail to release the punch slides (5.13). 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 (8.02). The latches, under spring tension, return to their unselected position when the pushlevers are repositioned at the beginning of the next selecting cycle.

ORIENTATION (Figure 9)

5.10 For optimum performance, the selecting mechanism should be adjusted to sample the signaling code bits 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 (Figure 9) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which supports the stop arm bail, stop arm and latchlever) 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 locklevers. 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 (Figure 13)

5.12 The function of the transfer mechanism is threefold:

(1) It provides a path for the signal intelligence from the selector to the associated pushbar in the type wheel positioning mechanism.

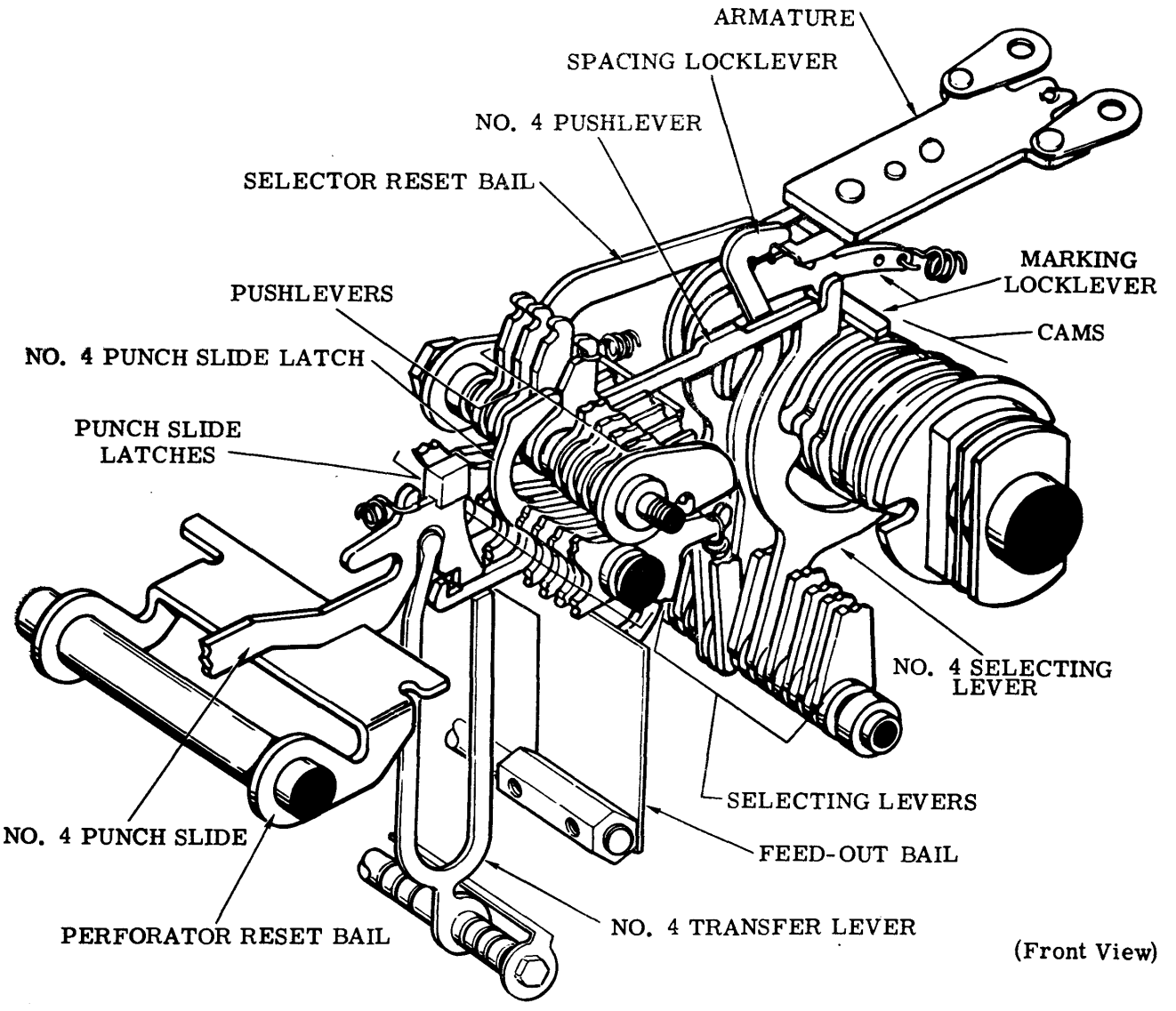


Figure 12 - Selector

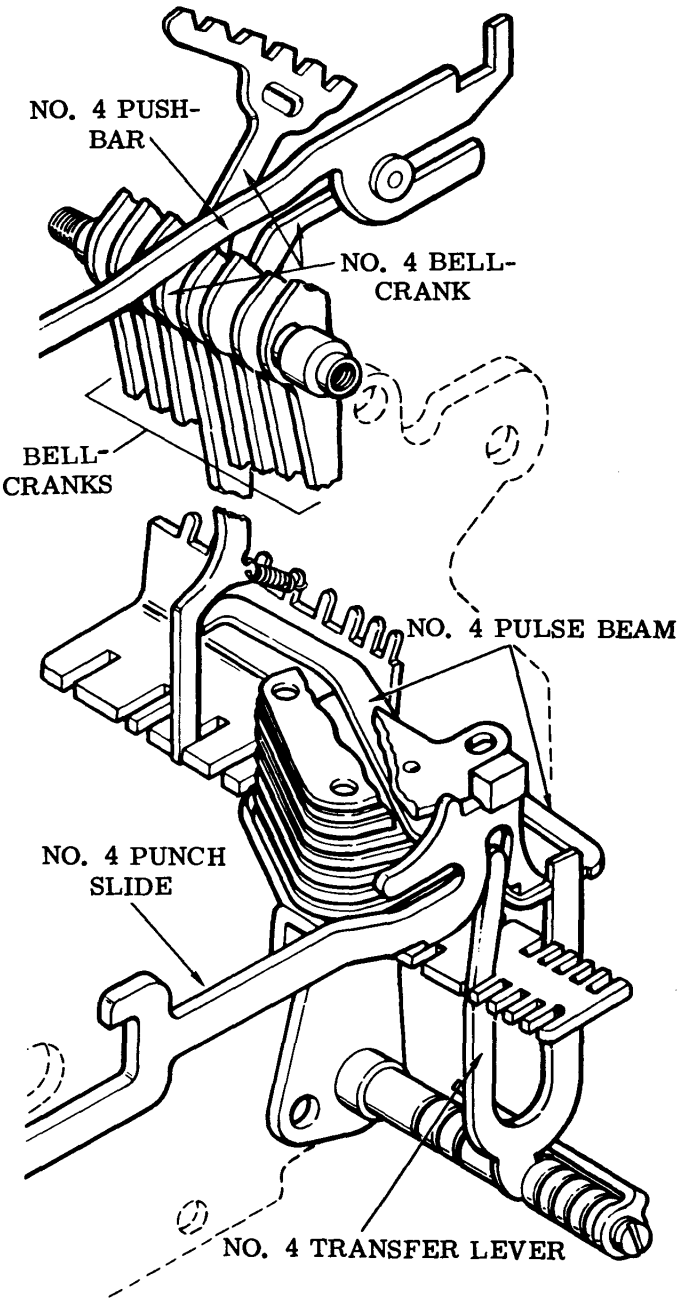
(2) It provides a path for the signal intelligence from other signal sources to the type wheel positioning mechanism.

(3) It provides a means for setting up the ribbon color shift contacts to condition ribbon for red or black printing or to initiate print suppression, determined by the unit.

5.13 The transfer levers engage the punch slides at one end, as illustrated by the no. 4 transfer lever in Figure 13. The transfer levers all pivot about a common point and, at various distances from this pivot, engage their corresponding transfer beams. The opposite end of the transfer beam is coupled to one arm of a bellcrank lever. The opposite arm of the number 1, 2, 3, 4, 5, and 7 bellcrank levers engage their associated pushbars. Since the no. 6 and 8 bits do not control the position of the type wheel, they do not have an associated pushbar. When a selected punch slide falls forward, the corresponding pushbar is raised upwards and into engagement with the rocker bail. An additional extension on the lower end of the latch-lever is arranged to engage a bail on the tape feed-out mechanism.

5.14 The no. 6 and 7 bellcranks have an additional arm which controls a transfer contact assembly in the function box. This pair of contacts is used to control the ribbon shift magnet which, in turn, controls the color of the printed character or initiates print suppression (7.26 and 7.28). Current is allowed to pass through the contacts when the no. 6 and 7 bits are opposite polarity, such as no. 6 marking, no. 7 spacing, or no. 6 spacing, no. 7 marking. Current is not allowed to pass when the no. 6 and no. 7 bits are of the same polarity.

5.15 The bellcranks are provided with an arrangement of projections and slots which either block or permit the entrance of a sensing blade. The function box provides slots for up to six sensing blades which can be coded to respond to any of 256 code combinations. Contact assemblies associated with the sensing blades provide a means of supplying a pulse of between 10 and 14 milliseconds for control purposes with external circuitry.



(Left Front View)

Figure 13 - Transfer Mechanism

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 (Figure 8), a clutch trip assembly (Figure 14), and a rocker bail (Figure 15).

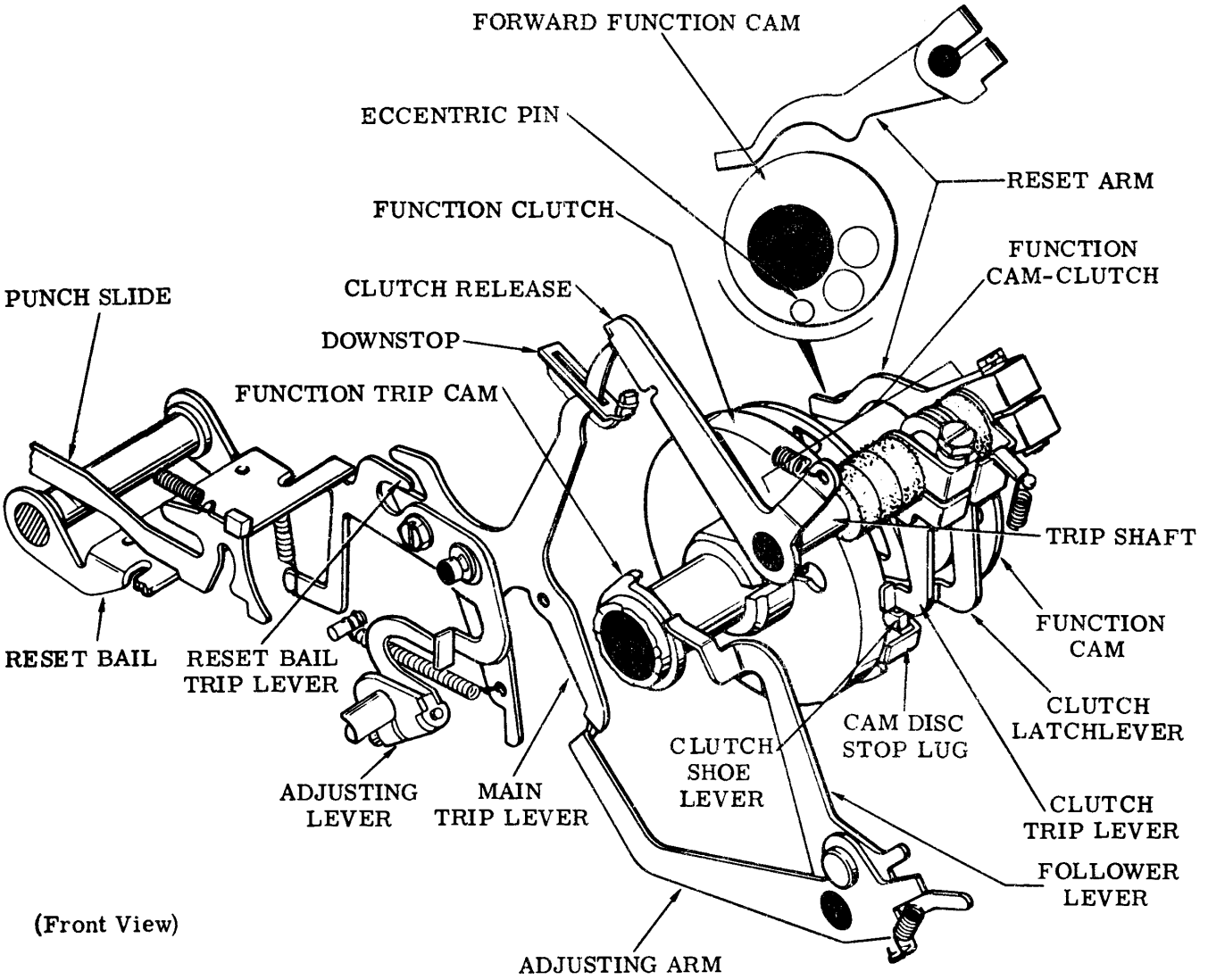


Figure 14 - Function Cam-Clutch and Clutch Trip Assembly

FUNCTION CAM-CLUTCH AND CLUTCH TRIP ASSEMBLY (Figure 14)

6.02 The trip assembly is shown in its unoperated condition in Figure 14. A follower lever rides on a function trip cam which is part of the selecting cam-clutch (Figure 8). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever (Figure 14) which, through an attached adjusting arm, rotates a main trip lever counterclockwise. A reset bail trip lever attached to the main trip lever lowers the perforator reset bail and releases the punch slides (8.02). An upper arm of the main trip lever moves out of the way of a clutch release, which falls against a downstop 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 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 clock-

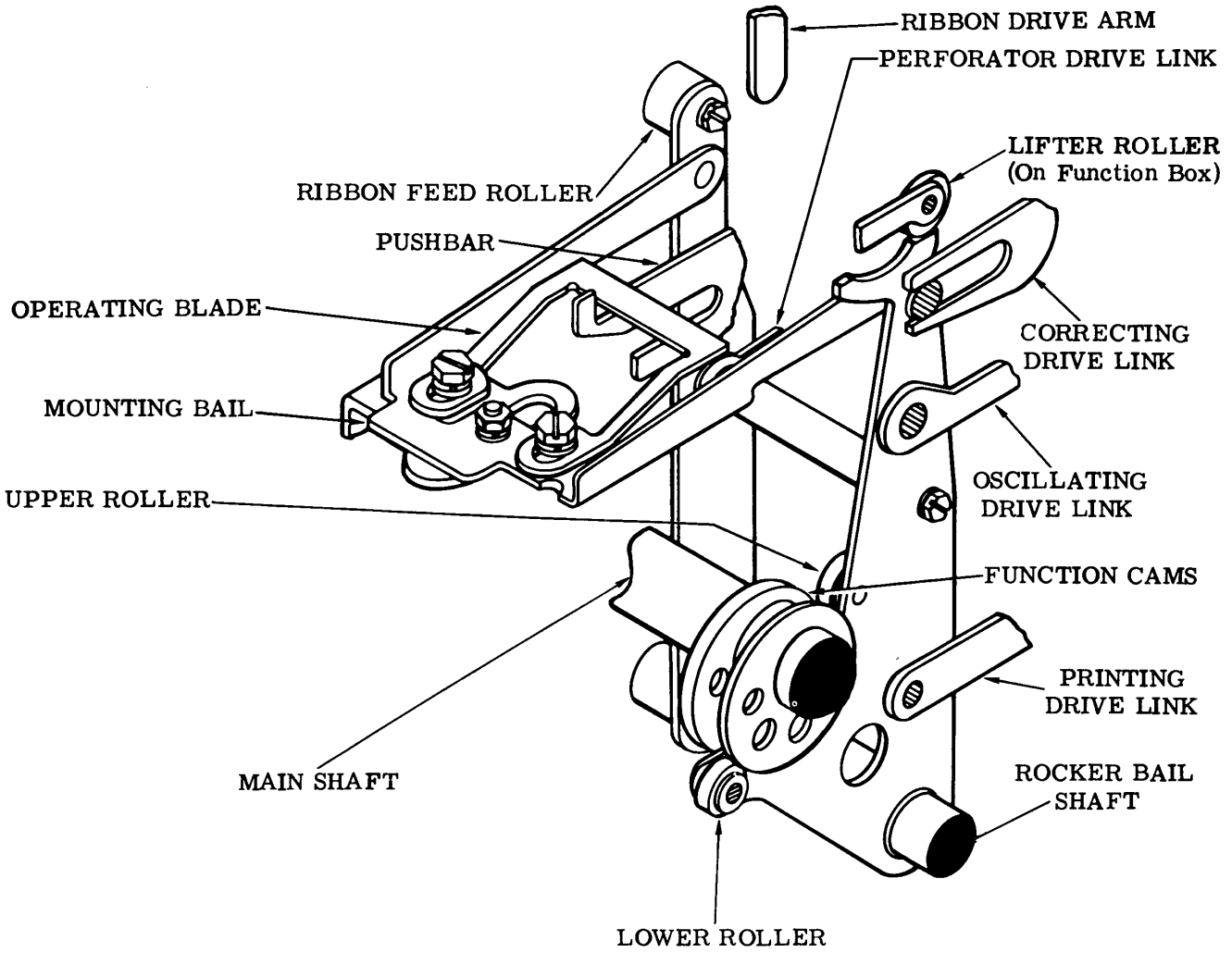


Figure 15 - Rocker Bail Assembly

wise. 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 (Figure 15)

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.

(c) Correcting mechanism.

(d) Function box.

(e) Printing mechanism.

(f) Oscillating assembly.

(g) Pushbars of the axial and rotary positioning mechanisms.

The bail is shown in its home position in Figure 15. 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 Figure 15) 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 type wheel (Figure 16). During the function cycle, the axial and rotary positioning mechanisms (Figures 17 and 19), having received the intelligence from the transfer mechanism, position the wheel so that the character represented by the received code combination is selected. Following type wheel positioning, the correcting mechanism (Figures 17 and 19) accurately aligns the selected character. Then the printing mechanism (Figure 21), by means of a hammer, drives the tape and inked ribbon against the wheel and imprints the character. A ribbon feed mechanism (Figure 22) 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 type wheel and a ribbon guide. On units equipped with the last character visibility feature, the forward portion of the ribbon is used for printing. When the type wheel and ribbon guide retract, 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 (Figure 20) to operate and cause the rotary positioning mechanism to shift the type wheel.

TYPE WHEEL POSITIONING

A. General

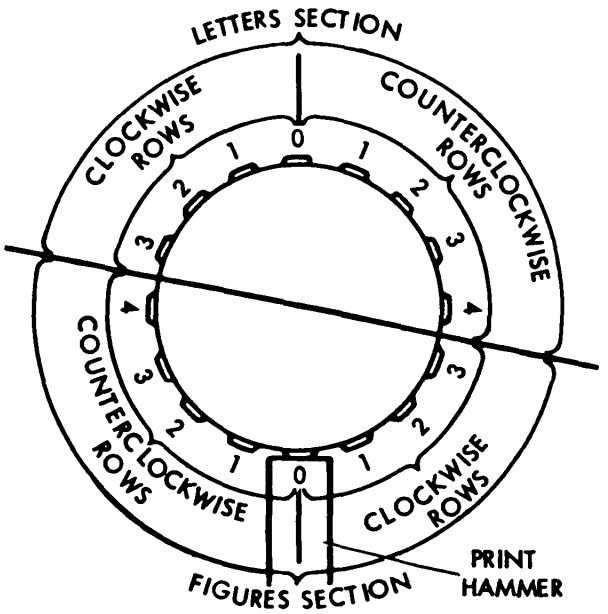
7.02 A typical type wheel character arrangement is shown in Figure 16. The cylindrical surface of the wheel is shown rolled out into a plane. There are 16 longitudinal rows, each of which is made up of four characters numbered 0 to 4 from front to rear. The surface is divided into two sections, a letters 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 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 type wheel in the home position of the section containing the character to be printed, ie, 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 it 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 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 proper character in the row. Rotation of the type wheel to print in either the letters or the figures section is controlled by the no. 7 bit of the code.

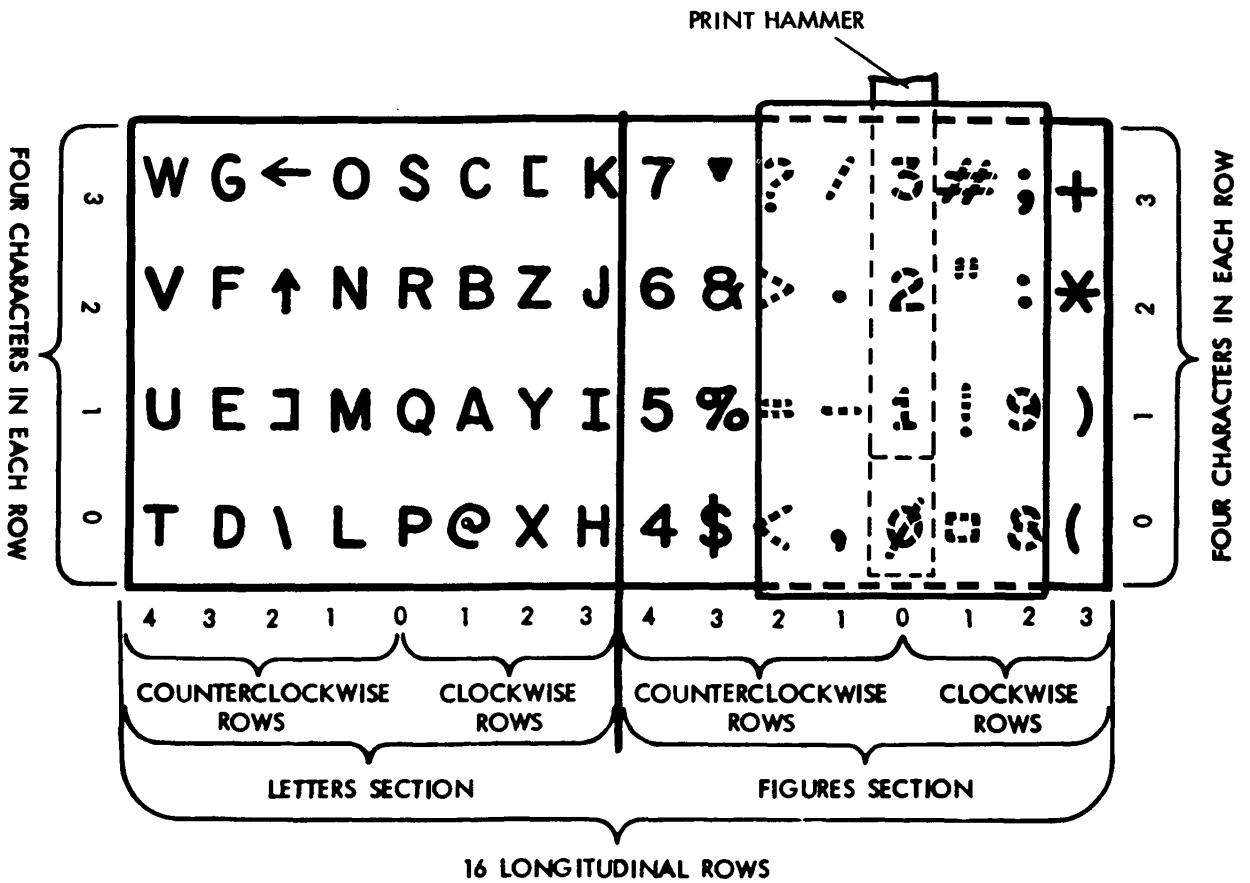
7.04 To illustrate the above, if the wheel is in the figures condition, as shown in Figure 16, and the numeral "0" is to be printed, there is no movement of the wheel during the printing operation, because "0" is already at the point of contact of the hammer. However, if the letter "F" is to be printed, the wheel is first shifted 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 "F" 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 (Figures 17 and 18)

7.05 The rotary positioning mechanism revolves the type wheel 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 Figures 17 and 18. 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



FRONT VIEW SHOWING 16 LONGITUDINAL ROWS



TOP VIEW SHOWING CYLINDRICAL SURFACE IN A PLANE

Figure 16 - Typical Type Wheel Character Arrangement

eccentric, referred to as the rear eccentric. A portion of the secondary shaft is also a pinion, and a crank pin mounted on its disc-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 a pushbar: the no. 3 bar engages the right front pinion, the no. 4 engages the left rear pinion, and the no. 5 engages the right rear pinion. The left front pinion is engaged by both the letters and the figures pushbar.

7.06 The eccentric assemblies are linked to a type wheel shaft by a drive assembly as shown in Figure 17. The type wheel is secured to the front of the shaft which is supported by a bearing housing mounted at the left rear of the front plate (Figure 19). A spur gear which meshes with a type wheel 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 bit a pushbar is lifted by its bellcrank, as described in 5.13, the rocker bail operating blade (Figures 15 and 18) engages a slot in the bar and moves it to the left during the first part of the

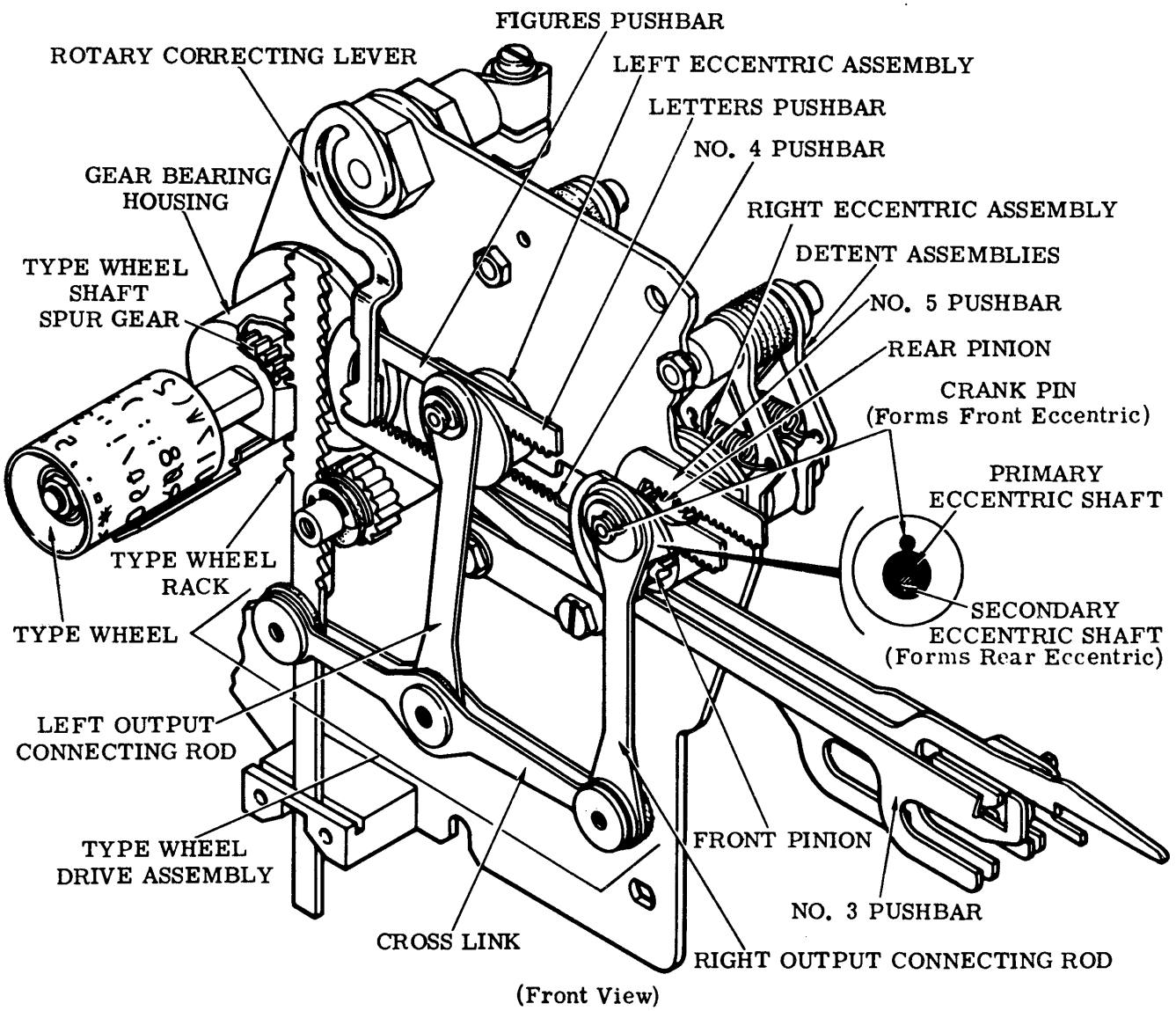


Figure 17 - Rotary Positioning Mechanism

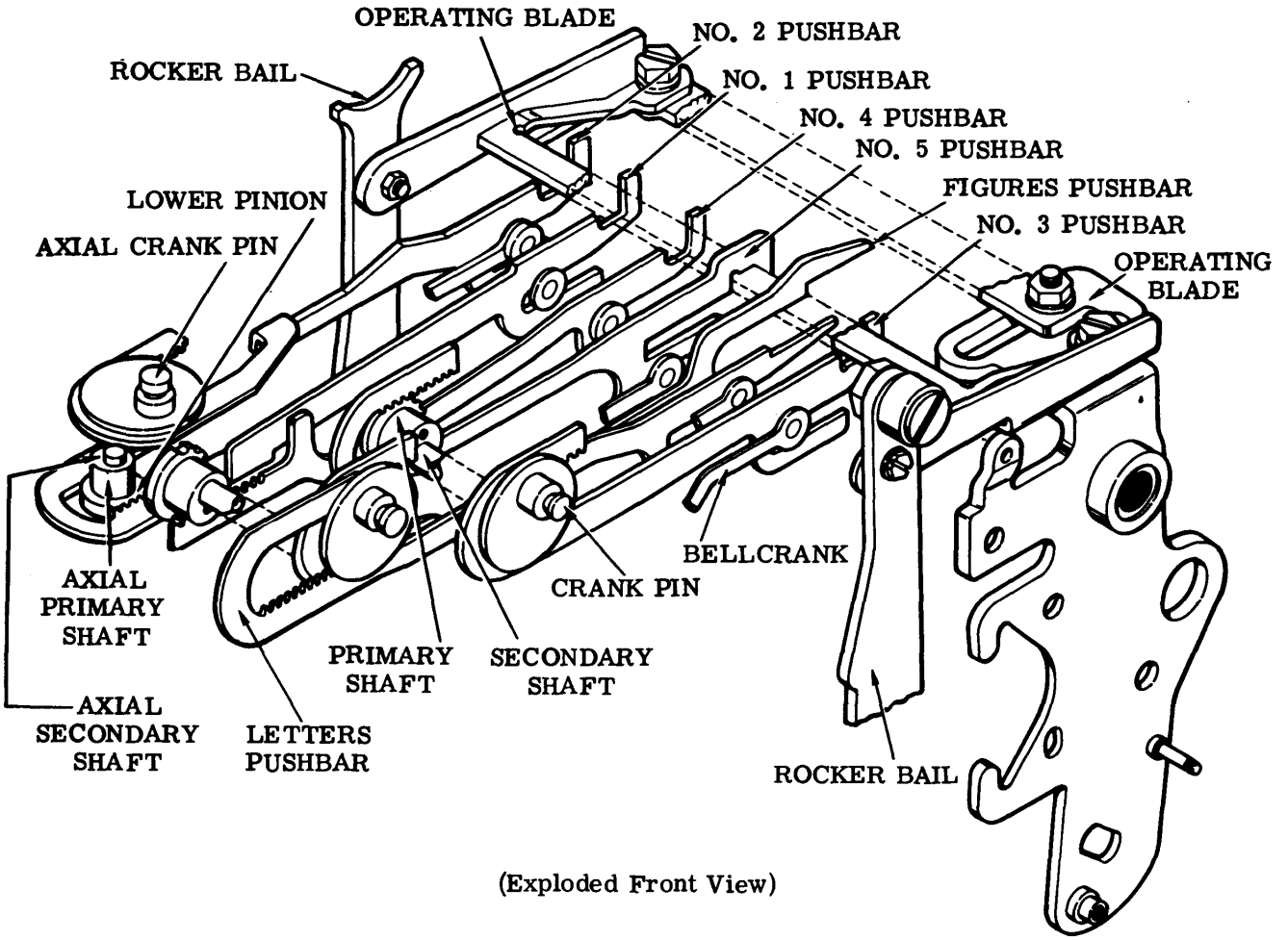


Figure 18 - Pushbars and Eccentric Assemblies

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. 7 pushbar, covered in 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 the front eccentric is up (Figure 18). 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 type wheel 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

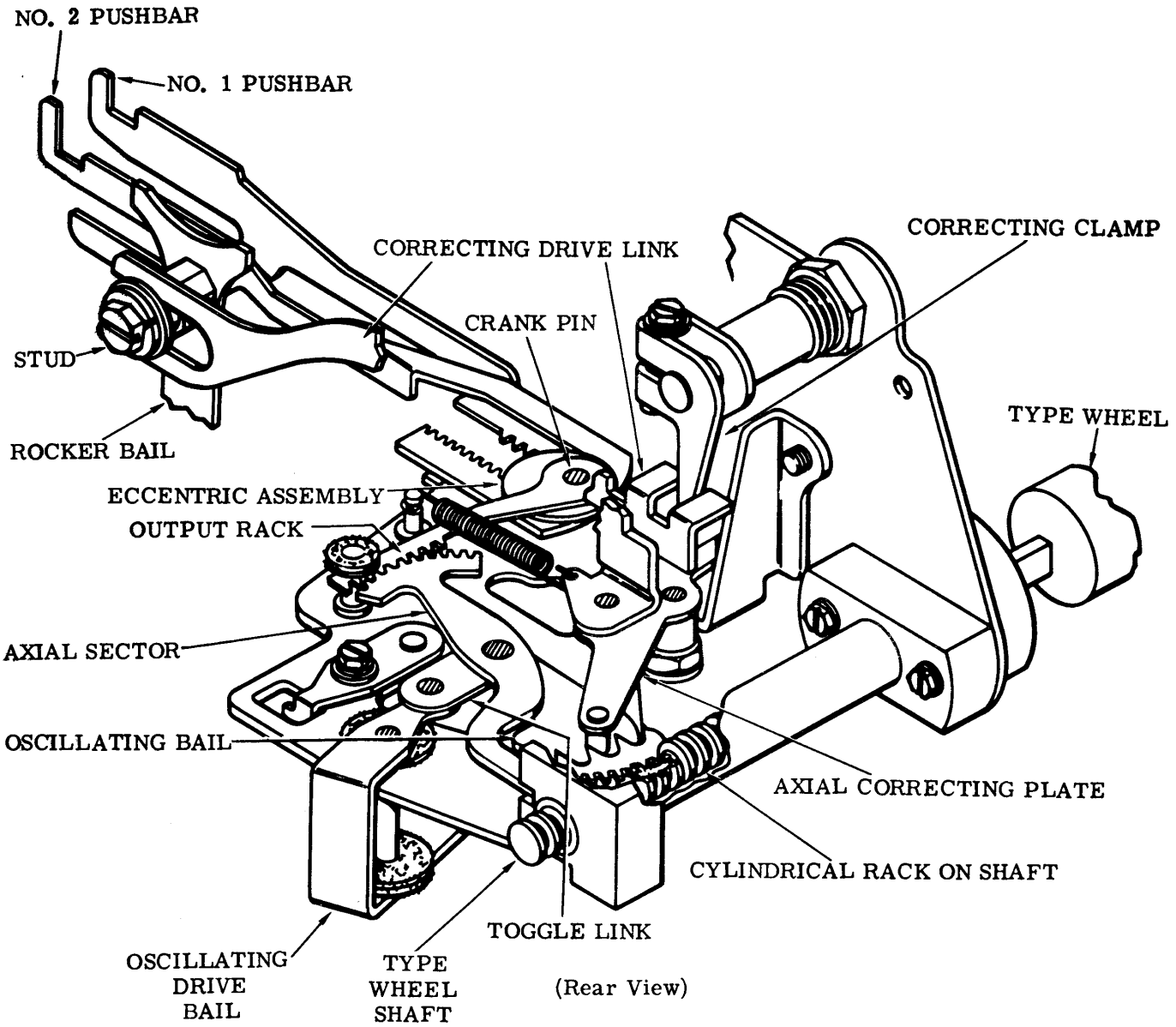


Figure 19. Axial Positioning Mechanism

is transferred through a right output connecting rod to the right end of a cross link (Figure 17). The cross link pivots about a left output connecting rod and at its left end imparts one unit of downward displacement to the type wheel rack. The rack rotates the spur gear, shaft, and type wheel one row of characters clockwise from the home position, and the no. 1 clockwise row (Figure 16) is presented to the print hammer at the time of printing. On its right stroke the no. 5 pushbar returns the eccentric and the type wheel 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 type wheel; and selection of both the three and five bars results in a three-row, counterclockwise rotation of the type wheel.

7.09 The home position of the left rear eccentric is up, and any displacement appearing in the left assembly is transferred to the type wheel rack in double quantity in the same direction. When the no. 4 pushbar is selected, the left rear eccentric is displaced one unit downward. This movement is conveyed through the

midpoint 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 type wheel rack which rotates the type wheel two rows clockwise from its home position.

7.10 When both eccentric assemblies are displaced, the motion occuring in the type wheel 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 type wheel. 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 three eccentrics, making it possible to select any of the eight rows in a given section (Figure 16).

C. Axial Positioning (Figures 18, 19, and 21)

7.11 The functions of the axial positioning mechanism are to position the type wheel so that the proper character in the selected row is aligned with the hammer at the time of printing and to retract the type wheel and ribbon guide at the end of the function cycle. 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 (Figures 18 and 19). 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 type wheel shaft by an axial output rack and sector as shown in Figure 19.

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 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 (Figure 16). 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 type wheel shaft, moves the type wheel one character forward from its home position. The no. 1 character is printed, and when the pushbar reverts to its unselected position it returns the axial linkage and type wheel to their home position. If the no. 2 pushbar is selected, the no. 2 character is printed, and if both pushbars 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 (Figures 19 and 21). 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 forepart of the function cycle, if no axial pushbar 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 type wheel 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 (Figure 21).

D. Position Correction (Figures 17 and 19)

7.15 After the type wheel 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 (Figure 19). The shaft pivots a rotary correcting lever (Figure 17) which is

equipped with an indentation that engages a tooth in a type wheel rack. There is a tooth in the rack for each row of characters (16 in all), and they are so correlated with the type wheel 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 above), and a roller mounted on the plate engages a notch in the axial sector (Figure 19). Thus, the type wheel 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 pushbars 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 type wheel 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. Type Wheel Shift (Figures 17 and 20)

7.17 The type wheel shift from the letters to the figures printing segment (or figures to letters) is controlled by the no. 7 selector pushlever, through an associated train of levers in the transfer mechanism, and two pushbars which engage a common pinion. The pushbars are connected to a common bellcrank which is, in turn, controlled by the no. 7 pulse beam and transfer lever.

7.18 To shift the type wheel from the figures section to the letters section, a marking no. 7 bit must be received by the unit. This will cause the no. 7 punch slide to be selected and move to the left (5.08). As the no. 7 punch slide moves left, it rotates its associated transfer lever counterclockwise which, in turn, pivots the no. 7 pulse beam clockwise. This allows the associated bellcrank to rotate counterclockwise, under spring tension, and lift the letters-figures pushbars until the step on the end of the letters pushbar is raised to a height which will bring it into engagement with the rocker bail operating blade, when the blade moves to the left (6.04). The operating blade simultaneously pushes the letters pushbar to the left and the figures pushbar to the right, resulting in rotation of the type wheel to the letters section. As long as the no. 7 bit is marking, the letters pushbar will remain in this left-most position.

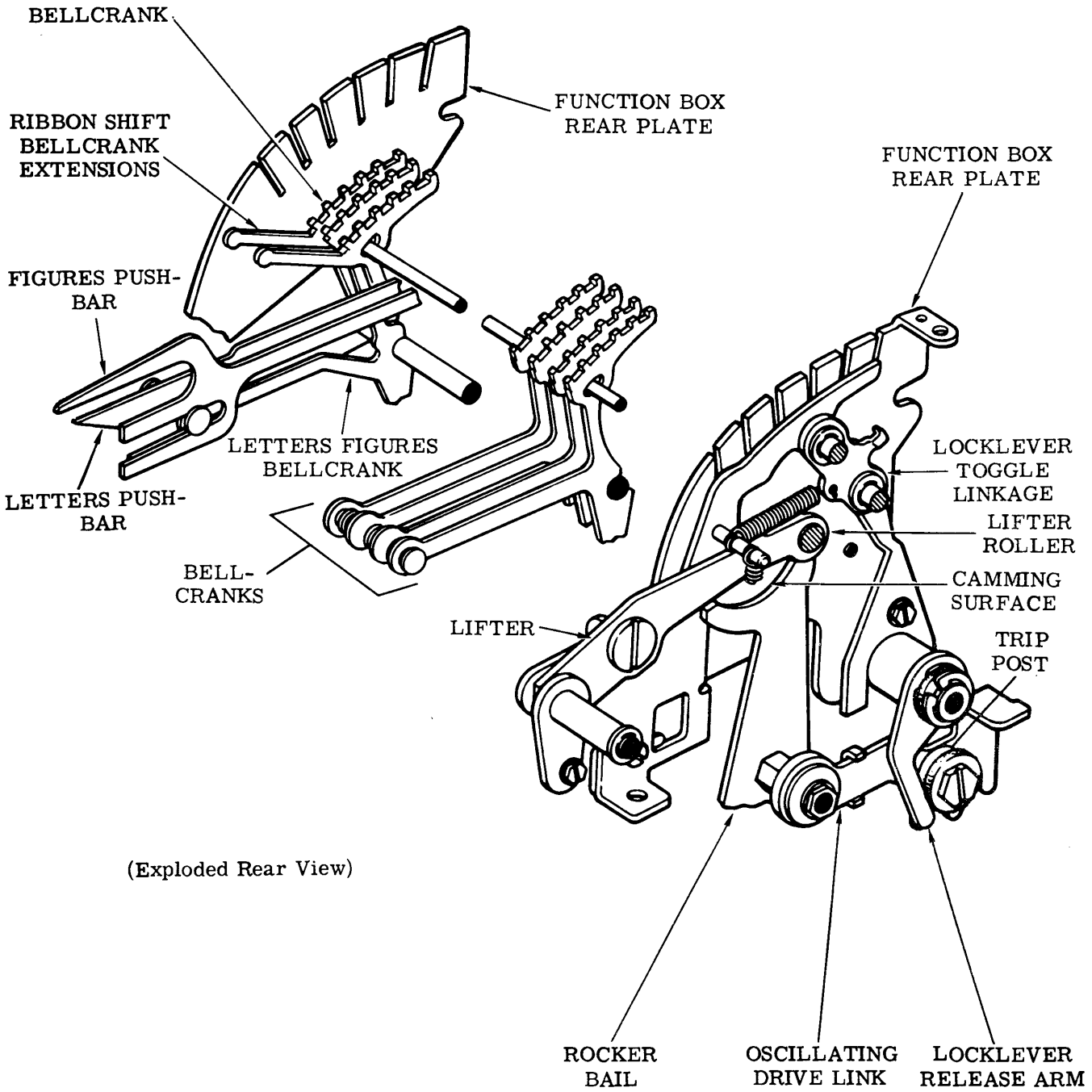
7.19 When the no. 7 bit changes from marking to spacing, the punch slide will remain unselected, and the pushbars will not be lifted by the bellcrank transfer lever linkage. The figures pushbar, which is furthest to the right, will then be in such a position that the step on its end extension will be engaged (and pushed) by the rocker bail operating blade as the blade moves to the left, resulting in rotation of the type wheel to the figures position. As the figures pushbar moves left, the letters pushbar simultaneously moves to the right.

7.20 As long as the no. 7 bit is spacing, the letters-figures pushbars will not be lifted and, therefore, the letters pushbar will not be moved to the left (7.18). The type wheel will shift back to the letters section only upon receipt of a no. 7 marking bit by the reperforator.

PRINTING (Figure 21)

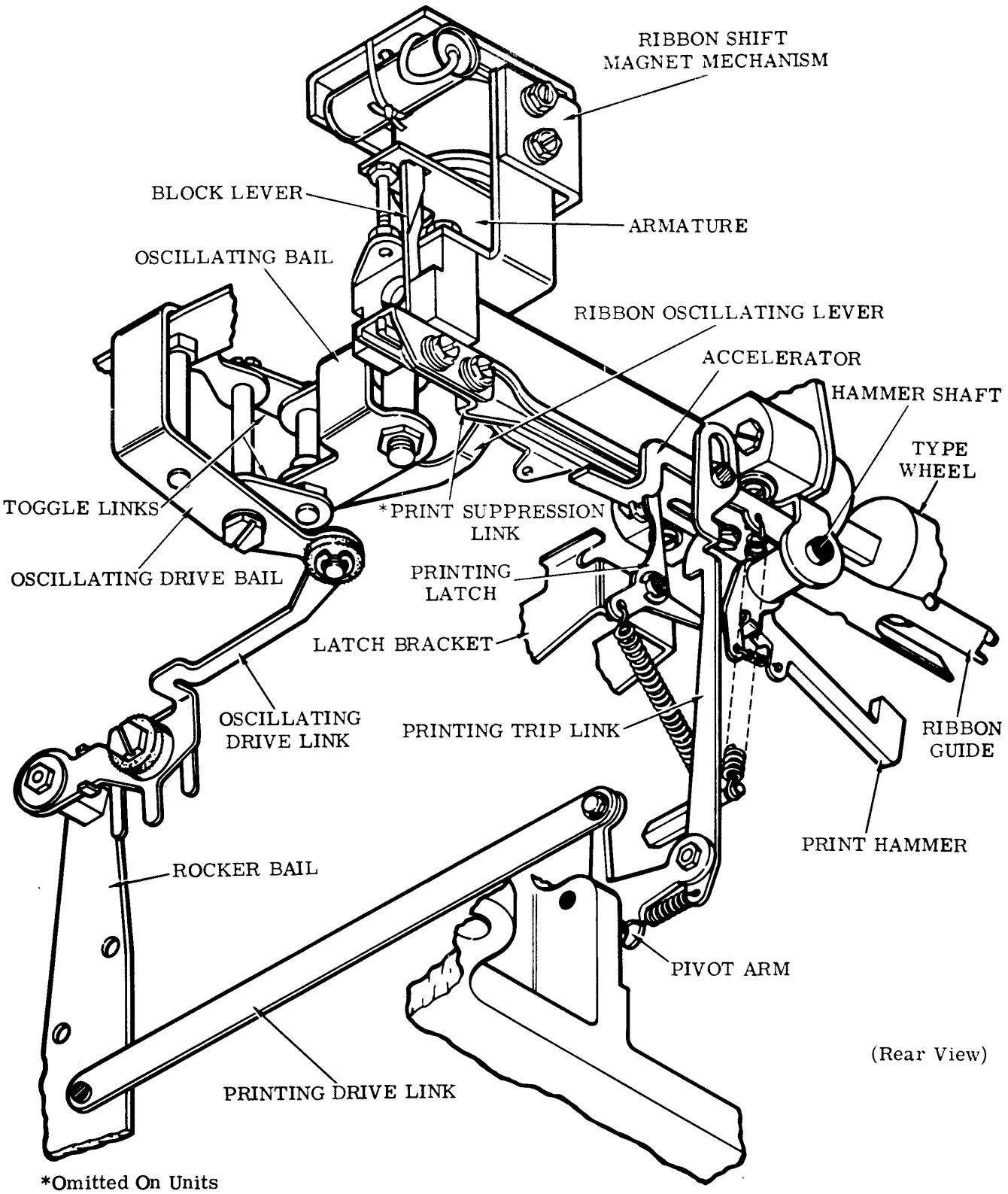
7.21 After the type wheel has been positioned and corrected, the printing mechanism supplies the impact which drives the paper and ribbon against the selected character. It effects this operation by means of a print hammer which is mounted on a shaft supported by a bracket attached to the type wheel bearing housing. In its unoperated condition, as illustrated in Figure 21, 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 forepart of the function cycle, moves a printing drive link to the right (as viewed from the rear in Figure 21) 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 type wheel and imprints the selected character on the



(Exploded Rear View)

Figure 20 - Function Box



*Omitted On Units
With One Color Ribbons.

Figure 21 - Printing Mechanism

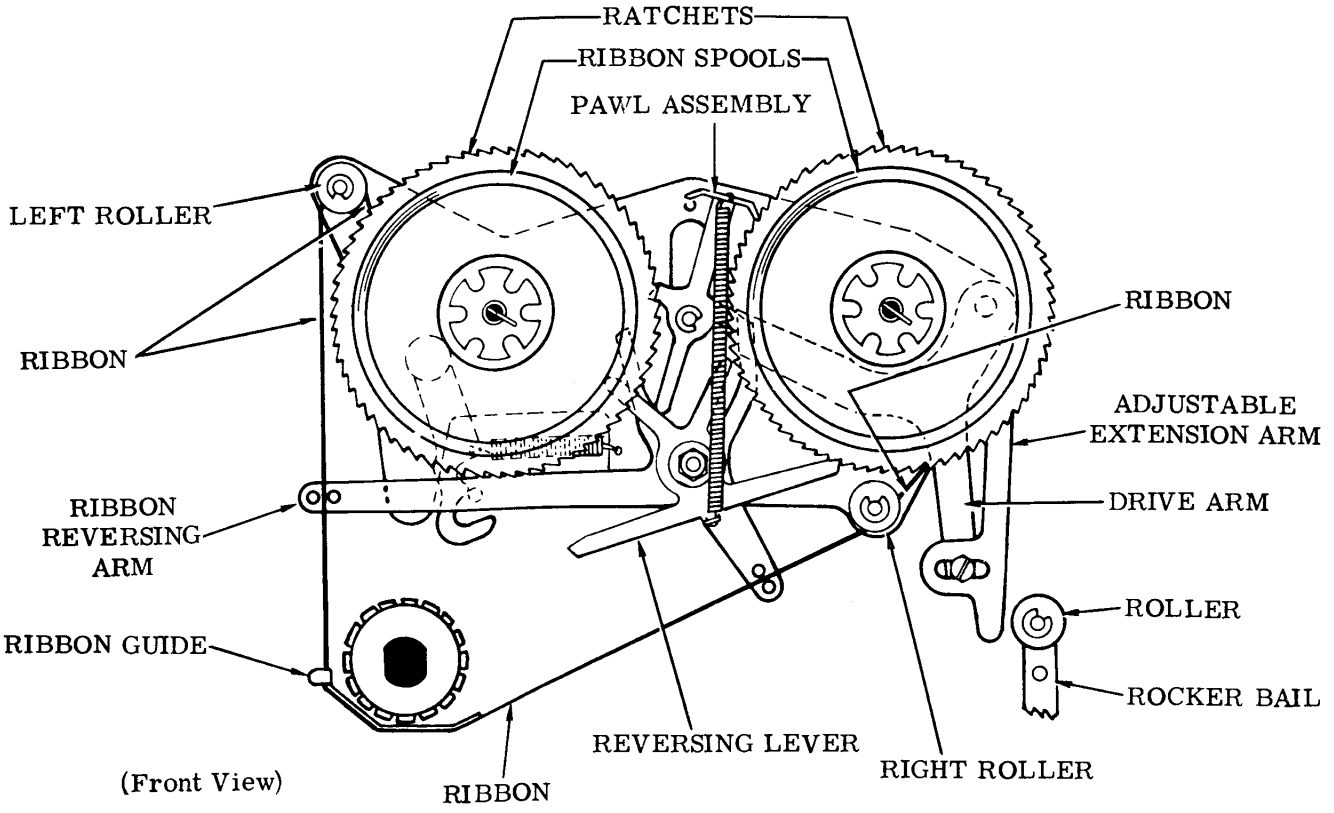


Figure 22 - Ribbon Feed Mechanism

tape. 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 (Figure 22)

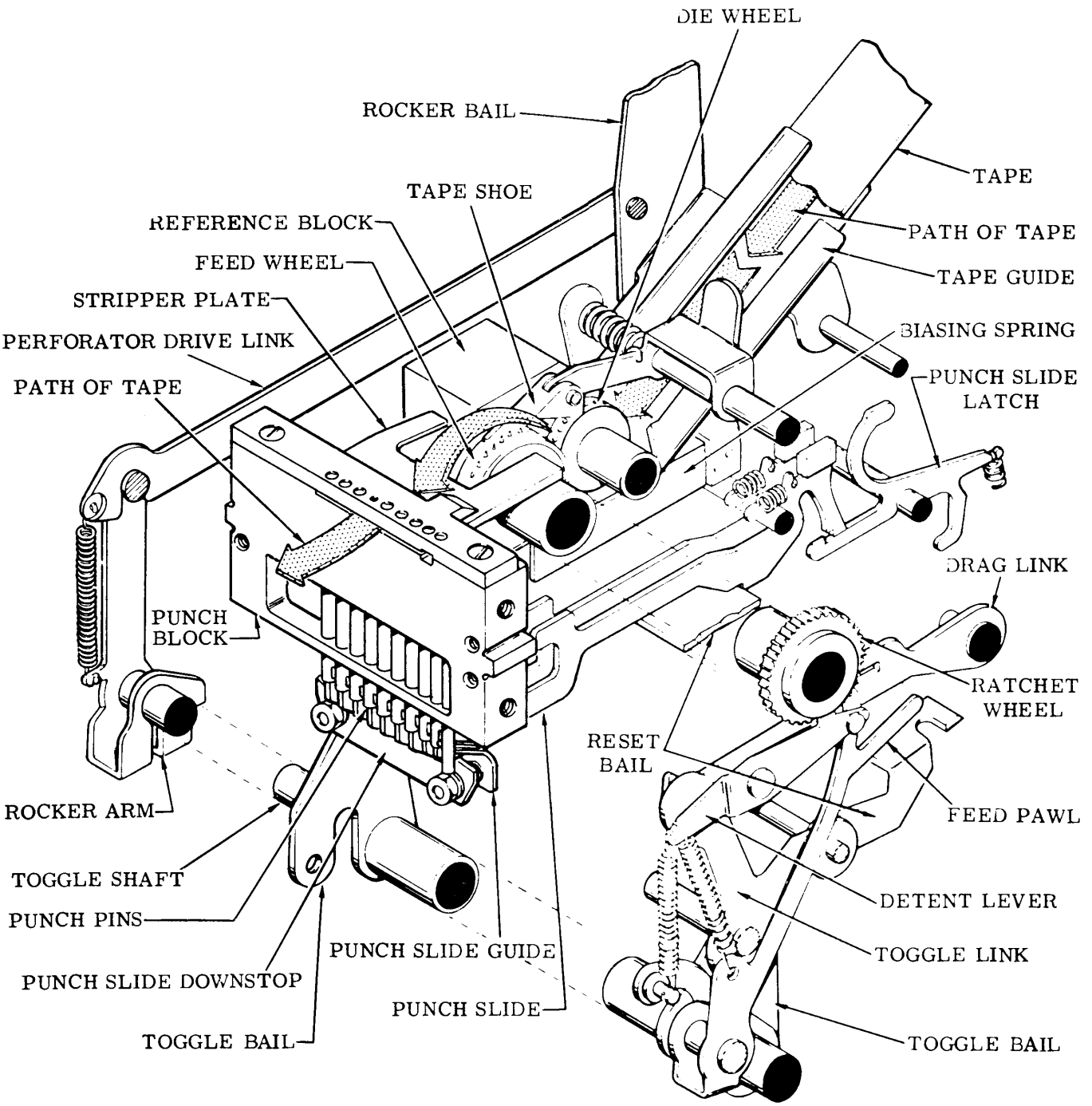
7.23 The characters are typed in ink supplied by the inked ribbon which is held between the tape and the type wheel by a guide and advanced by the ribbon feed mechanism (Figure 22). The path of the ribbon is down to the right off the top of a right spool, under a right roller, through the guide, up through 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.

RIBBON SHIFT MECHANISM (Figure 21)

7.26 On units designed for two color printing, as the ribbon carrier drive arm is driven by the motion of the axial oscillator lever, the ribbon carrier follows by the action of a spring.



(Left Front Exploded View)

Figure 23 - Perforating Mechanism

When the ribbon color shift magnet is energized and its armature attracted, a blocking lever is removed from the path of the ribbon carrier placing the black portion of the red-black ribbon over the print hammer. If, on the other hand, the ribbon shift magnet is not energized, the blocking lever blocks the ribbon carrier which leaves the red portion of the red-black ribbon over the print hammer resulting in a red character.

7.27 When the no. 6 and 7 signal bits are the same, both marking or both spacing, the ribbon shift magnet is de-energized, and a red character is printed. If, however, the no. 6 and 7 bits are different, one marking, the other spacing, the ribbon shift magnet is energized, and a black character will be printed.

PRINT SUPPRESSION MECHANISM

7.28 Manual and automatic print suppression operate similarly to block the movement of the print hammer and prevent contact between the tape, inked ribbon, and type wheel. Manually controlled suppression operates through a lever extending from the front of the reperforator at the base of the punch pins.

7.29 Manual print suppression is accomplished by raising the NO PRINT lever at the front of the typing reperforator. This rotates a blocking extension across the top of the print hammer, preventing all printing, regardless of the input code.

7.30 Automatic printing suppression (Figure 21) is a function controlled by the ribbon shift mechanism and is used by typing reperforators with one color ribbons. Automatic printing suppression is operative on control function code combinations. An accelerator blocking link, attached to the ribbon carrier, prevents the print hammer accelerator from rotating downward when the release latch is disengaged. As a result, printing is suppressed whenever a no-current condition keeps the ribbon shift blocking link engaged with the ribbon carrier.

8. TAPE PERFORATING AND FEEDING (Figure 23)

GENERAL

8.01 The perforating mechanism rolls the tape between a feed wheel and a die wheel, which does not perforate the feed hole but merely regulates the amount of tape feed. The punch perforates round holes corresponding to the code combination received from the signal line and perforates a smaller feed hole positioned between the third and fourth intelligence levels. Intelligence is received from the selecting mechanism by the punch slides, which select the proper punch pins in a punch block assembly (Figure 23). Motion from the rocker bail is distributed to the pins and the tape feed 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

8.02 As described in 6.02, near the end of the selecting cycle, the reset bail is lowered and releases the eight punch slides (Figure 13). 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 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.

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, both up and down. The punch pins are positively driven and retracted, to produce the fully perforated tape.

8.04 A chad chute, mounted on the reperforator punch block, mates with a chute on the mounting base. The chutes carry chad punched from the tape into a chad container on the tape handling stand. Refer to the appropriate section for a detailed discussion of the chad storing mechanisms.

FEEDING

8.05 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 (Figure 23). A feed pawl, driven by the toggle bail, acts upon a ratchet and rotates the feed wheel which, by means of sharp 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 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 biasing spring holds it back against a reference block, so that the feed holes are punched a constant distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block, where it is perforated, and finally emerges at the left.

8.06 The slack tape mechanism (Figure 2) is driven by the rocker bail of the perforator or reperforator. As the rocker bail moves toward the left, it rotates the tape depressor in a clockwise direction. When the tape depressor rotates, it pushes the tape down between the end of the tape platform and a post, causing a loop of tape to be formed. Since the tape is prevented from moving in a direction opposite to that of the tape feeding by the wedging action of a clamp plate, mounted on a post located between the loop and feed wheel, the loop of slack tape is formed

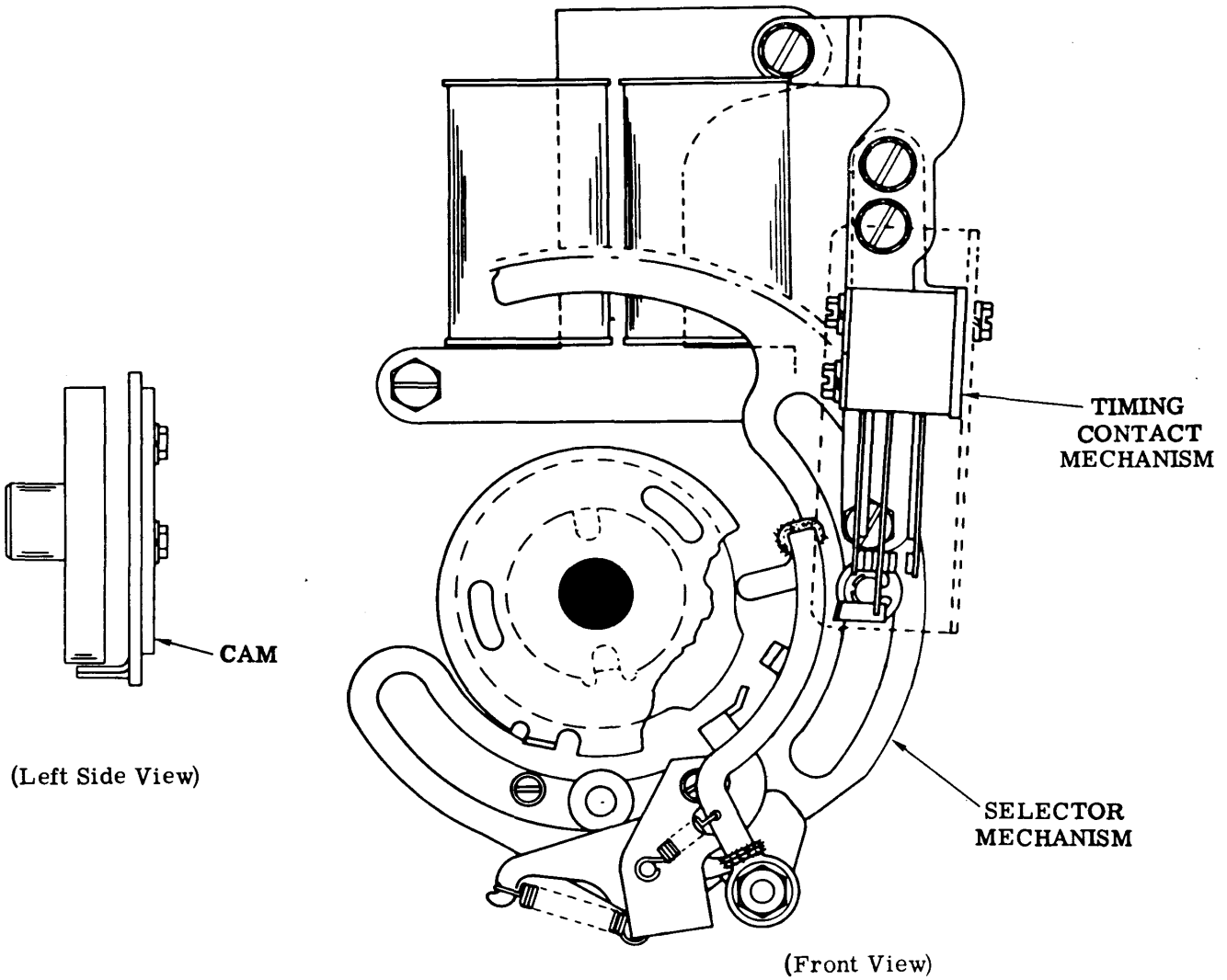


Figure 24 - Selector Magnet Timing Contacts

only from the tape pulled from the roll of tape. When the rocker bail moves back toward the right, the tape depressor is rotated in a counterclockwise direction, leaving a loop of load-free tape for the punch to feed.

9. VARIABLE FEATURES

CONTACT ASSEMBLIES

A. Selector Mechanism Timing Contacts (Figure 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.

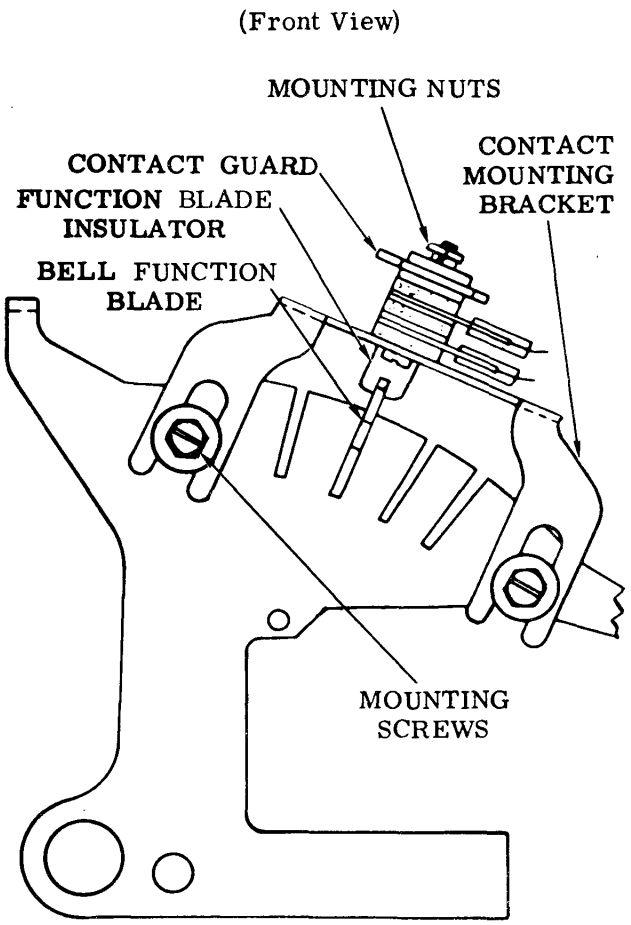


Figure 25 - Signal Bell Contacts

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 pushbar. 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 pushbar 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.

C. Signal Bell Contacts (Figure 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 is received at the selector mechanism, the bellcranks rotate in response to the marking and spacing bits. The slotted arms at the top of the bellcrank 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 bellcrank blocks the signal bell function blade.

D. End of Feed-Out Timing Contacts

9.06 Used in conjunction with the noninterfering rubout (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 (Figure 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.

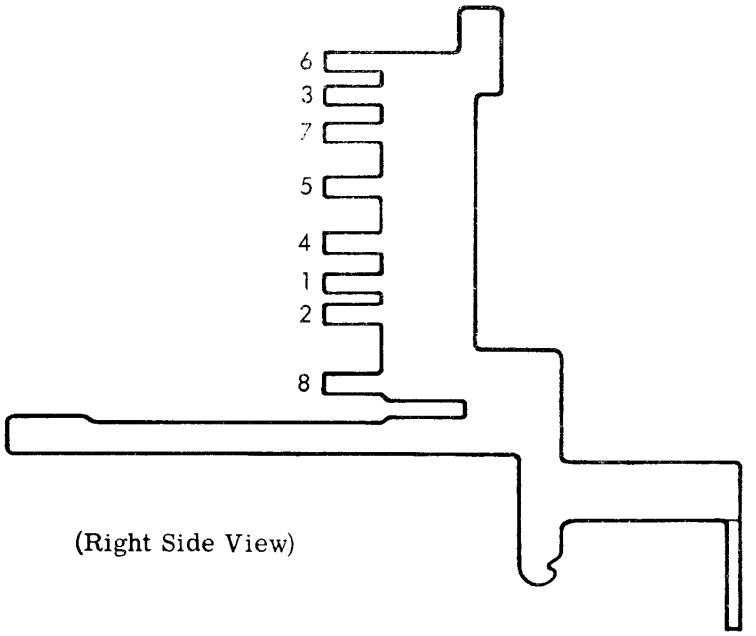


Figure 26 - Universal Function Blade

E. Code Reading Contacts

9.07 Consisting of a bank of eight 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 eight elements. Either transfer or make contacts are available. Applications include error checking and parallel code input.

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 acutated by bails which receive motion from the typing reperforator function cam.

UNIVERSAL FUNCTION BLADE (Figure 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.

INTERFERING RUBOUT TAPE FEED-OUT

A. General

9.10 This feature enables the typing reperforator to step out tape containing successive rubout 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 energizing a solenoid. Rubout 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 cannot be received during the feed-out period. The mechanism is shown operated in Figure 27.

B. Initiation

9.11 When the typing reperforator is in the idling condition, the selector magnet is energized and the start lever is blocked as shown in Figure 8. Feed-out is initiated by moving a hand lever to the left (Figure 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,

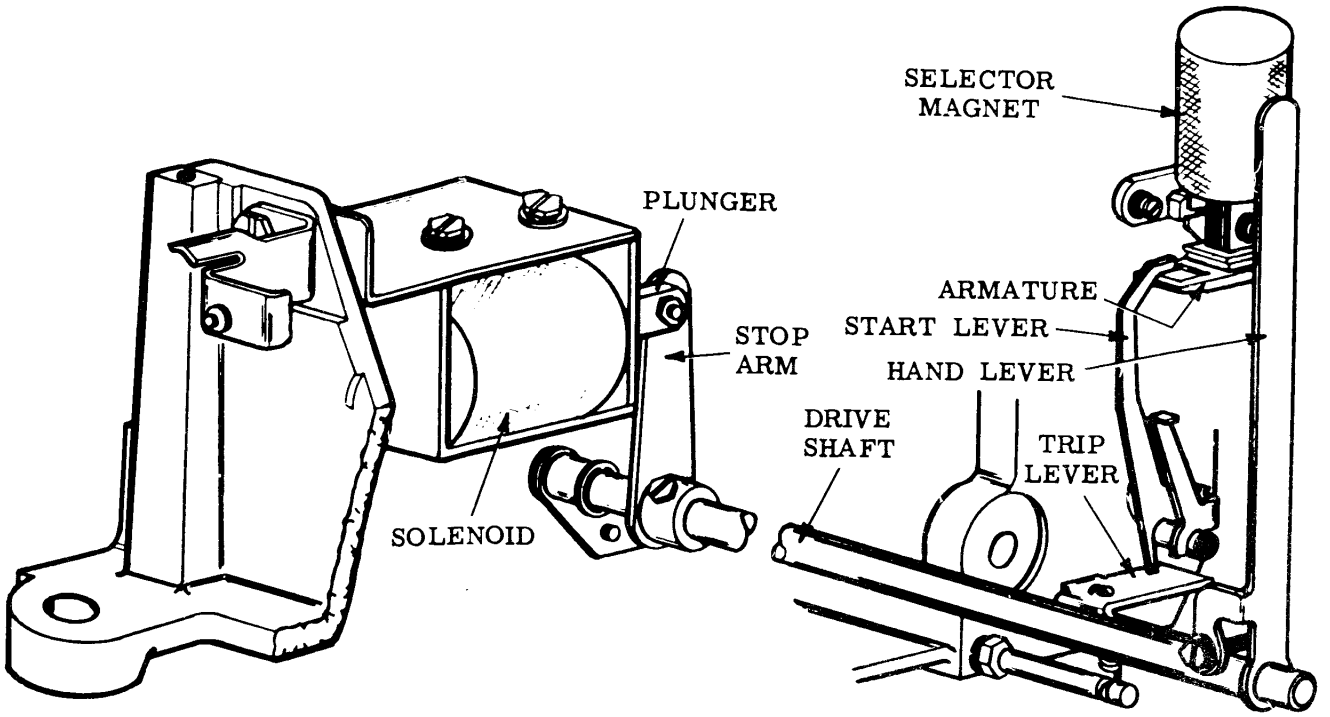


Figure 27 - Manual Interfering Rubout Tape Feed-Out Mechanism

it is equivalent to all intelligence bits of the signaling code marking. As a result, the rubout symbols are printed, the rubout code combination (12345678) 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

9.12 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

9.13 By the use of an additional set of parts, the rubout feed-out operation can be initiated by an electrical pulse from an external source. When the solenoid (Figure 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 9.11. Feed-out will continue until the solenoid is de-energized at which time the plunger moves back to the right, the start lever is lowered and feed-out is terminated as described in 9.12.

REMOTE CONTROL NONINTERFERING BLANK TAPE FEED-OUT (Figure 28)

A. General

9.14 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 nonrepeat 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.

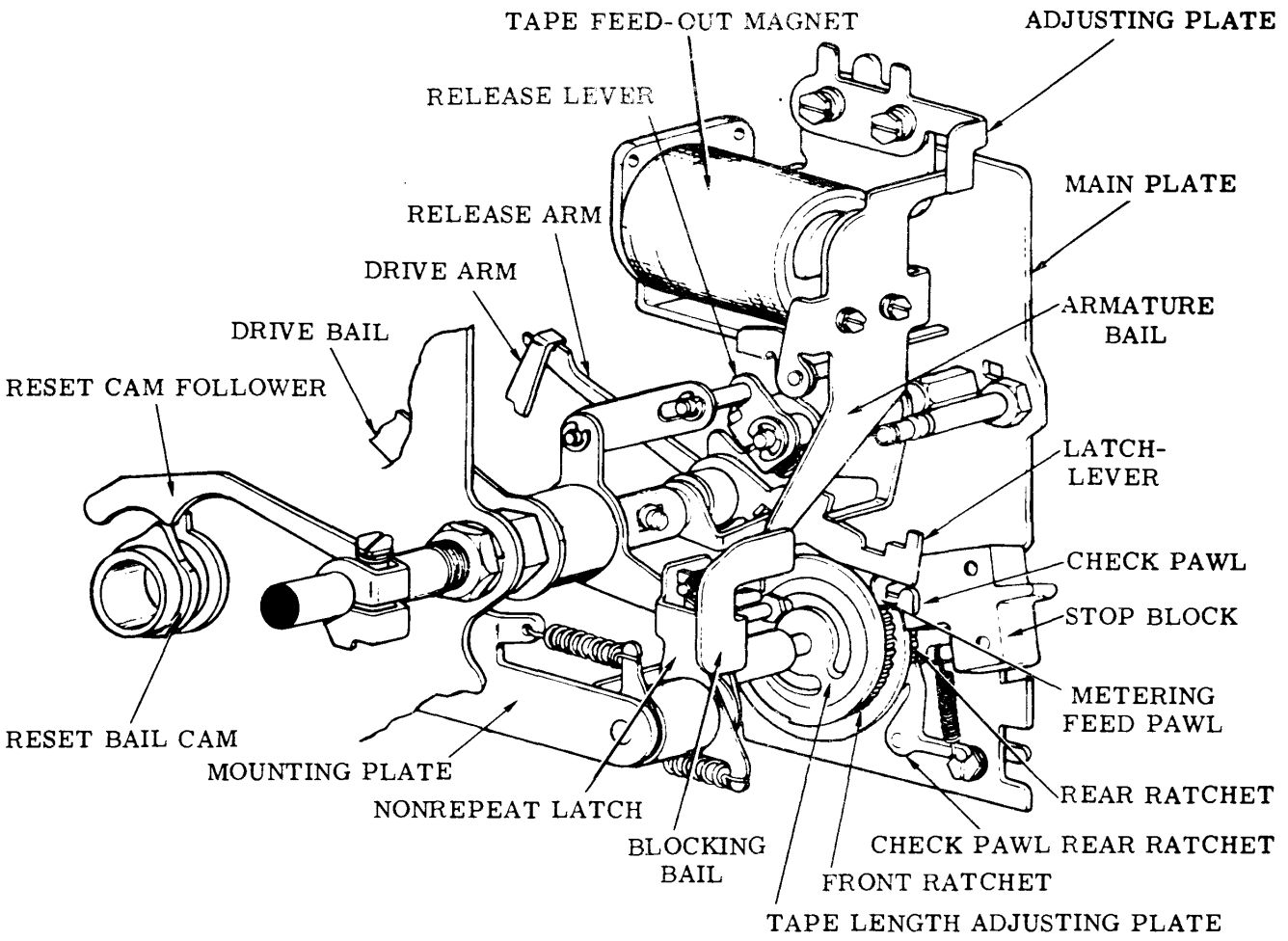


Figure 28 - Remote Control Noninterfering Rubout Tape Feed-Out Mechanism

B. Initiation

9.15 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 latchlever. The nonrepeat 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 nonrepeat 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 nonrepeat latch. The drive bail then reaches the high part of its cam and the nonrepeat 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 nonrepeat latch.

C. Metering

9.16 When the drive bail positions the release levers on the lower step of the latchlever as described in 9.15, metering takes place. The release lever has not permitted the check pawl to engage two adjacent ratchets. One of the ratchets is fed continually by the feed pawl. This ratchet 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 latchlever 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

9.17 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 latchlever, as described in 9.16, 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.

9.18 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

9.19 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.

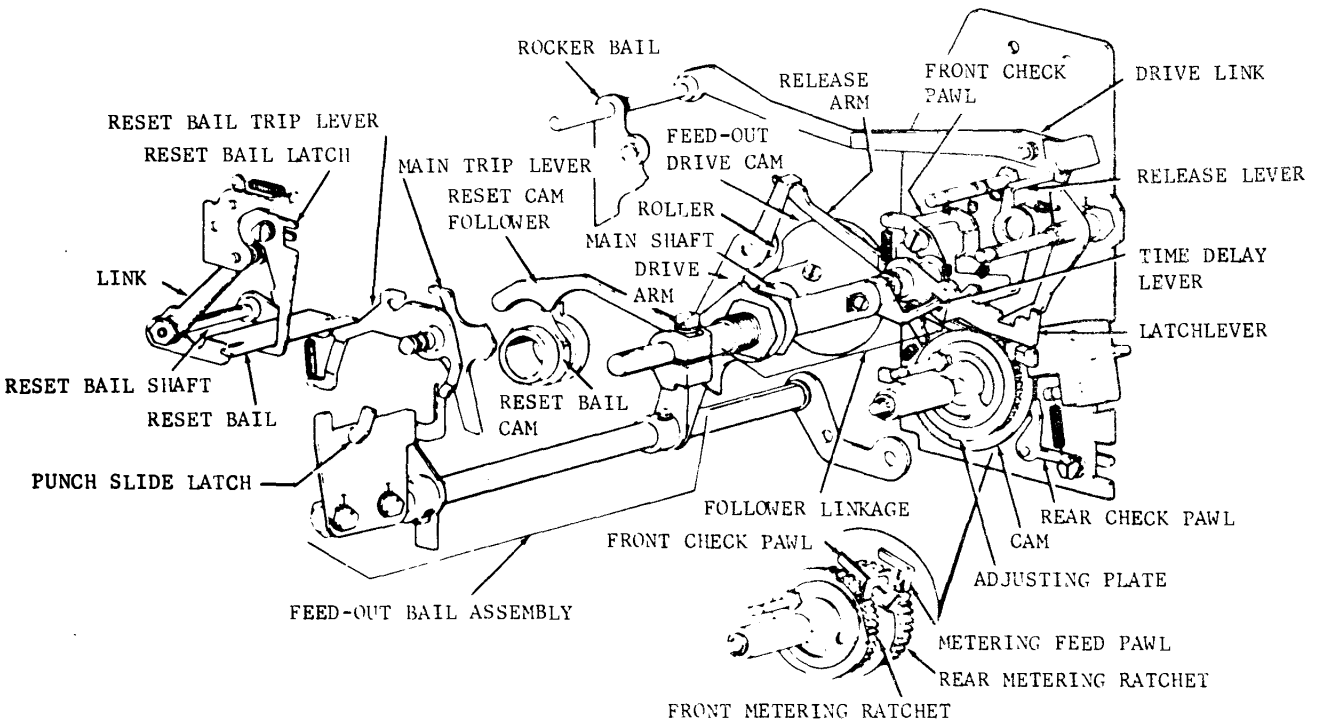


Figure 29 - Automatic Noninterfering Rubout Tape Feed-Out Mechanism

REMOTE CONTROL NONINTERFERING RUBOUT TAPE FEED-OUT (Figure 28)

9.20 The operation of this mechanism is essentially the same as that of the remote-control noninterfering blank tape feed-out mechanism (9.16). This feature, however, does not contain a blocking link on the stripper cam follower shaft (9.17). The tape output, therefore, is perforated in the rubout code combination.

AUTOMATIC NONINTERFERING RUBOUT TAPE FEED-OUT (Figure 29)

A. General

9.21 This feature automatically initiates the feed-out of a predetermined length of rubout 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 0.6 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.

B. Initiation

9.22 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 latchlever 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 at-

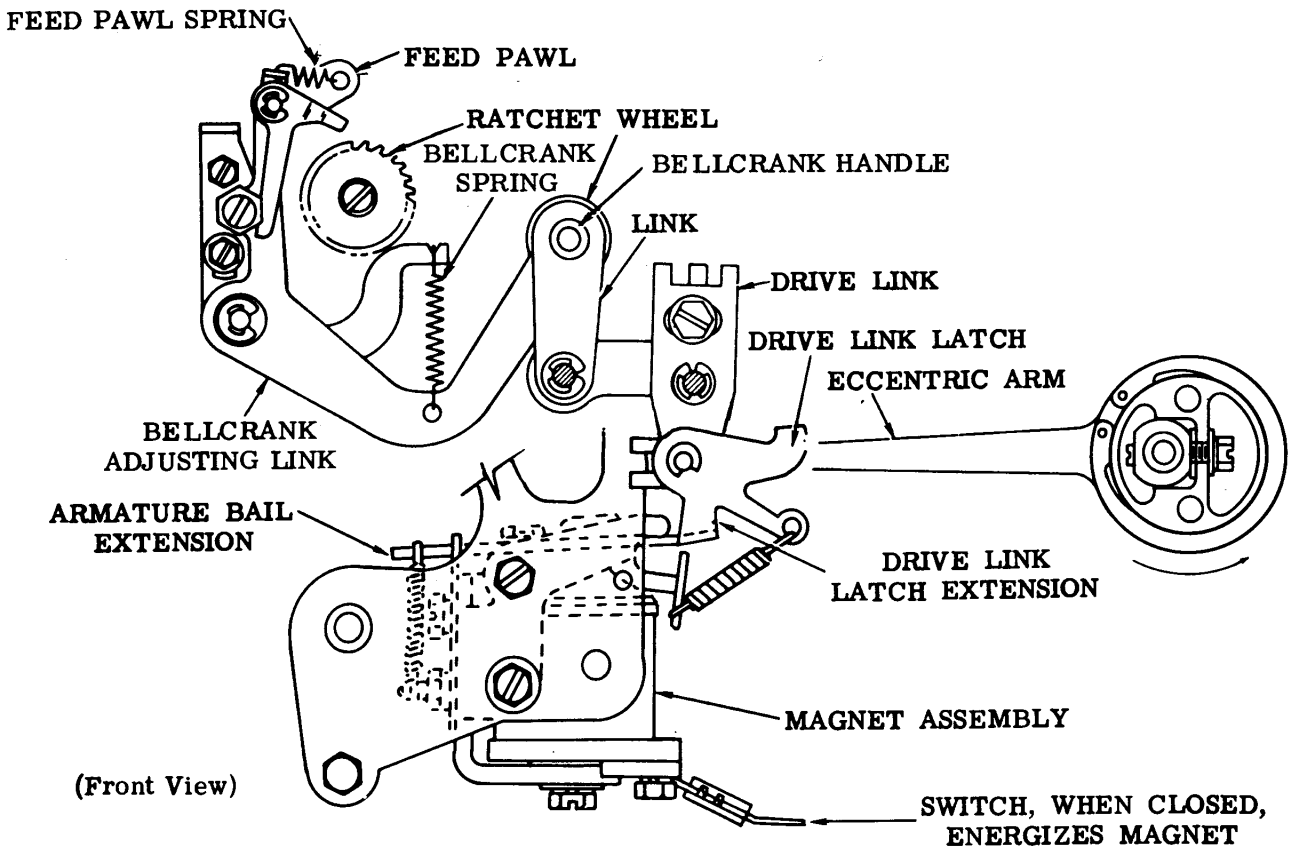


Figure 30 - Backspace Mechanisms

tached drive link rotates the release lever counterclockwise and places the mechanism in its operated condition, as explained in 9.26. Each time a new character is received, the above sequence occurs.

9.23 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

9.24 When the release lever rotates counterclockwise, it lowers a front check pawl onto two metering ratchets. These function as described in 9.22 above.

9.25 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 rubout code combination. Thus, the reperforator feeds out rubout tape in the same manner as if the function clutch and punch slides had been actuated by the selector.

9.26 As the ratchets are rotated as described above, an adjusting plate on the front ratchet reaches the position where it rotates the latchlever clockwise. The latchlever, 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. Noninterference

9.27 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.

9.28 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 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.

BACKSPACE MECHANISMS (Figure 30)

A. General

9.29 The backspace 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 rubout code combination in its place. The backspace mechanism may be operated manually or it may include power drive (Figure 30).

B. Manual Backspace

9.30 Depressing the handle of the backspacing bellcrank disengages the perforator feed pawl from the feed wheel ratchet. The backspacing feed pawl then engages the feed wheel ratchet and rotates the feed wheel clockwise, backspacing the tape to the next row of perforations.

9.31 After the tape has been retracted into the punch block, the set of code holes above the punch pins may be replaced with the rubout code combination (all bits marking).

C. Power Drive Backspace

9.32 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 bellcrank handle to be depressed through a system of linkages between the drive link latch and bellcrank. The subsequent operation is as described in 9.30 and 9.31.