TELETYPE model 28 THE LEADERSHIP LINE

BULLETIN 246B

DESCRIPTION AND PRINCIPLES OF OPERATION

MODEL 28 TYPING REPERFORATOR SETS

TELETYPE® CORPORATION
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INTRODUCTION

Bulletin 246B provides description and principles of operation for the Send-Receive and Receive-Only Typing Reperforator Sets and associated component units.

The Bulletin is made up of a group of appropriate independent sections. The sections are complete within themselves; they are separately identified by title and section number and the pages of each section are numbered consecutively, independent of other sections.

The identifying number of a section, a 9-digit number, appears at the top of each page of the section, in the left corner of left-hand pages and the right corner of right-hand pages.

To locate specific information, refer to the table of contents. Find the name of the involved component in column one and the title of the section in column two. The correct 9-digit section number will then be found in column three. The sections are arranged in the order shown in the table of contents. Turn to page one of the section indicated where the contents of that section will be found (except where a section is small and does not require a listing of contents).

FEBRUARY, 1964
CHANGE 1

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28 KEYBOARD SEND-RECEIVE AND RECEIVE-ONLY TYPING REPERFORATOR SETS (KTR AND ROTR)

DESCRIPTION

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1. GENERAL

1.01 The 28 Keyboard Send-Receive Typing Reperforator Set (KTR) is an electromechanical apparatus that provides terminal facilities for exchanging messages over appropriate transmission facilities including telegraph lines, telephone networks, and radio channels. An operator sends the messages by typing them on a keyboard which translates the data to a serial start-stop (teletypewriter) code. The originating KTR set records the transmission on communications-type tape in the form of code hole perforations and printed characters. The distant stations record the transmission on tape, page-width copy paper, or continuous business forms, determined by the facilities of the station. The sets operate at various speeds up to 100 words per minute.

1.02 The 28 Receive-Only Typing Reperforator Sets (ROTR) are similar to KTR Sets, but have no keyboard sending facilities. They are used in applications that require only the reception of messages on tape.

2. VARIATIONS

2.01 The Sets are available in several configurations to meet varying installation and operational requirements:

(a) Table Model Sets - These cover-enclosed KTR and ROTR Sets rest on any flat surface or a table, which contains space for additional equipment (Figs. 1, 3, 4, and 5).

(b) Miniaturized Set - Similar to the other table model ROTR Sets, but equipped with a close-fitting cover (Figs. 5 and 6).

(c) Multiple ROTR Sets - Provide the facilities of three ROTR sets in a single mounting. They are used, for example, in the Receiving and Monitor Groups of the Universal Torn Tape System (Figs. 7 and 8).

3. COMPONENTS

3.01 The component complement of the Sets may vary from one installation to another, depending upon the operational requirements. In general, a KTR Set consists of a typing reperforator unit, a keyboard base, a motor unit, an electrical service unit, and an enclosure. The receive-only base replaces the keyboard in Receive Only Sets; and in the Multiple Sets, it accommodates three typing reperforator units.

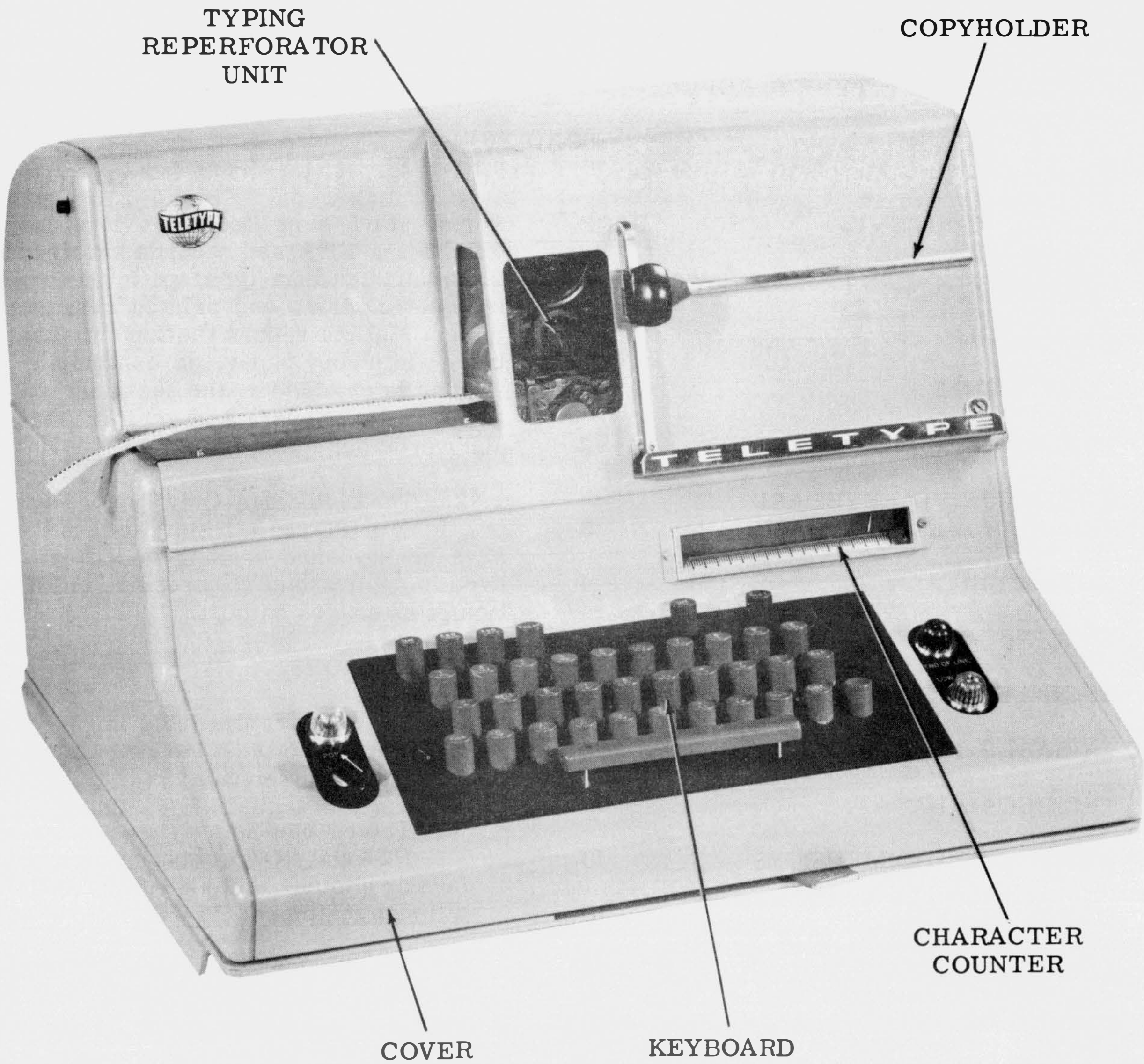


Figure 1 - 28 Keyboard Send-Receive Typing Reperforator Set

A complete description of these components will be found in the appropriate section for a particular component.

3.02 In KTR Sets, the motor unit and typing reperforator unit are mounted on the base portion of the keyboard (Fig. 2). The motor unit supplies rotary motion through a gear set to the typing reperforator unit and the keyboard. Gear sets may be interchanged to obtain various operating speeds up to 100 words per minute. The transfer of rotary motion from the motor unit to the typing reperforator unit in Receive-Only Sets is achieved through interchangeable gear sets or, in certain Sets, by an optional, variable speed drive mechanism (Fig. 6). In the Multiple ROTR Sets, the typing reperforator units may operate at a common, or at independently varied speeds.

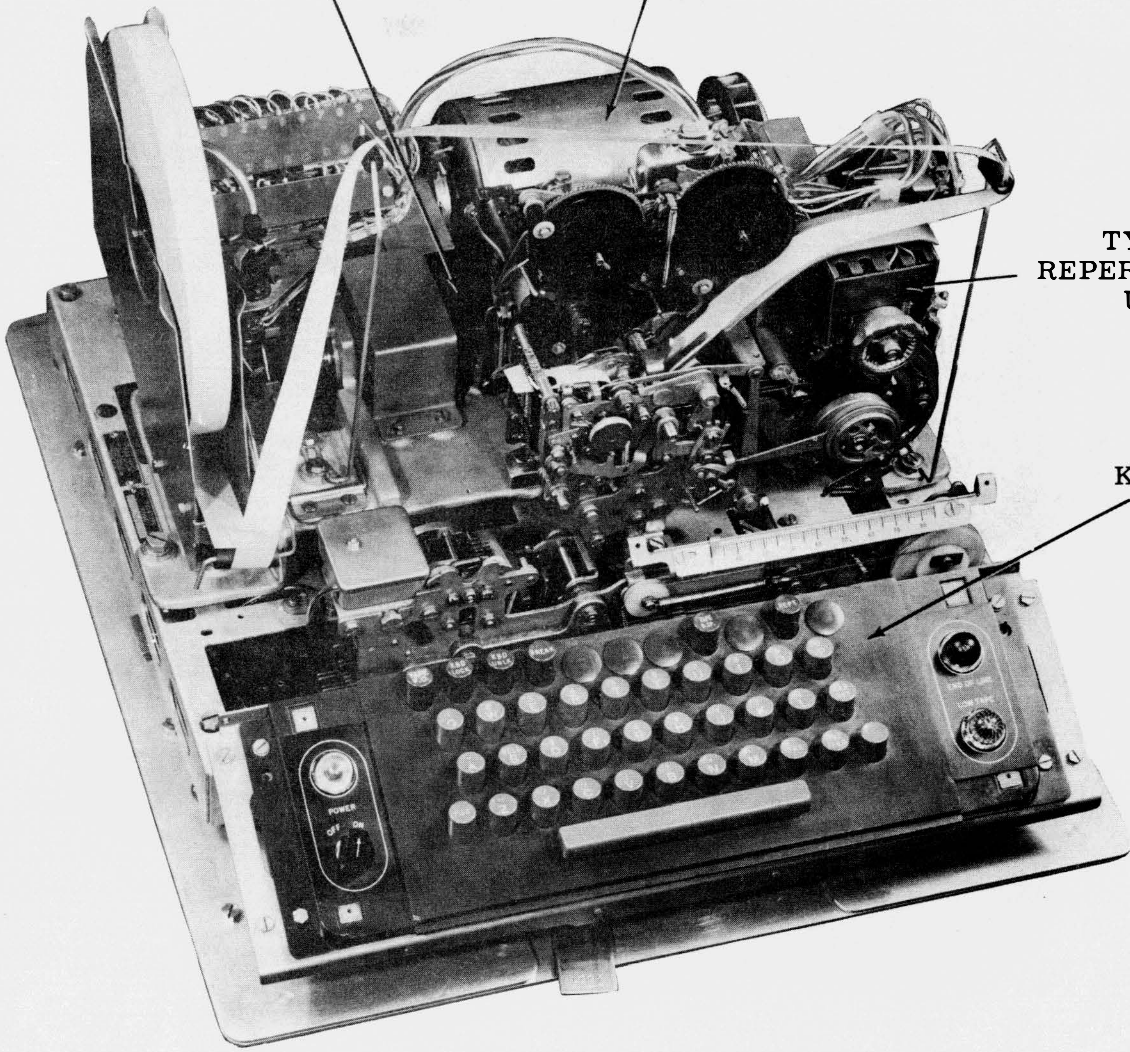


Figure 2 - 28 Keyboard Send-Receive Typing Reperforator Set (Cover Removed)

TYPING REPERFORATOR UNIT (Fig. 2)

3.03 The typing reperforator unit contains the mechanisms necessary for translating electrical input signals into mechanical motions that perforate code holes and print the equivalent messages on tape. The unit may be equipped to provide either fully-perforated or partially-perforated (chadless) operation. A function box is included to provide special functions such as unshift on space and signal bell.

SEND-RECEIVE KEYBOARD AND RECEIVE-ONLY BASE (Figs. 2, 4, 6 and 7)

3.04 Both the send-receive keyboard and the receive-only base provide mounting facilities for the typing reperforator unit, motor, drive gears, and various mechanism required for control of the set. Unlike the receive-only base, the send-receive keyboard is equipped with mechanisms for generating and transmitting a teletypewriter signal.

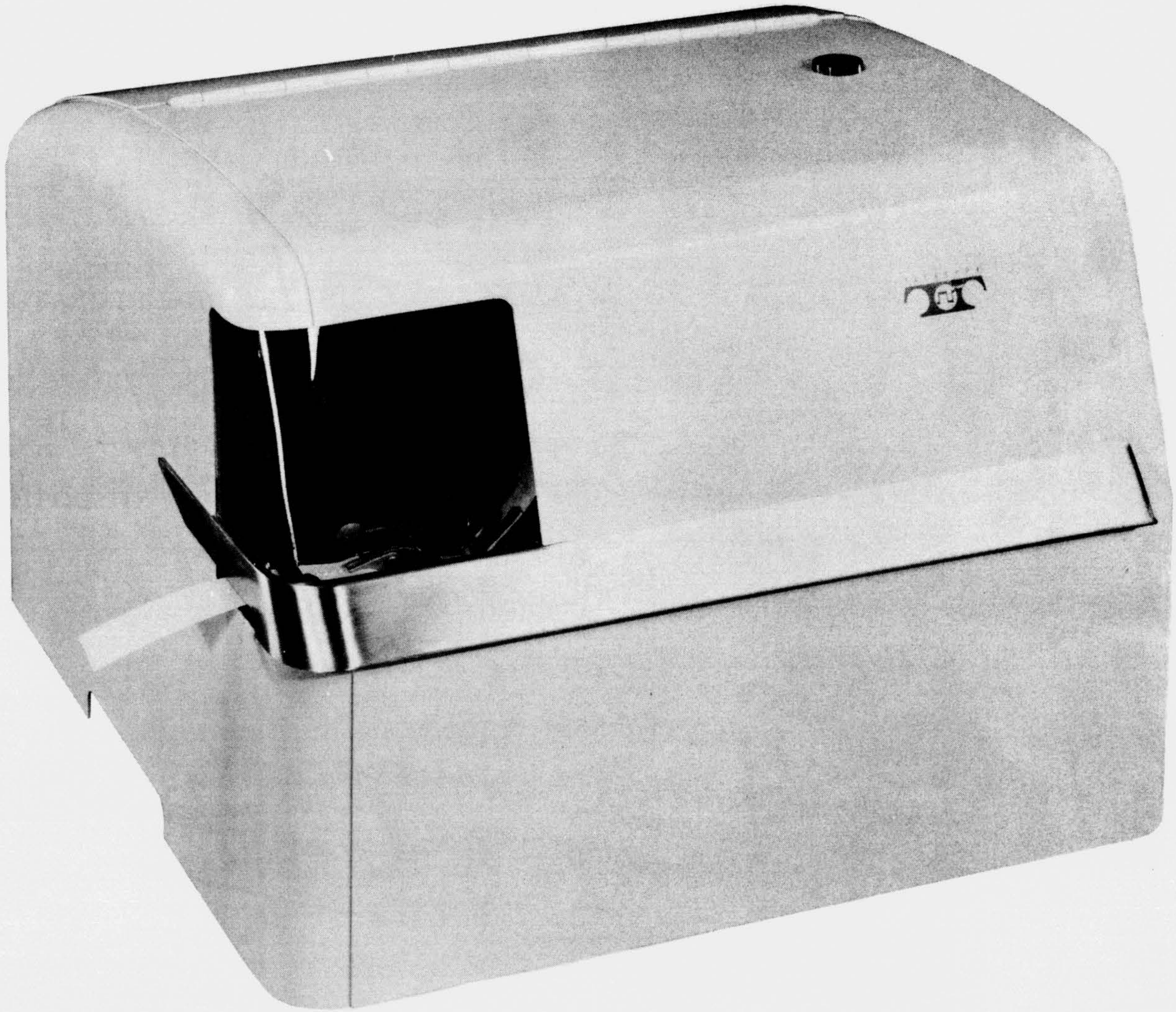


Figure 3 - 28 Receive-Only Typing Reperforator Set

MOTOR UNITS (Fig. 2)

3.05 The motor units that provide mechanical motion for KTR and ROTR sets are of two basic types: ac synchronous and ac/dc series governed. The ac synchronous motor is used when the power source is regulated; the ac/dc series governed motor operates from either regulated or unregulated power. The latter is required where only unregulated power is available. The units operate at the same speed and, to accommodate varying load requirements, they are available in standard and heavy-duty horsepower ratings.

ELECTRICAL SERVICE UNIT (Fig. 4)

3.06 The electrical service unit serves as the area of concentration for the wiring of

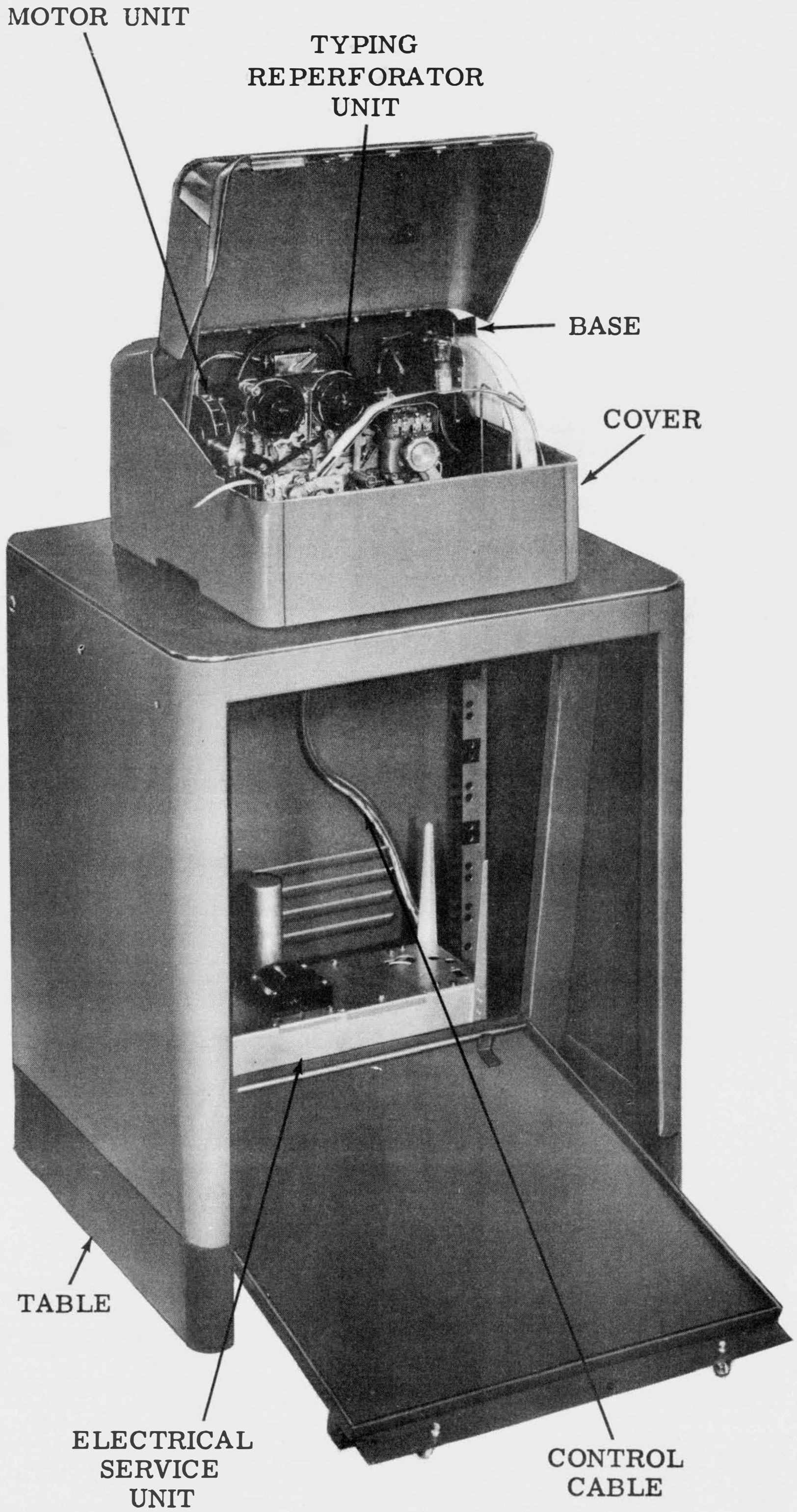


Figure 4 - 28 Receive-Only Typing Reperforator Set and Reperforator Table

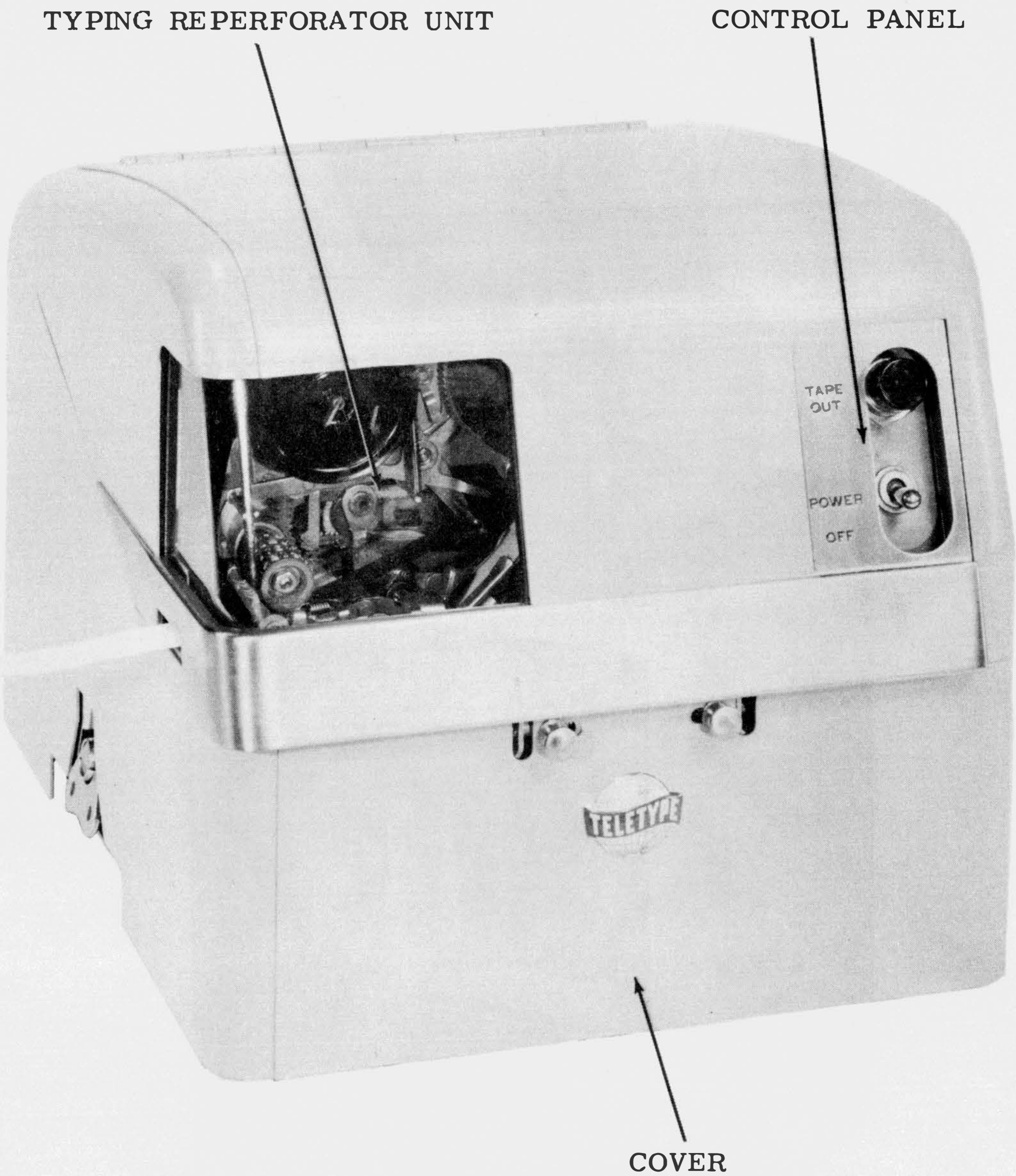


Figure 5 - 28 Miniaturized Receive-Only Typing Reperforator Set

KTR and ROTR sets, and provides mounting facilities for various electrical assemblies and components. It may include such optional assemblies as a line (polar) relay, line shunt relay, rectifier, motor control mechanism, and selector magnet driver. The set's main power switch, convenience outlet and fuse, terminal blocks, and interconnecting cables may also be included.

ENCLOSURES

3.07 The components of KTR and ROTR Sets may be housed in the following enclosures: The keyboard send-receive typing reperforator set cover, the receive-only reperforator set cover, the receive-only miniaturized typing reperforator set cover, and the multiple reperforator set cabinets. In addition, tables are available for supporting the cover-enclosed sets.

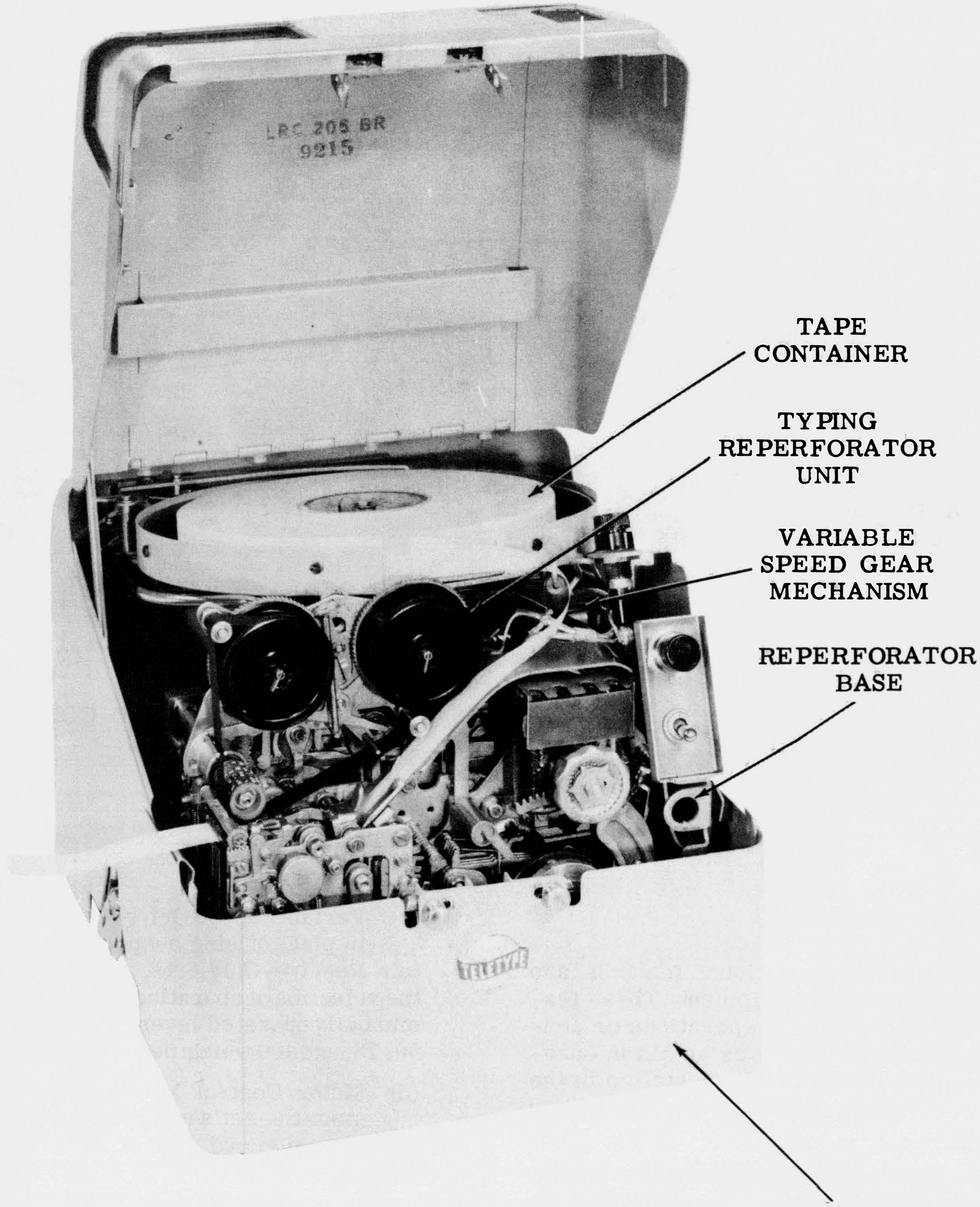


Figure 6 - 28 Miniaturized Receive-Only Typing Reperforator Set (Cover Open)

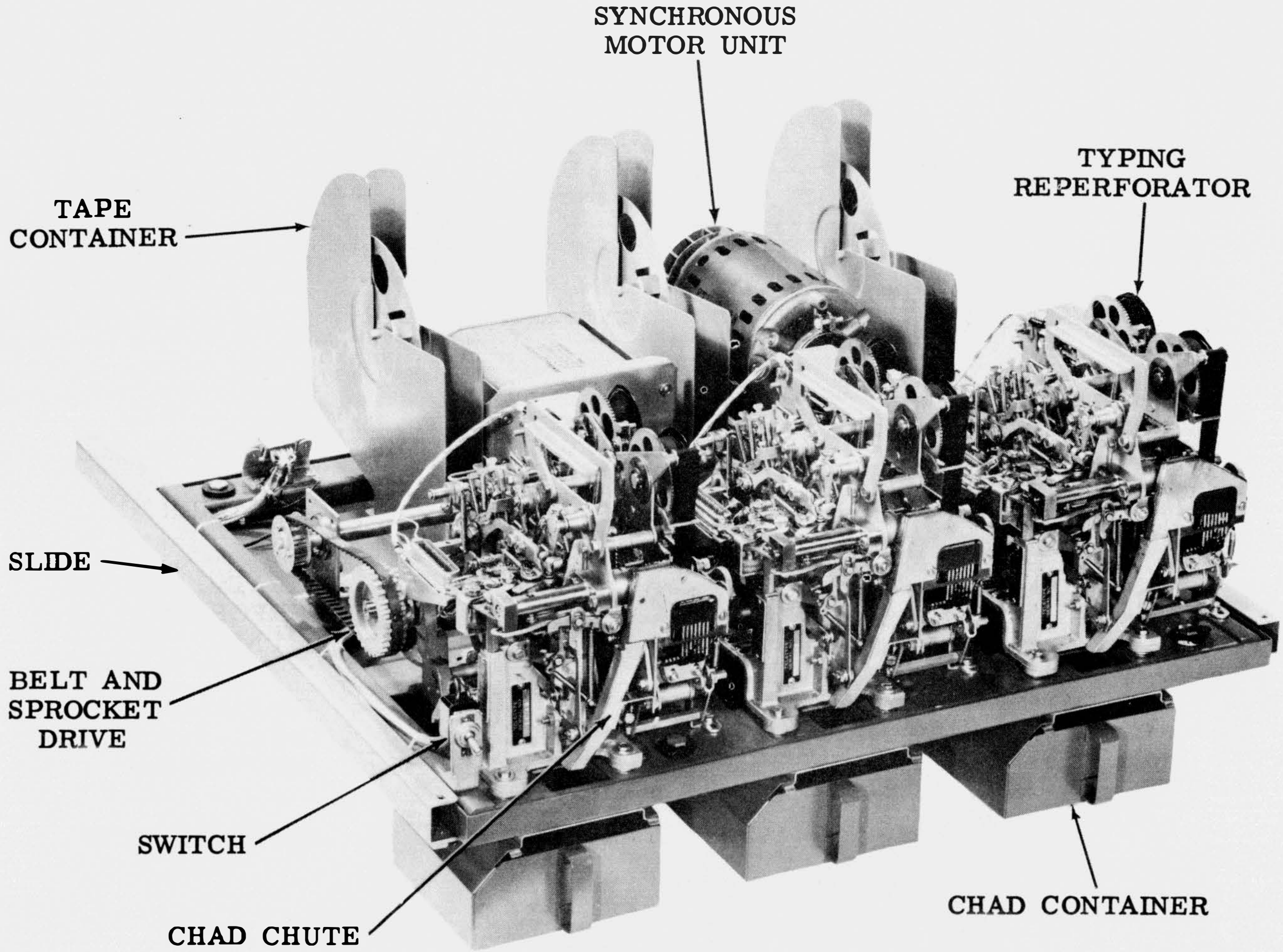


Figure 7 - 28 Multiple Typing Reperforator Set

4. VARIABLE FEATURES

4.01 A wide variety of optional features are available with the equipment. These features, which provide special operations or control facilities, or which serve as an aid in operation, are in most cases readily installed in the field. Some of these features are described briefly below.

(a) Tape Feed Out Mechanisms - These mechanisms operate automatically or manually to step-out a length of blank or letters perforated tape for convenience in tape handling. Feed out may be interfering or non-interfering.

(b) Back Space Mechanisms - Operated manually or with power-drive, the mechanism retracts tape back through the punch block to allow erroneously perforated data to be obliterated by replacement with the letters code combination.

(c) Variable Speed Drive Mechanisms - Used in place of single-speed gear sets on certain Receive-Only Sets, this feature permits the selection of operating speeds by means of a manually operated lever. Typically, speeds of 60, 75, and 100 words per minute are available.

(d) Motor Control Mechanisms - Starts or stops the set's motor in response to predetermined signal line or separate line conditions.

(e) Contact Mechanisms - A number of electrical contacts are available to provide control of external equipment or for other special applications. These include code reading, timing and letters-figures contact mechanisms.

(f) Accessories - Various accessories are available to facilitate tape processing and handling including tape bins, chad chutes, low tape and tape out alarms, and tape winders.

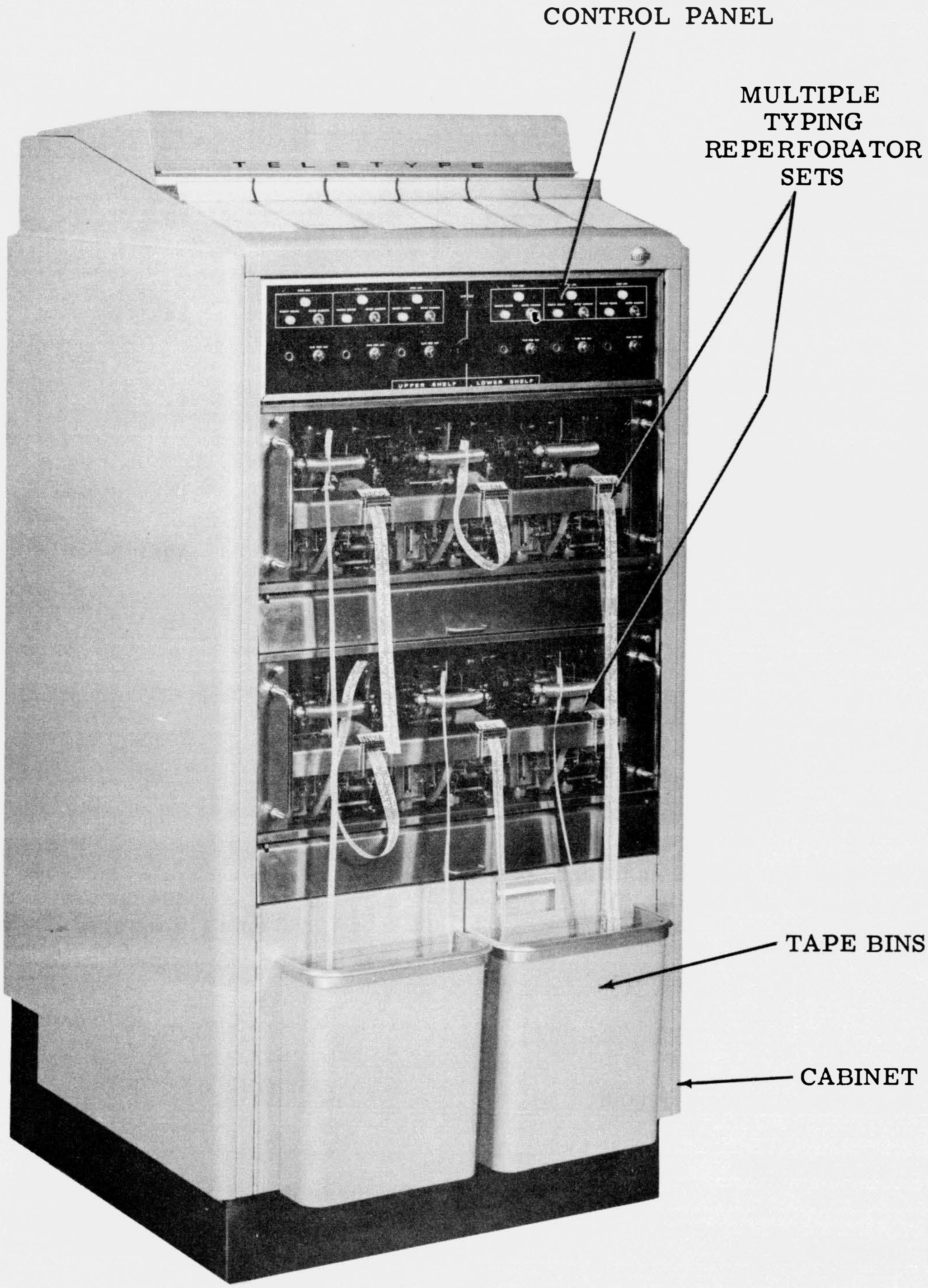


Figure 8 - Typical 28 Multiple Reperforator Set Cabinet

5. TECHNICAL DATA

WEIGHTS AND DIMENSIONS

SET	APPROX. DIMENSIONS (INCHES)			APPROX. WEIGHT (POUNDS)
	Height	Width	Depth	
Keyboard Send-Receive Typing Reperforator Set	13-3/4	17	18-3/4	119
Receive-Only Typing Reperforator Set	9-1/2	13	14-1/2	48
Receive-Only Miniaturized Typing Reperforator Set	9-1/4	10	12	40
Typical 28 Multiple Reperforator Set Cabinet (Includes Multiple Typing Reperforator Sets)	57-1/2	25-1/2	32-1/2	270
Table	35	20-1/2	18-1/2	50

SIGNALING CODE . . . . Sequential five-unit start-stop

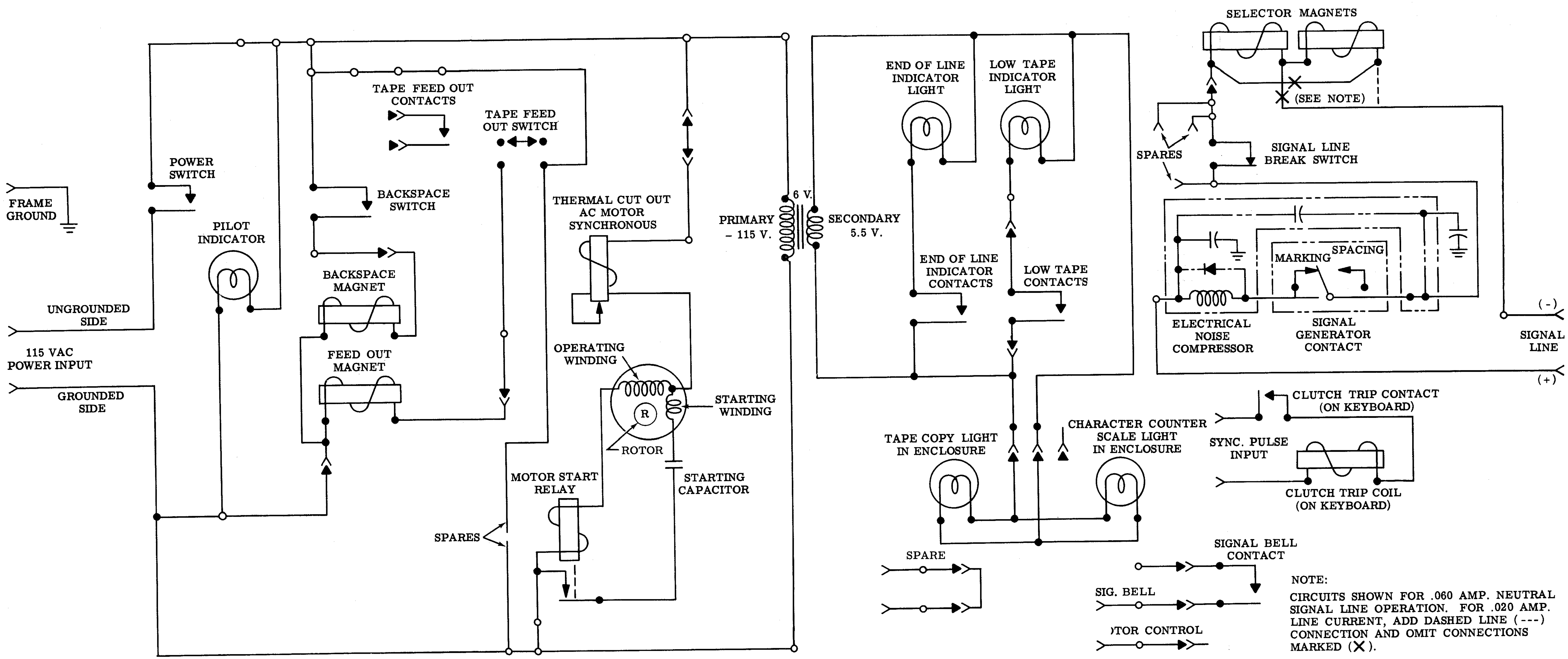
LINE CURRENT . . . . 0.020 or 0.060 ampere

SPEED (operations per minute and words per minute) . . . . 368 opm (60 wpm),
(Other speeds are also available) 404 opm (67 wpm or 50 baud),
460 opm (75 wpm) or 600 opm (100 wpm)

TAPE
Type . . . . Standard communications
Width . . . . 11/16 inch
Code perforations. . . . . Chadless or fully perforated
Characters or feed holes per inch 10

PRINTED CHARACTERS
Height . . . . Chadless, 0.120 inch; fully perforated, 0.100 inch
Width . . . . Chadless, 0.075 inch; fully perforated, 0.046 inch
Location of printing . . . . Along upper edge of chadless perforated tape;
between feed holes on fully perforated tape

POWER REQUIREMENTS . . . . 115 volts ac, single-phase,
60 cycles



NOTE:

CIRCUITS SHOWN FOR .060 AMP. NEUTRAL SIGNAL LINE OPERATION. FOR .020 AMP. LINE CURRENT, ADD DASHED LINE (---) CONNECTION AND OMIT CONNECTIONS MARKED (X).

DOT DASH (—— -- ———) LINES INDICATE FILTERING, SHIELDING AND SUPPRESSION NETWORKS.

Figure 9 - Typical 28 Typing Reperforator Set Schematic Diagram

28 TYPING REPERFORATOR

DESCRIPTION AND PRINCIPLES OF OPERATION

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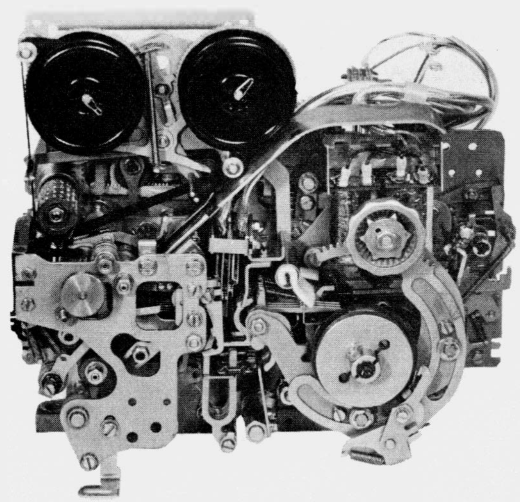

Figure 1 - 28 Typing Reperforator Unit

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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.

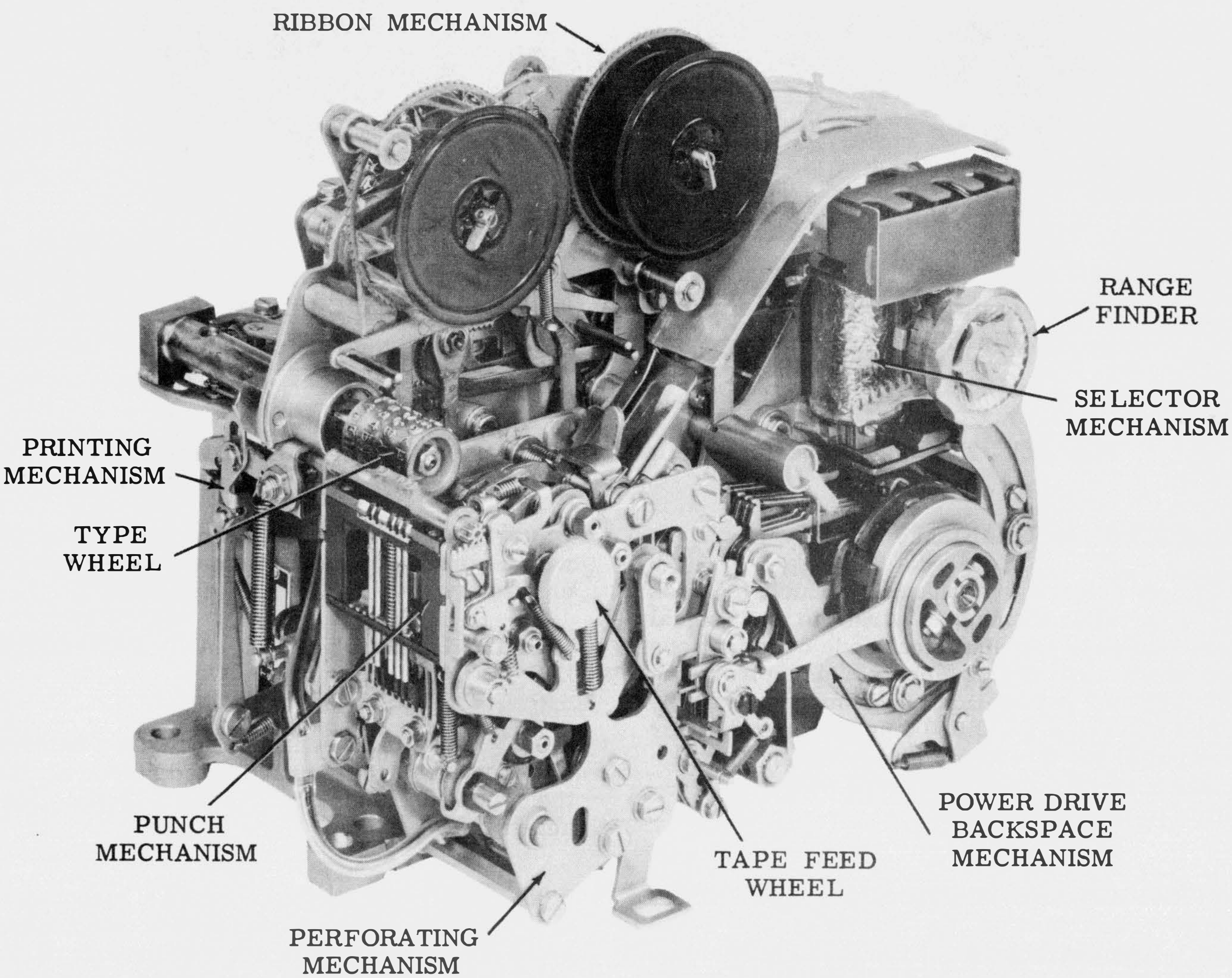


Figure 2 - 28 Typing Reperforator Unit - Chadless Tape (Left Front View)

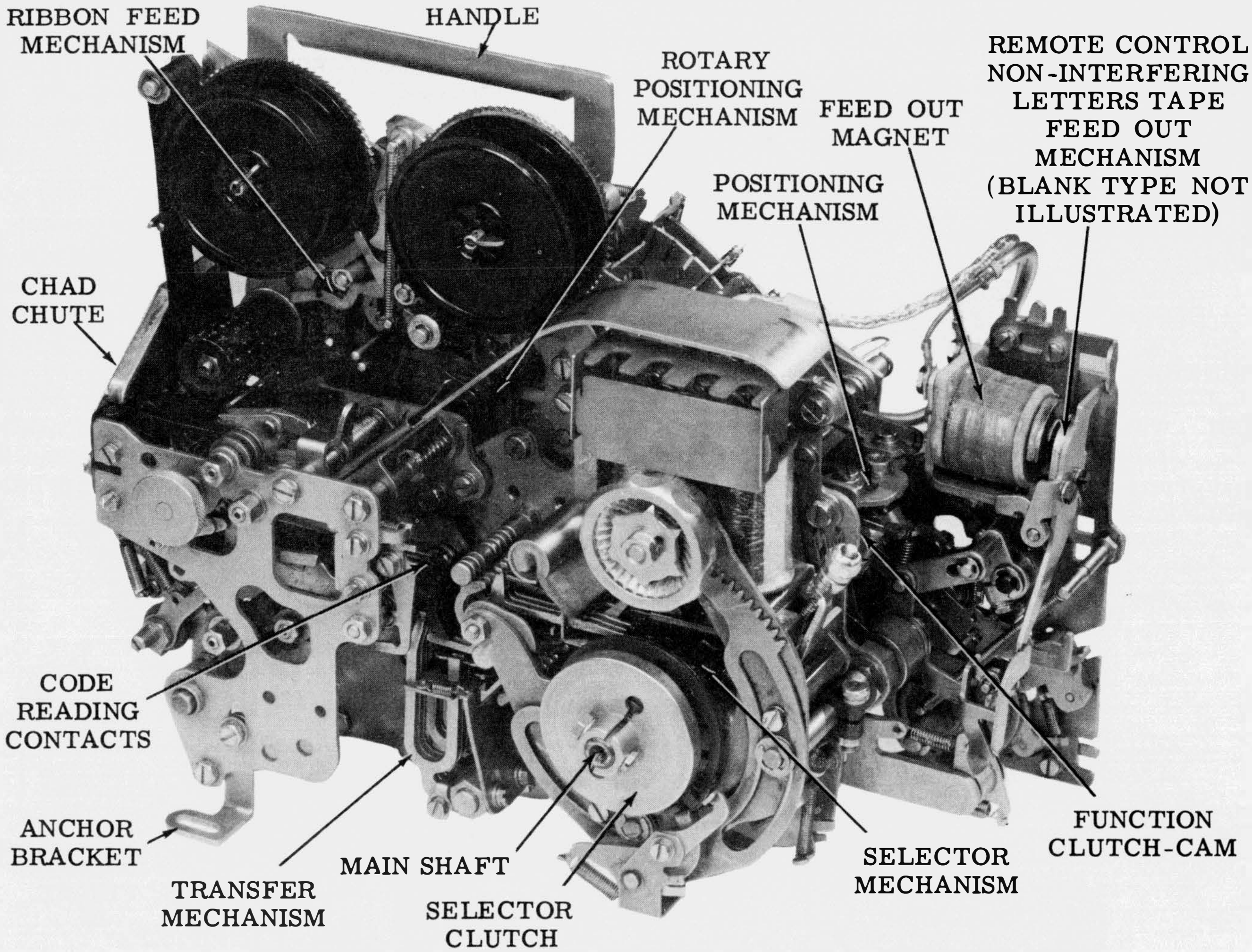


Figure 3 - 28 Typing Reperforator Unit - Fully Perforated Tape (Left Rear View)

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.

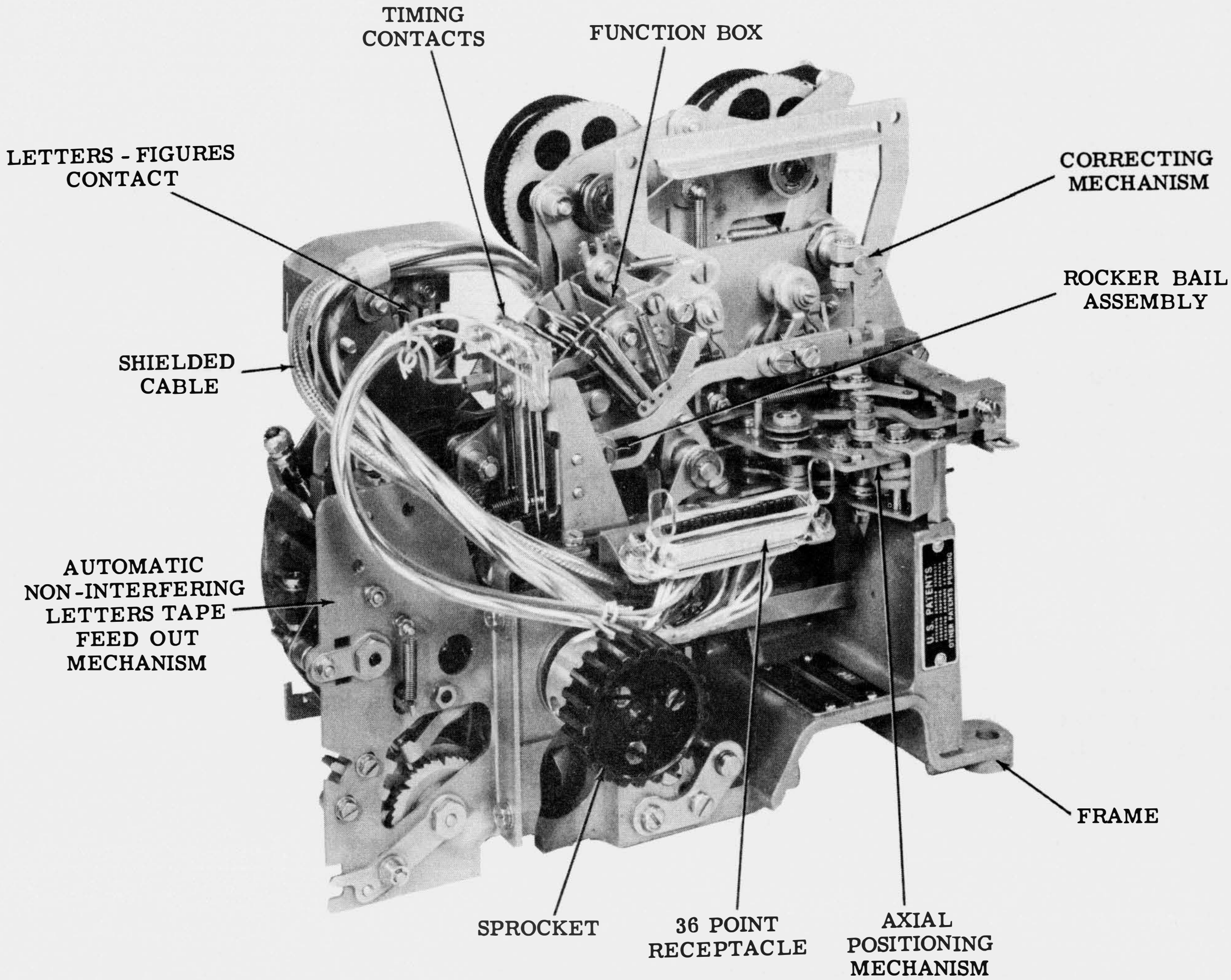


Figure 4 - 28 Typing Reperforator Unit (Front View)
(Fully-Perforated Tape)

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. . . . . 0.046 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

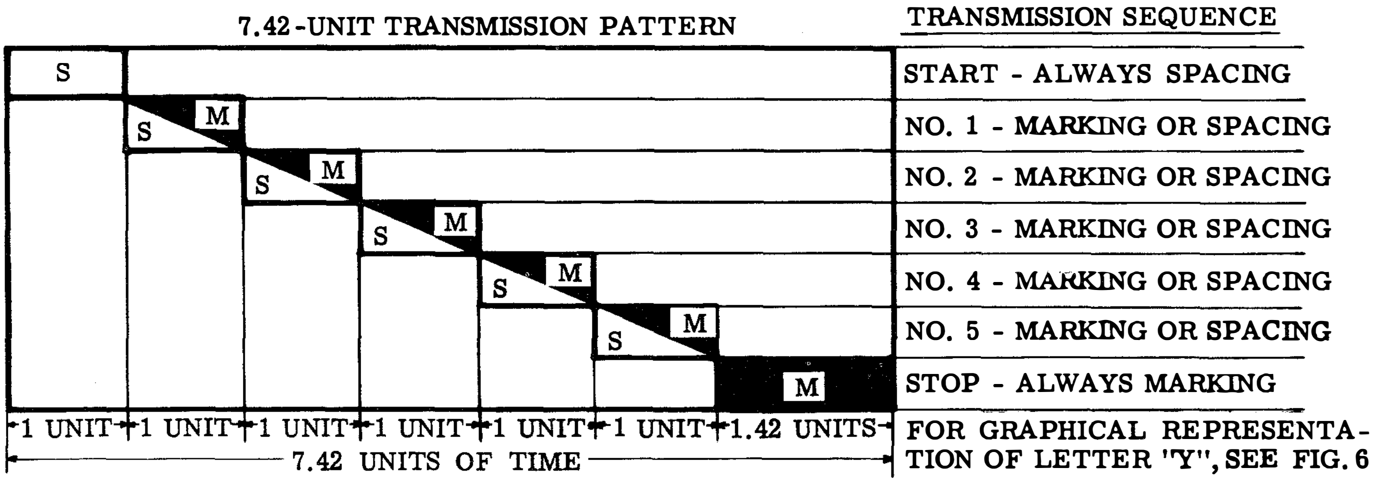
SIGNALING CODE (Fig. 5)

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	"	≀	<	≡	■	∨	∧
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

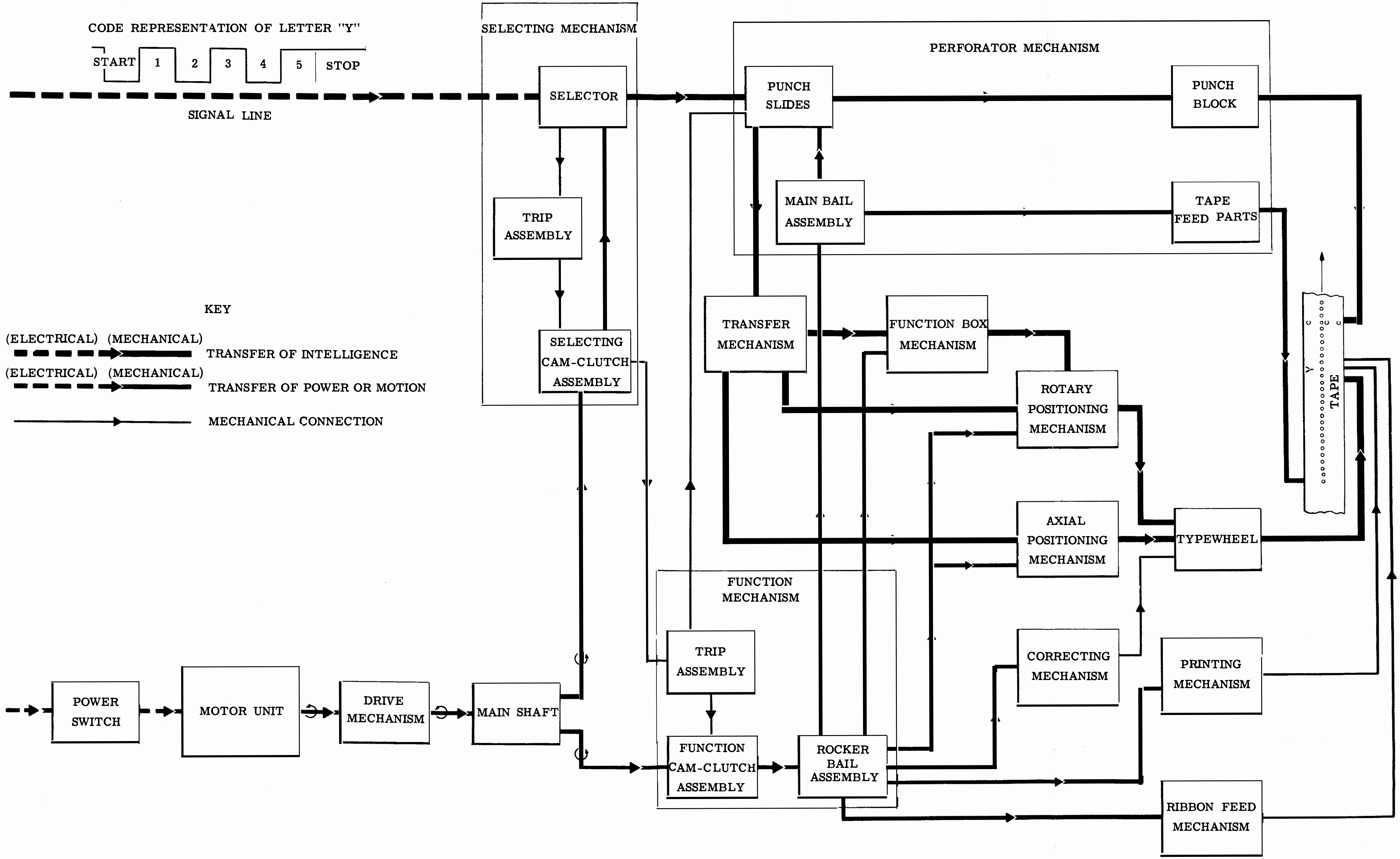


Figure 6 - 28 Typing Reperforator Unit, Block Diagram

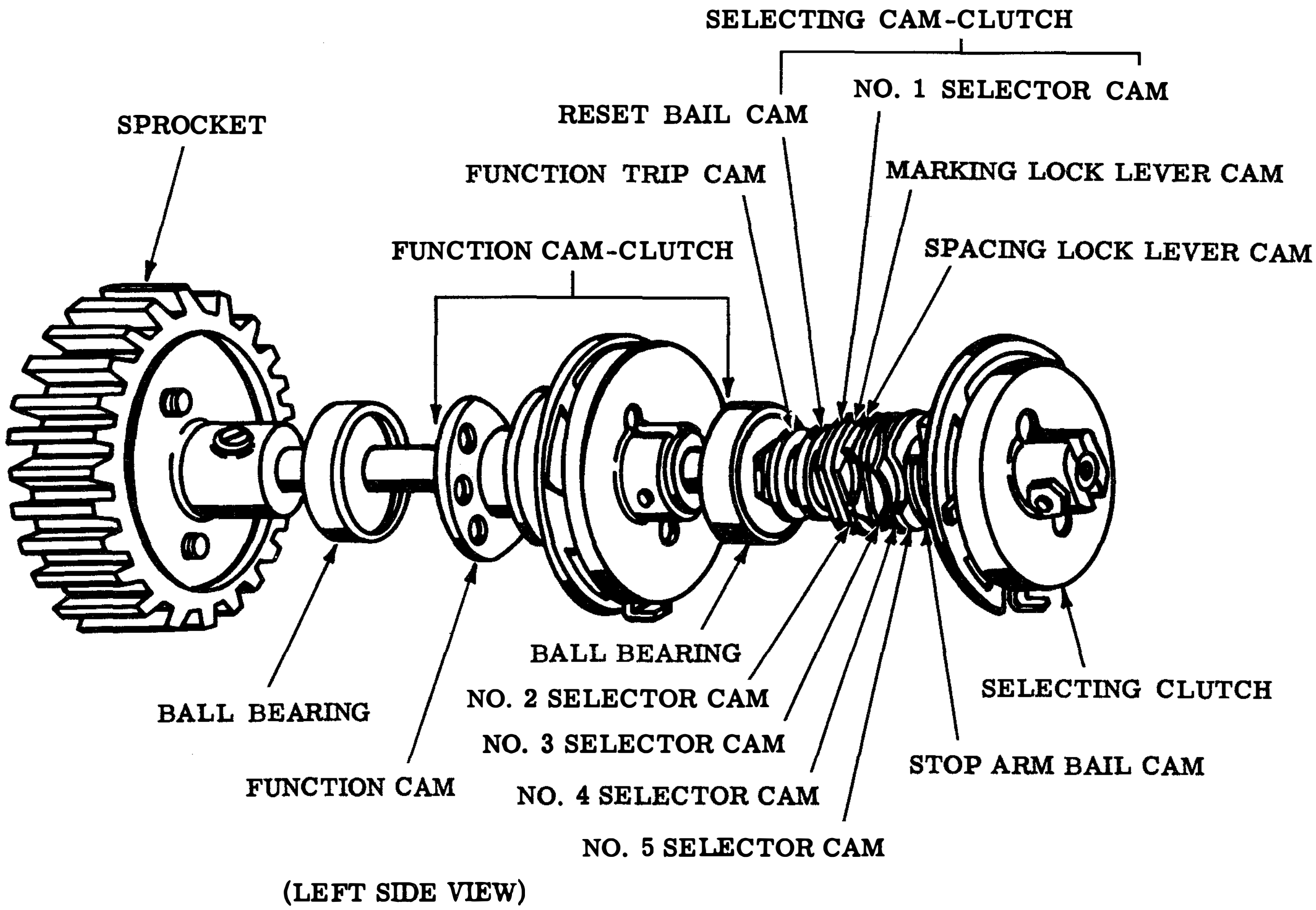


Figure 7 - Main Shaft

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.

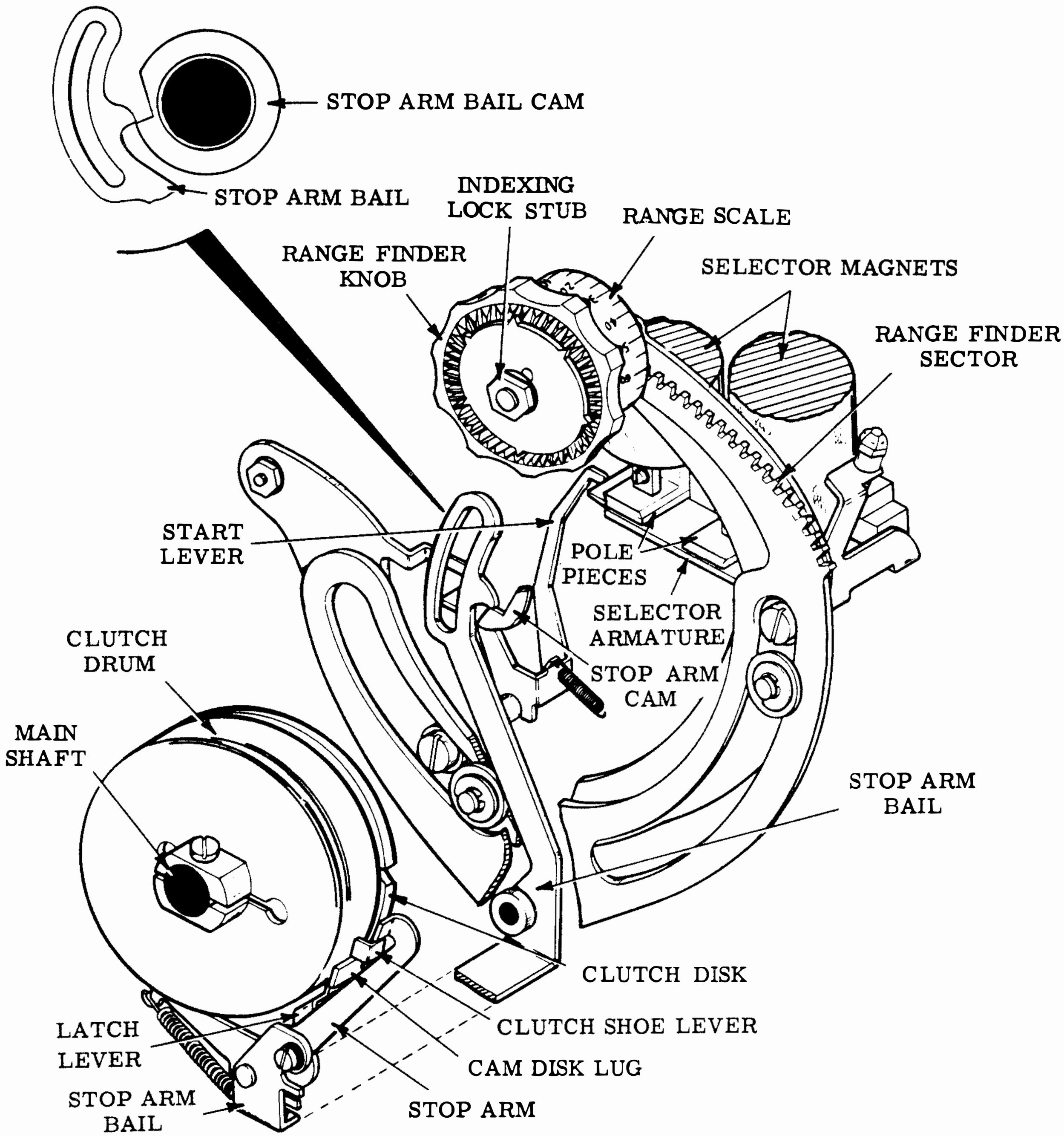


Figure 8 - Range Finder and Selecting Cam-Clutch Assembly

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.

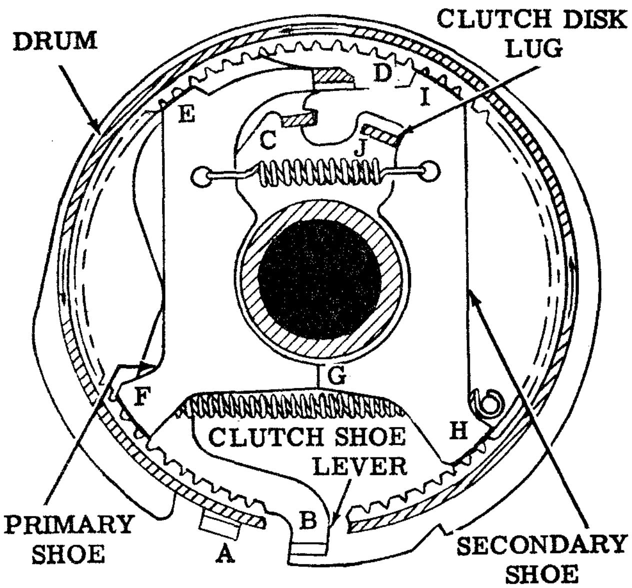


Figure 9 - Clutch, Engaged

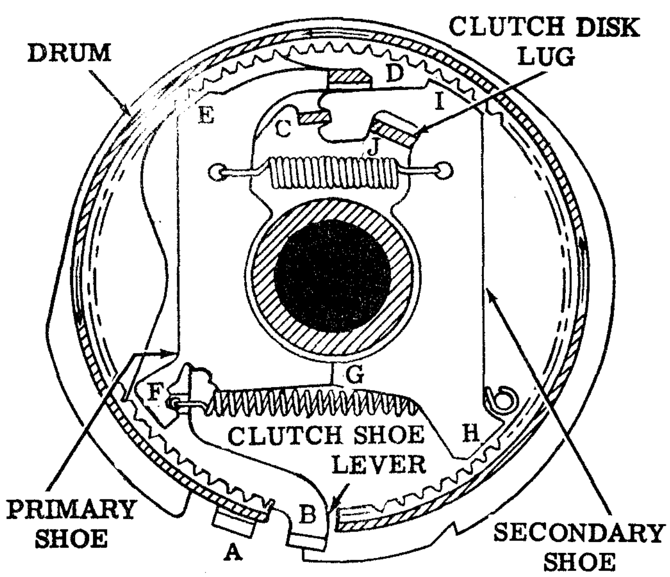


Figure 10 - Clutch, Disengaged

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.

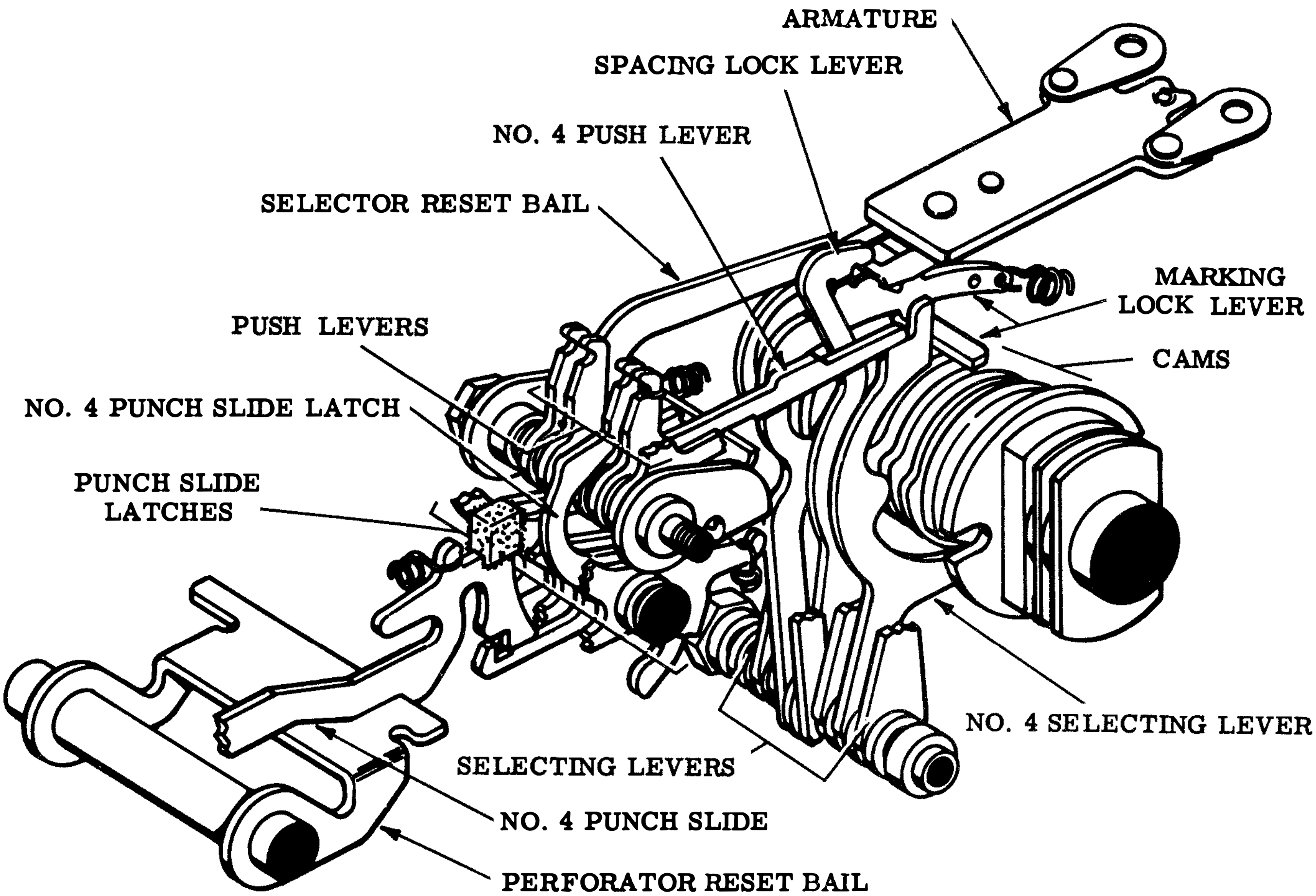


Figure 11 - Selector

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

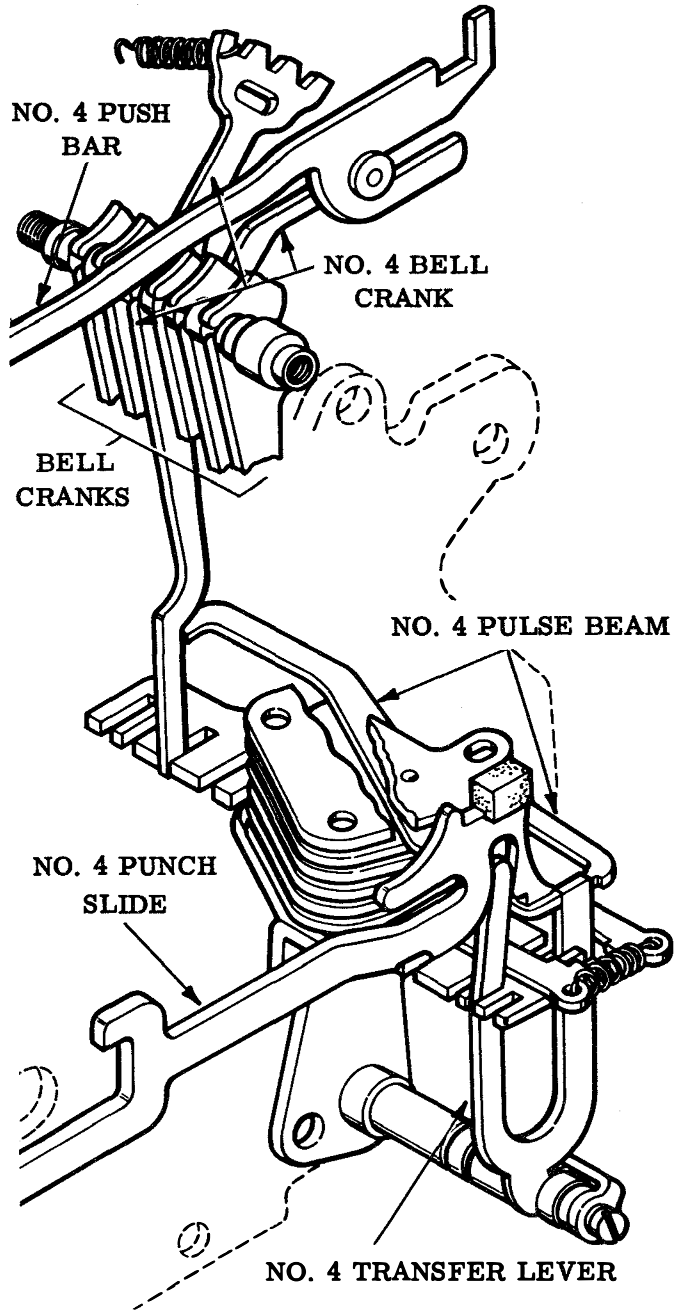


Figure 12 - Transfer Mechanism

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

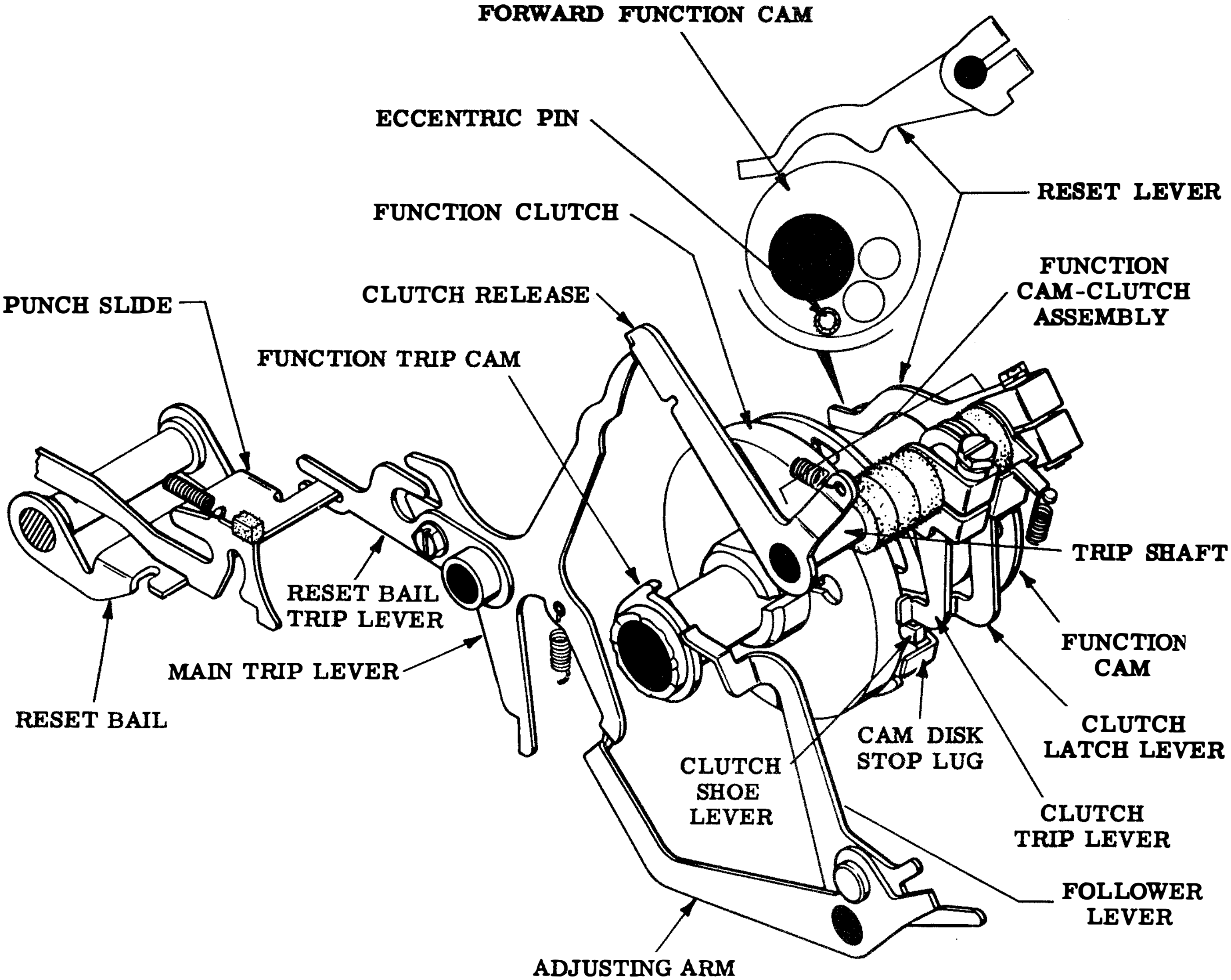


Figure 13 - Function Cam-Clutch and Clutch Trip Assembly

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

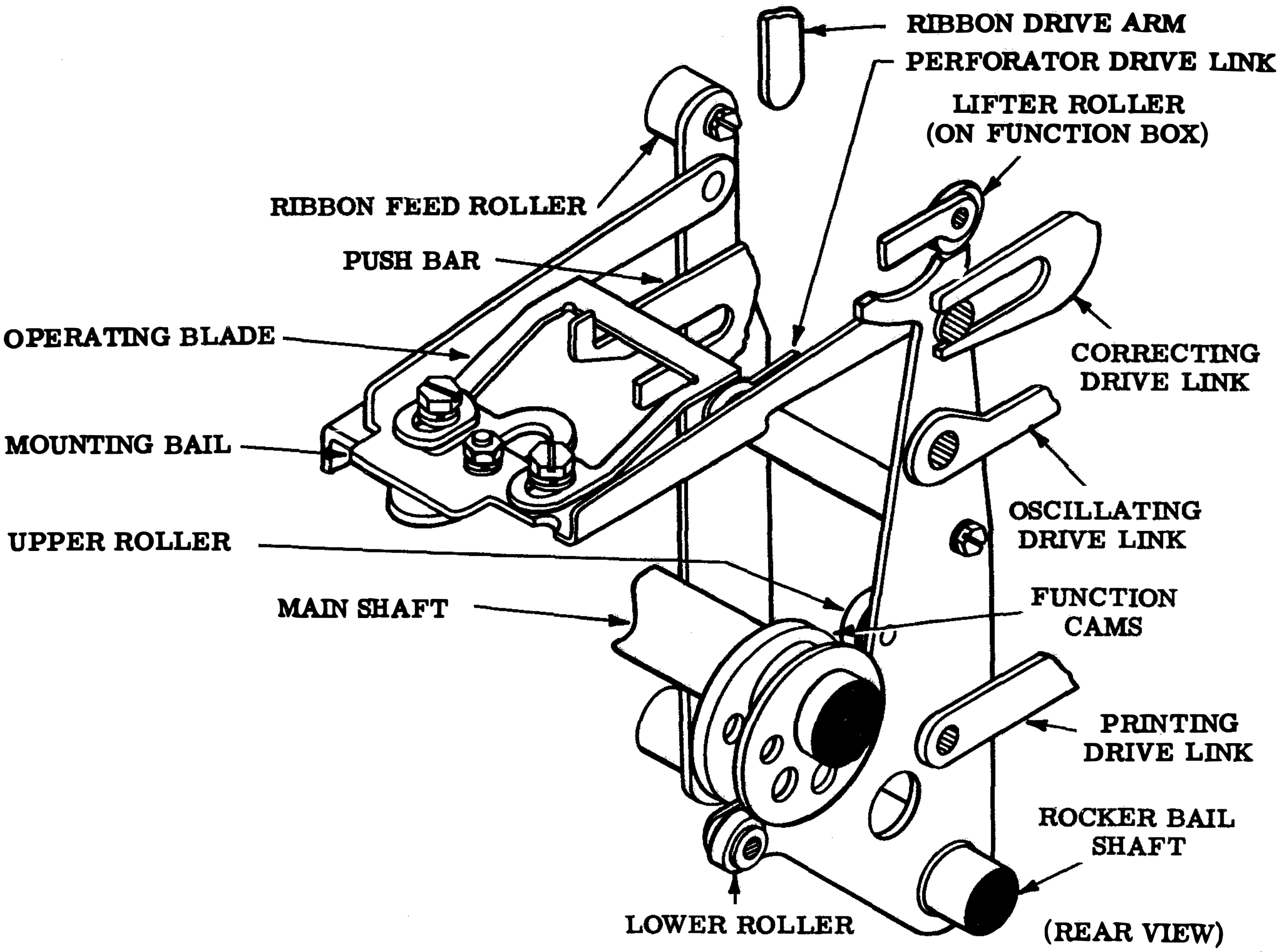


Figure 14 - Rocker Bail Assembly

(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

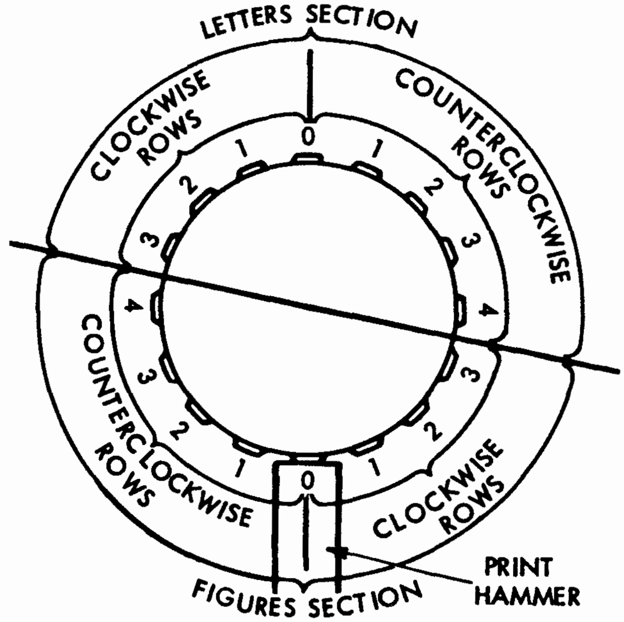
GENERAL

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.

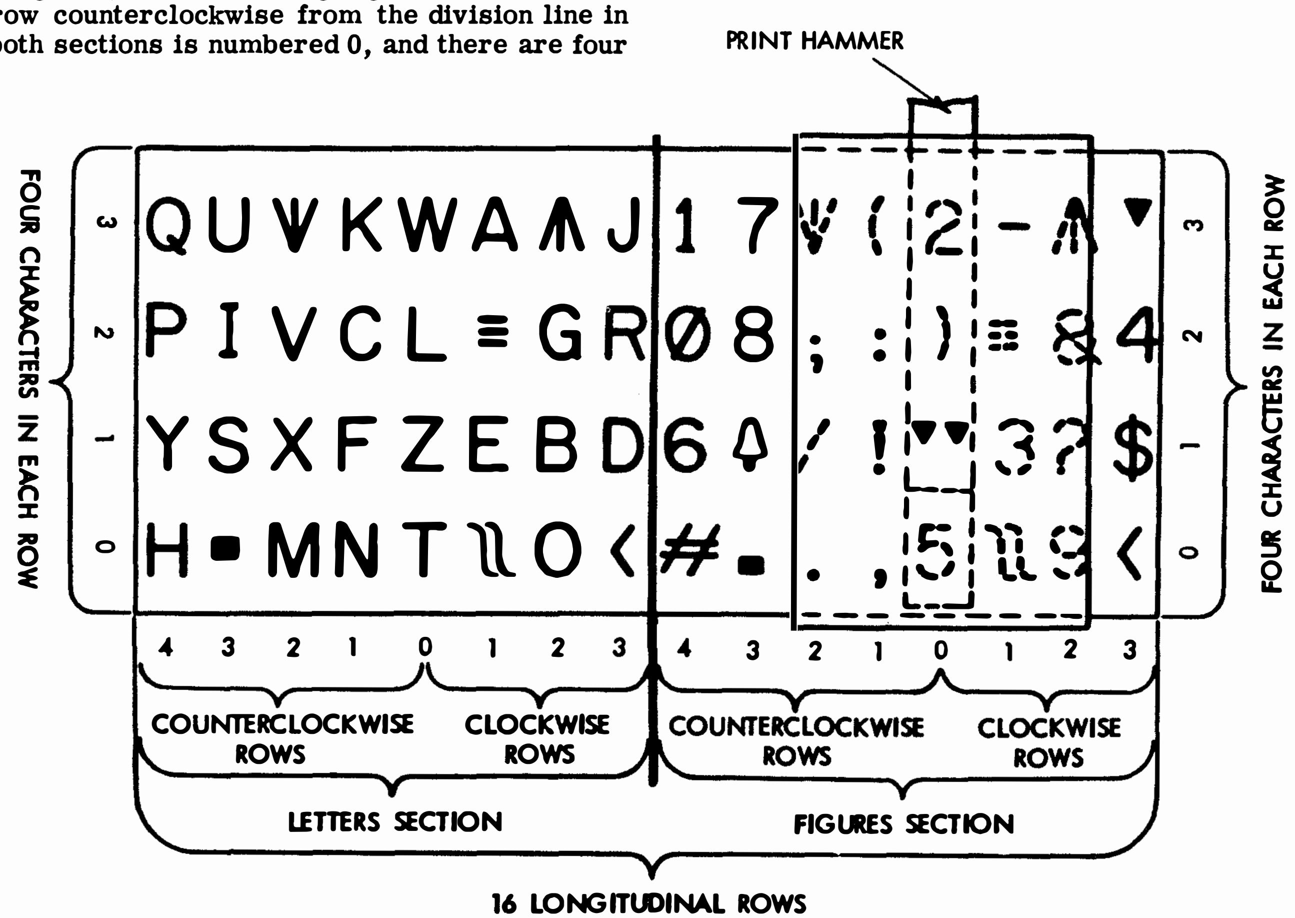
TYPEWHEEL POSITIONING

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



a.
FRONT VIEW SHOWING 16 LONGITUDINAL ROWS



b.
TOP VIEW SHOWING CYLINDRICAL SURFACE IN A PLANE

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

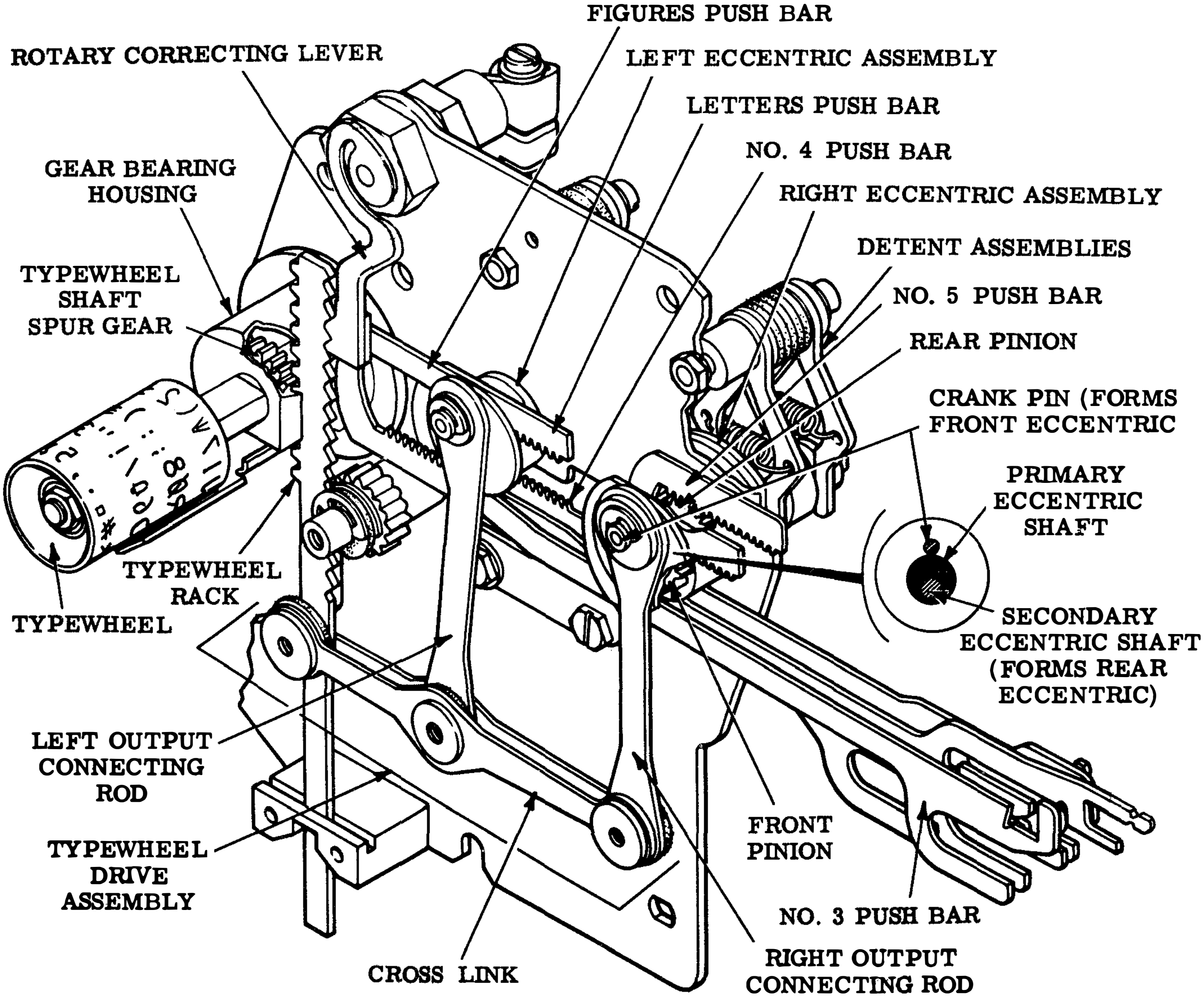


Figure 16 - Rotary Positioning Mechanism

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

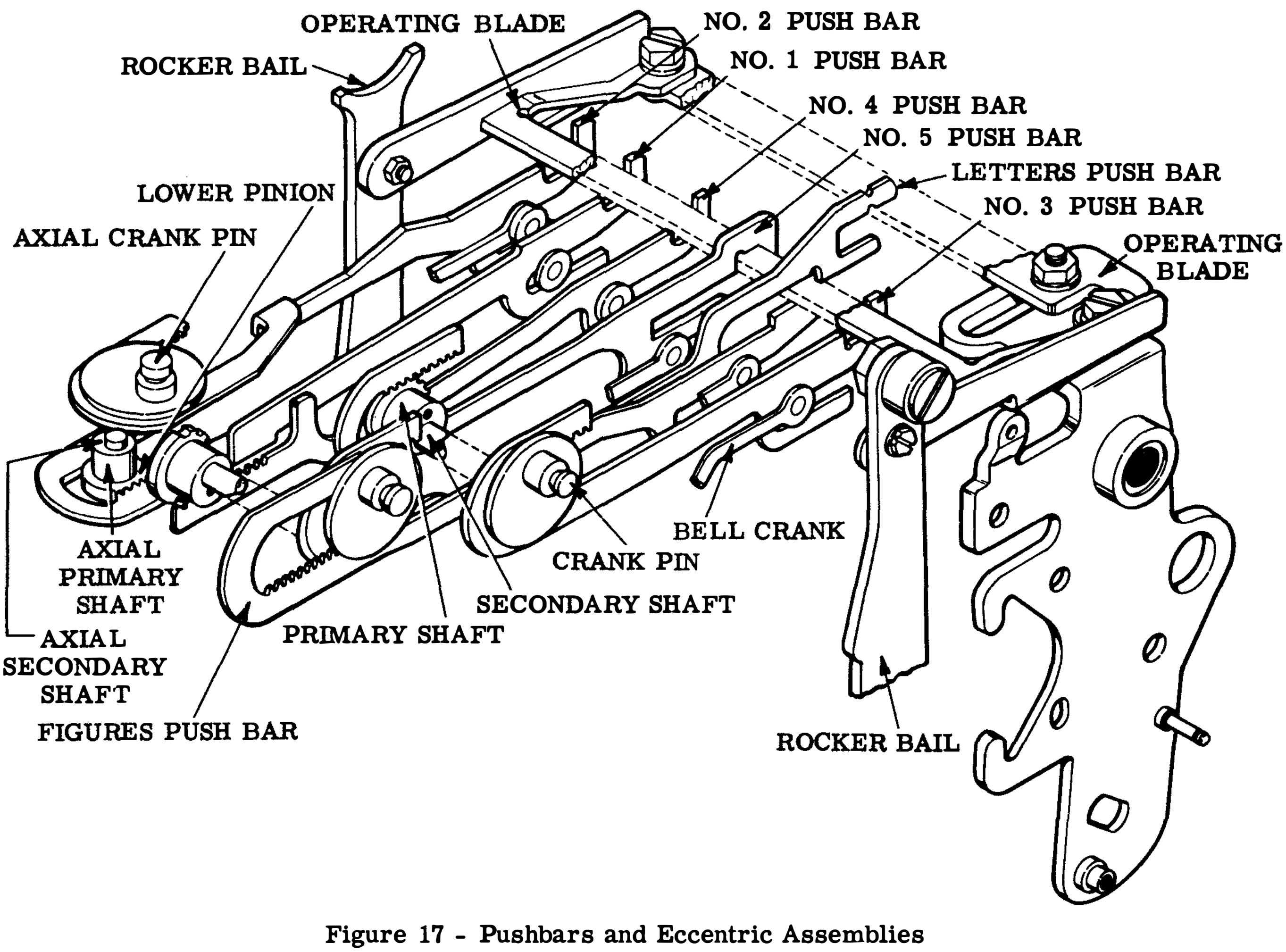


Figure 17 - Pushbars and Eccentric Assemblies

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

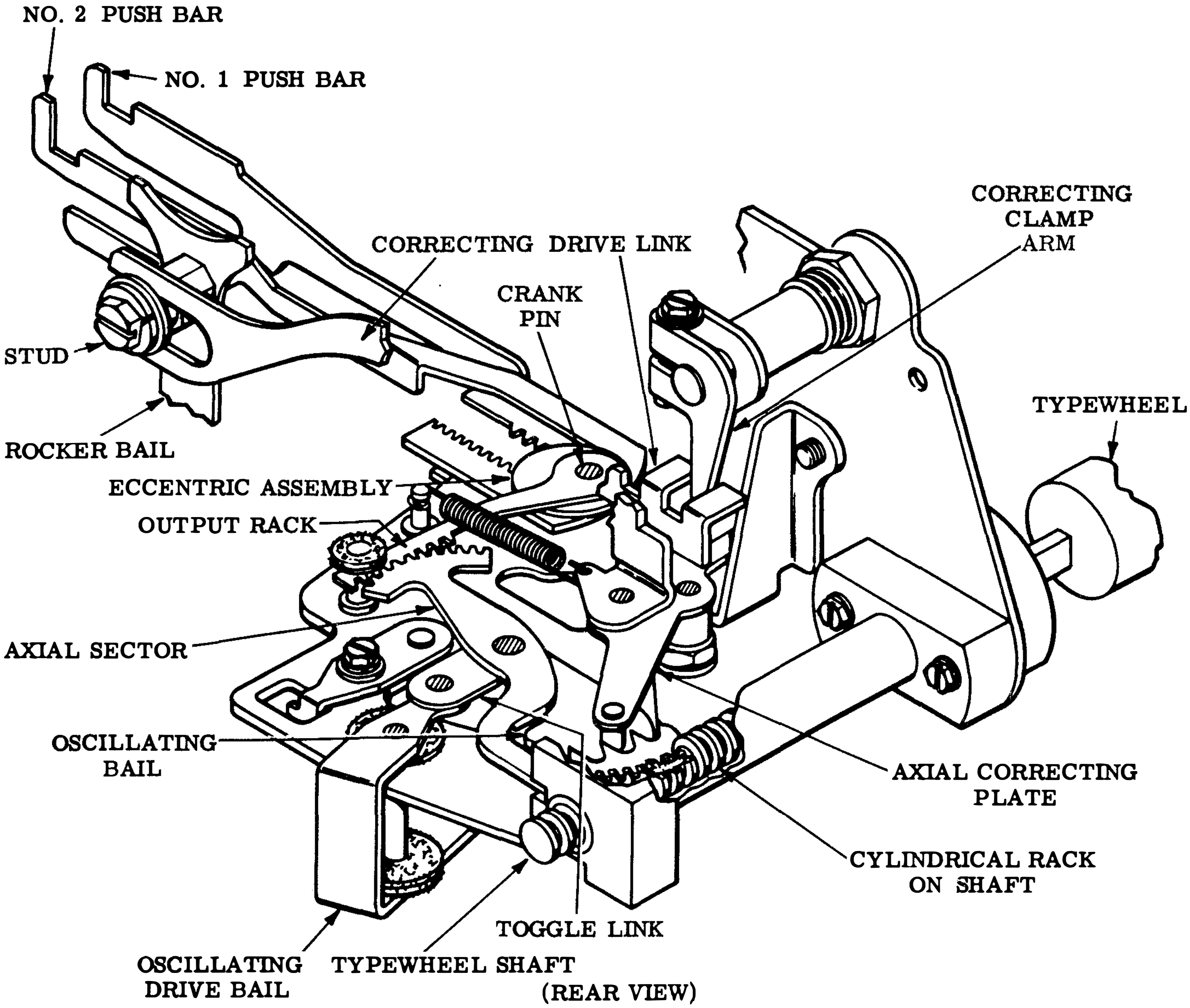


Figure 18 - Axial Positioning Mechanism

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

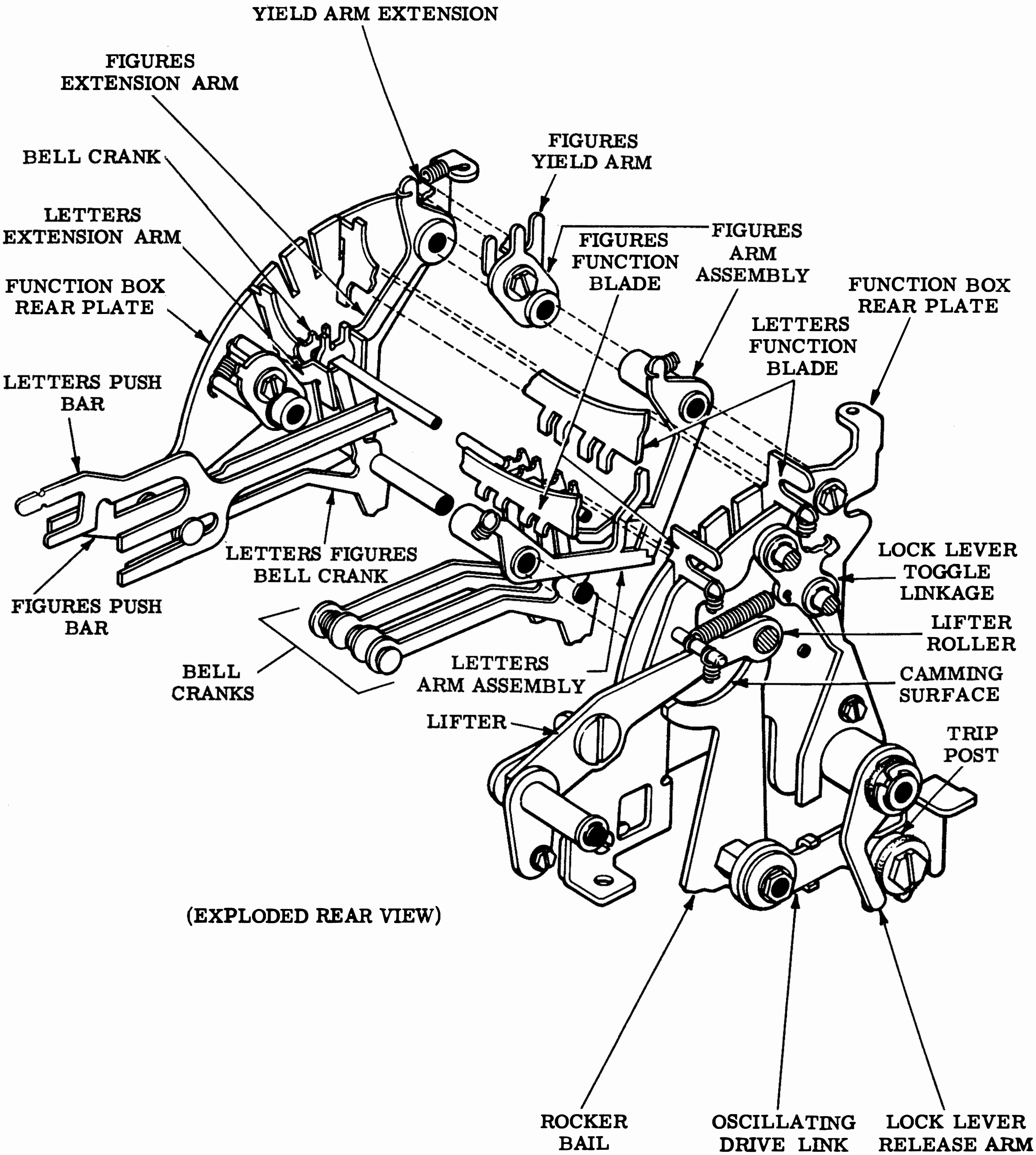


Figure 19 - Function Box

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

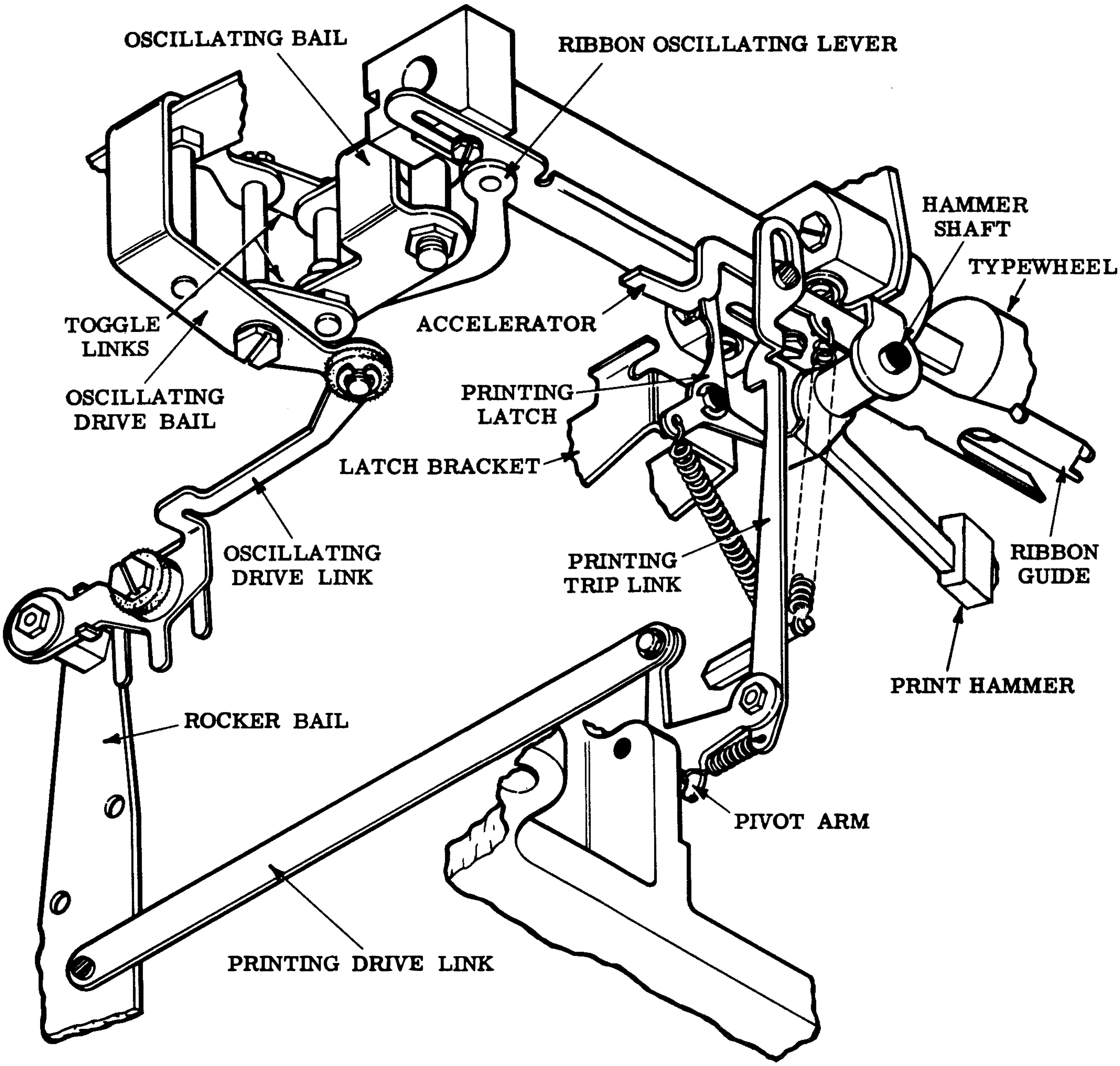


Figure 20 - Printing Mechanism

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 pushbar 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 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 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.

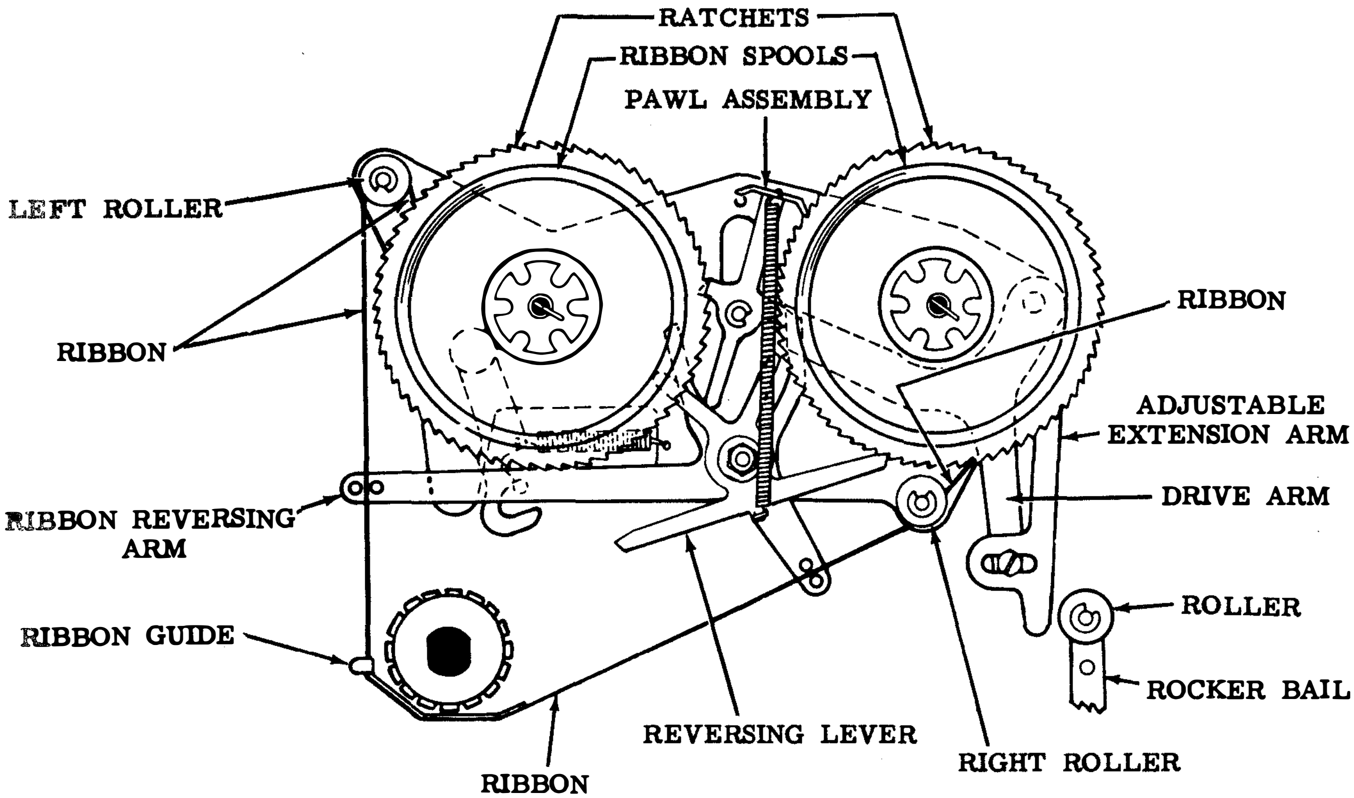


Figure 21 - Ribbon Feed Mechanism

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.

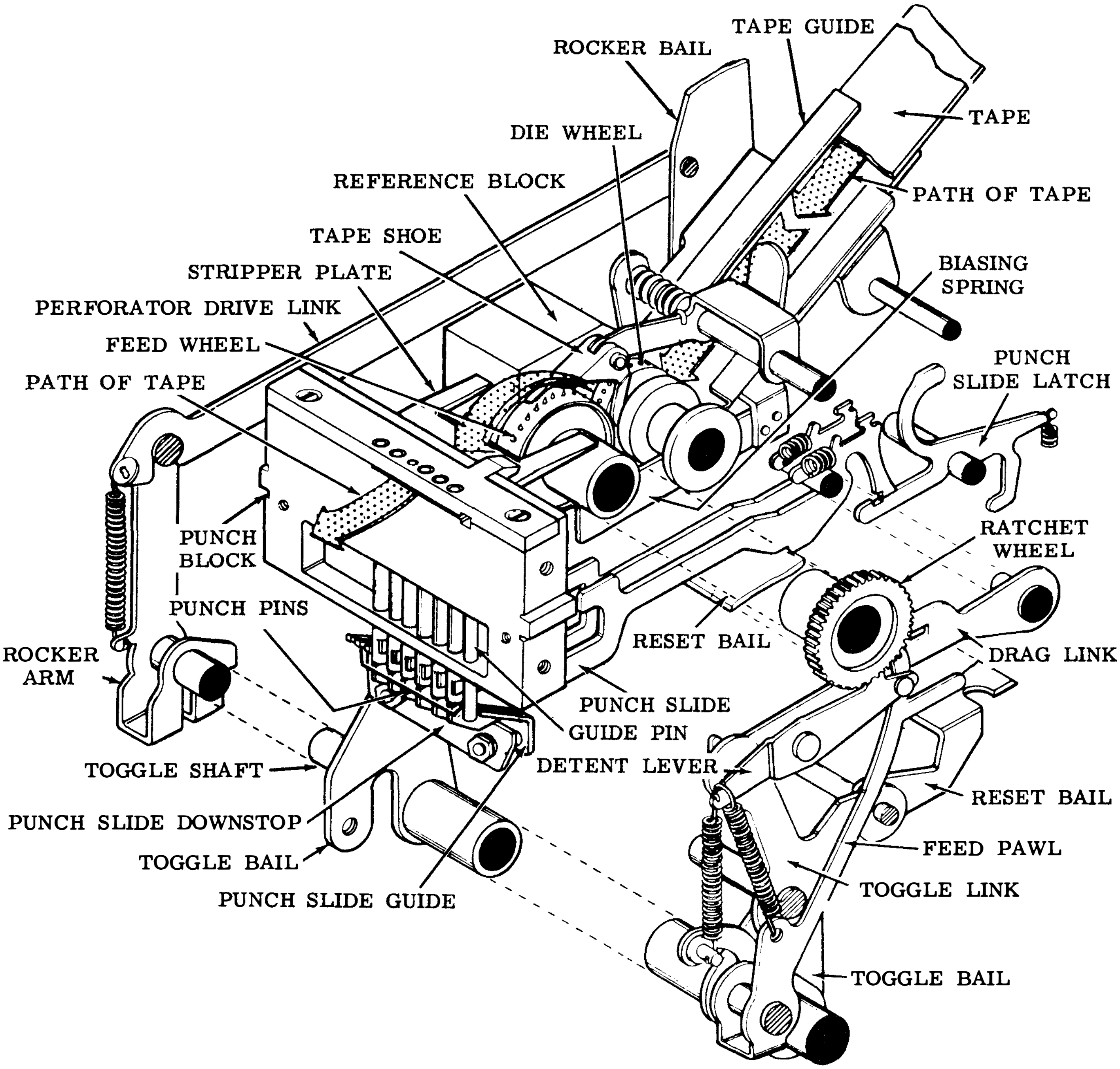


Figure 22 - Perforating Mechanism - Fully Perforated Unit

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-

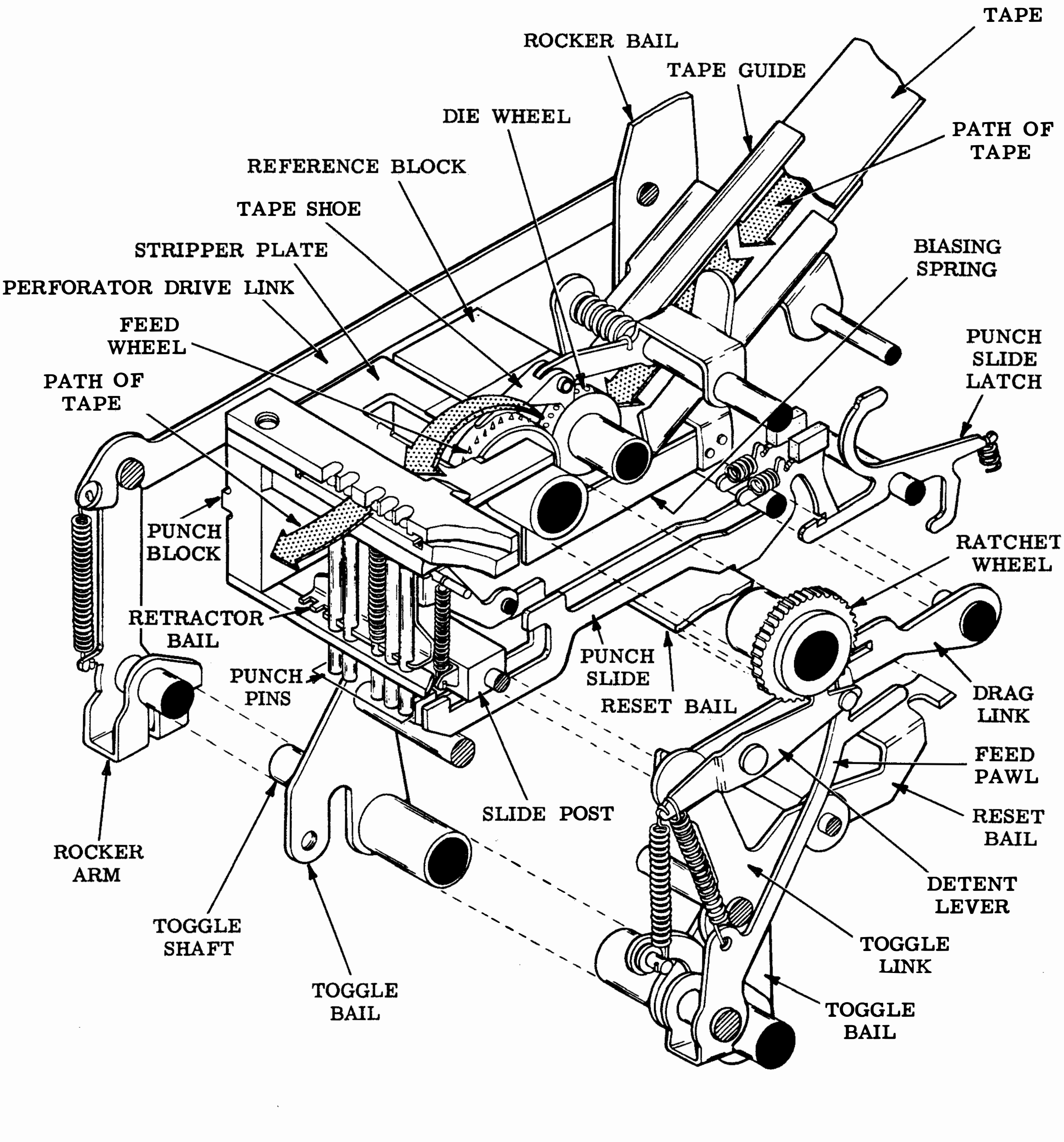


Figure 23 - Perforating Mechanism - Chadless Tape Unit

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.

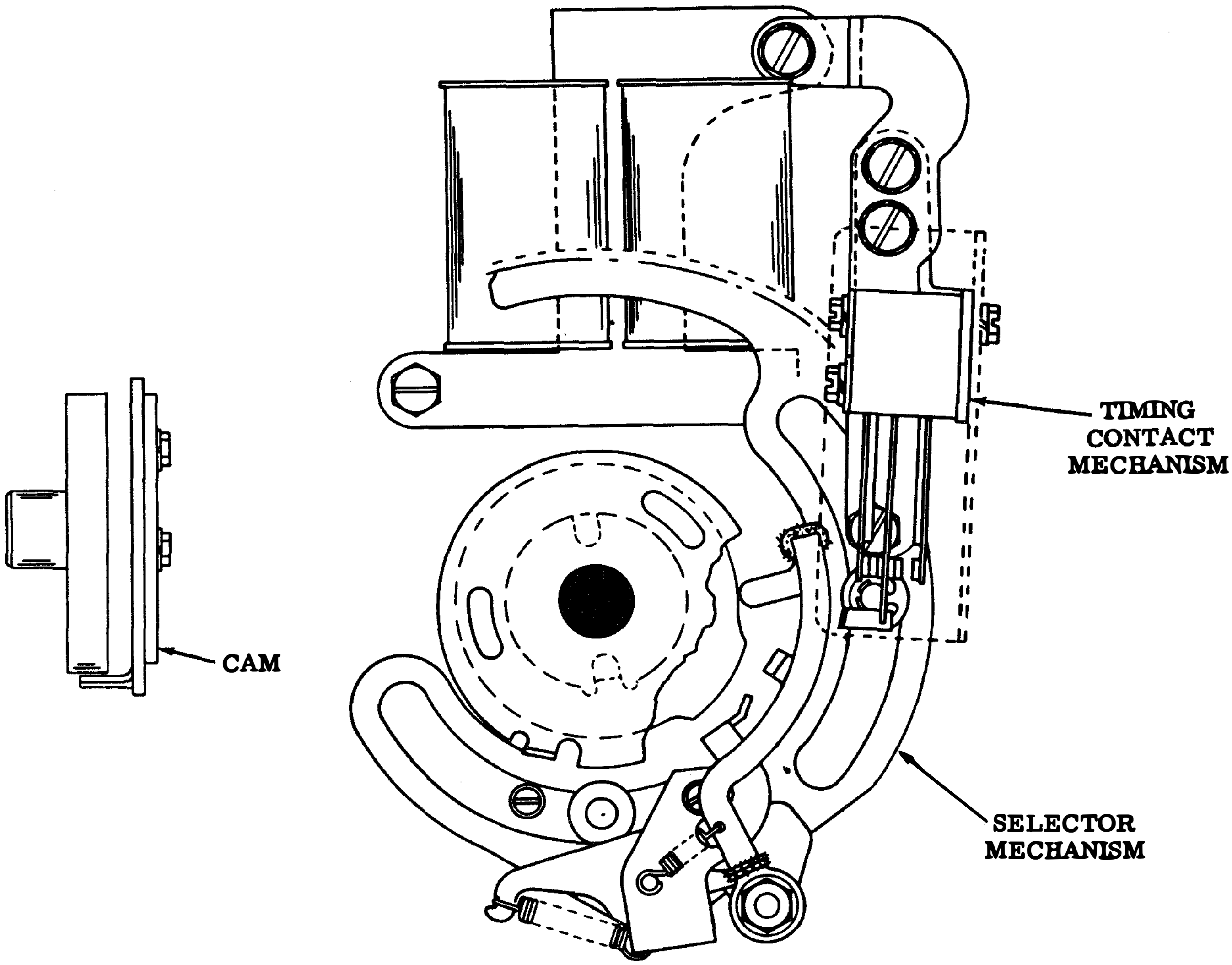


Figure 24 - Selector Magnet Timing Contacts

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.

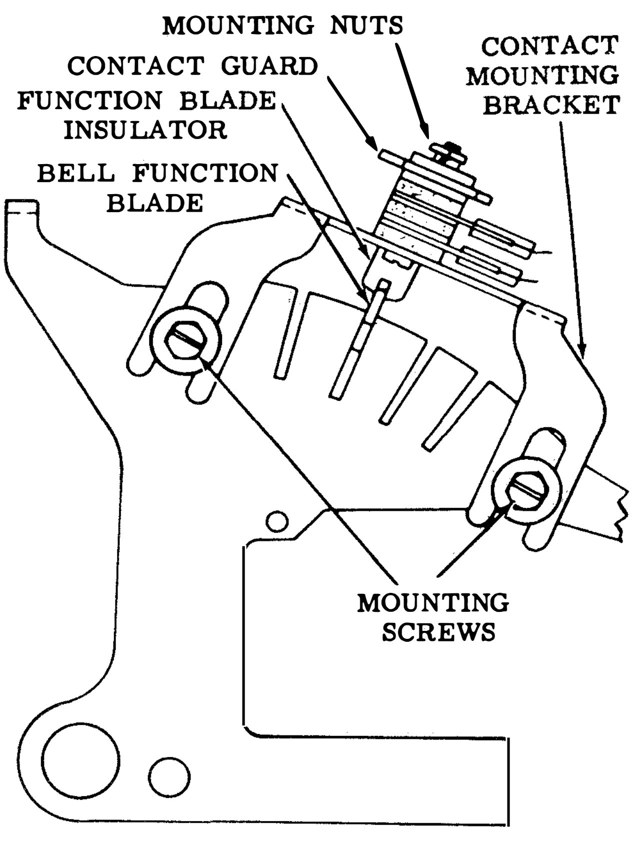


Figure 25 - Signal Bell Contacts

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-

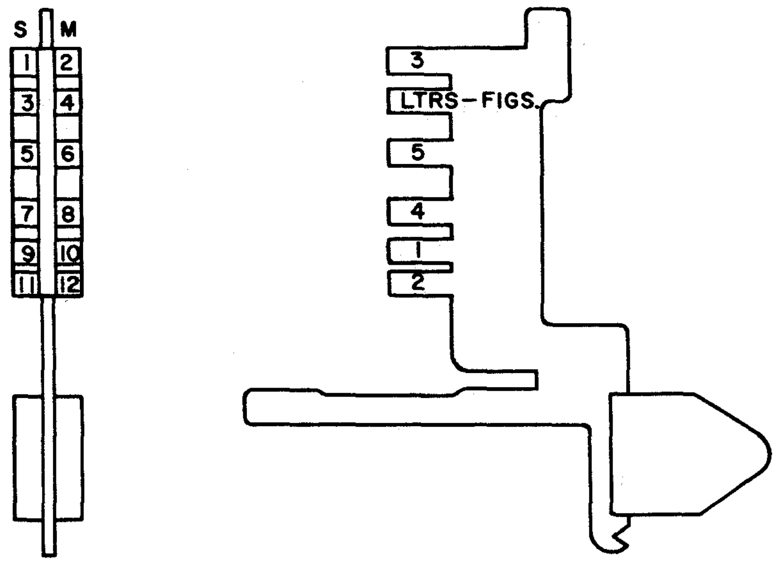


Figure 26 - Universal Function Blade

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.

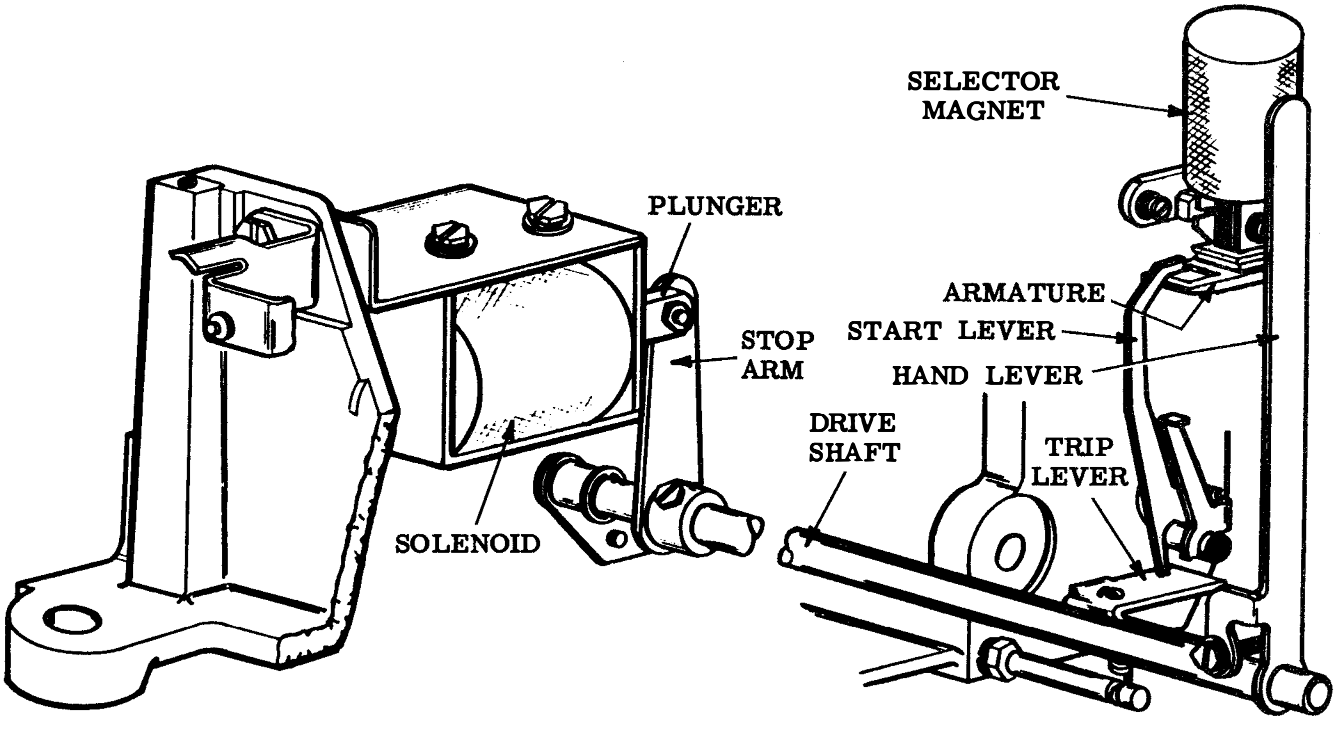


Figure 27 - Manual Interfering Letters Tape Feed Out Mechanism

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

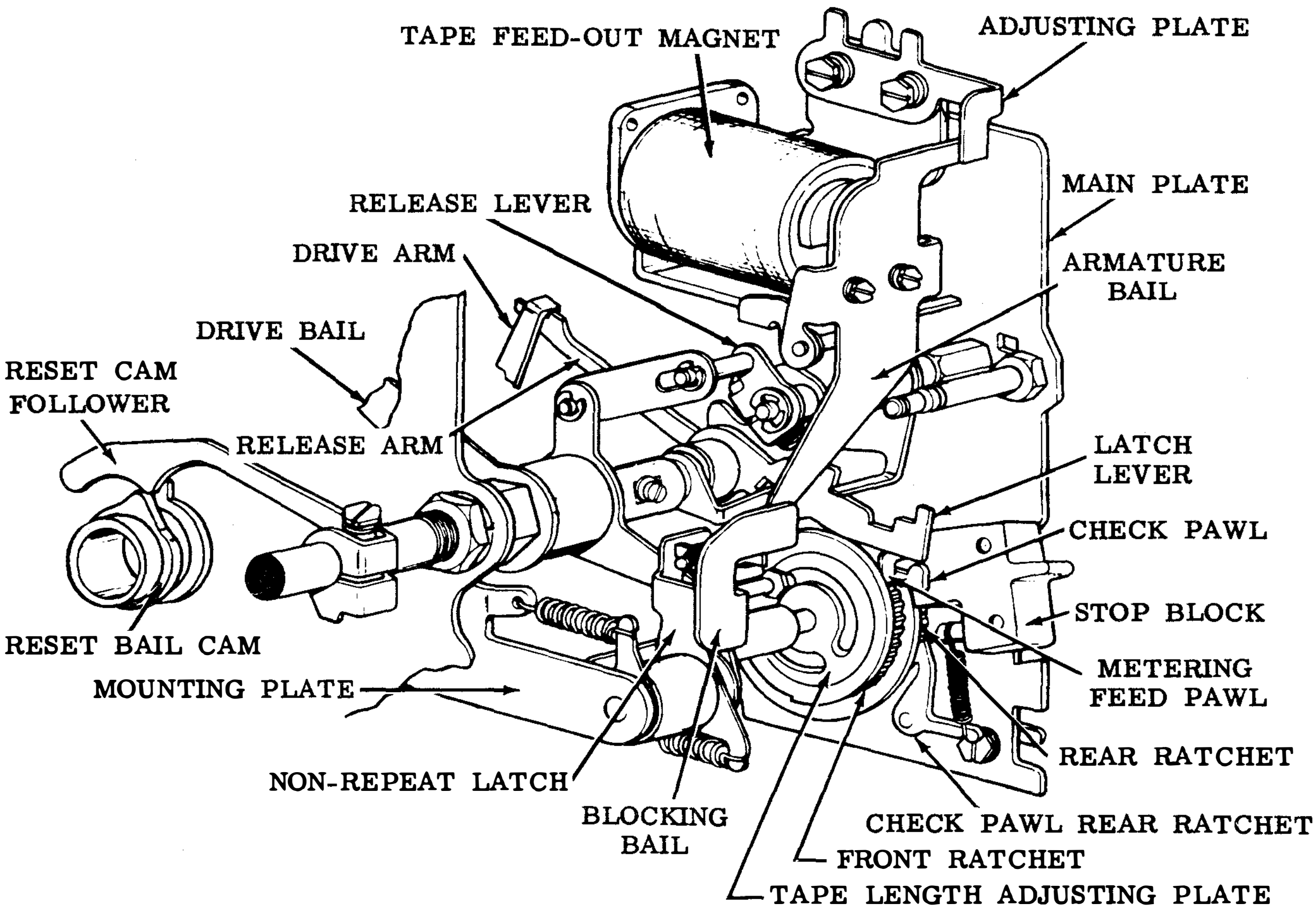


Figure 28 - Remote Control Non-Interfering Letters Tape Feed Out Mechanism

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.

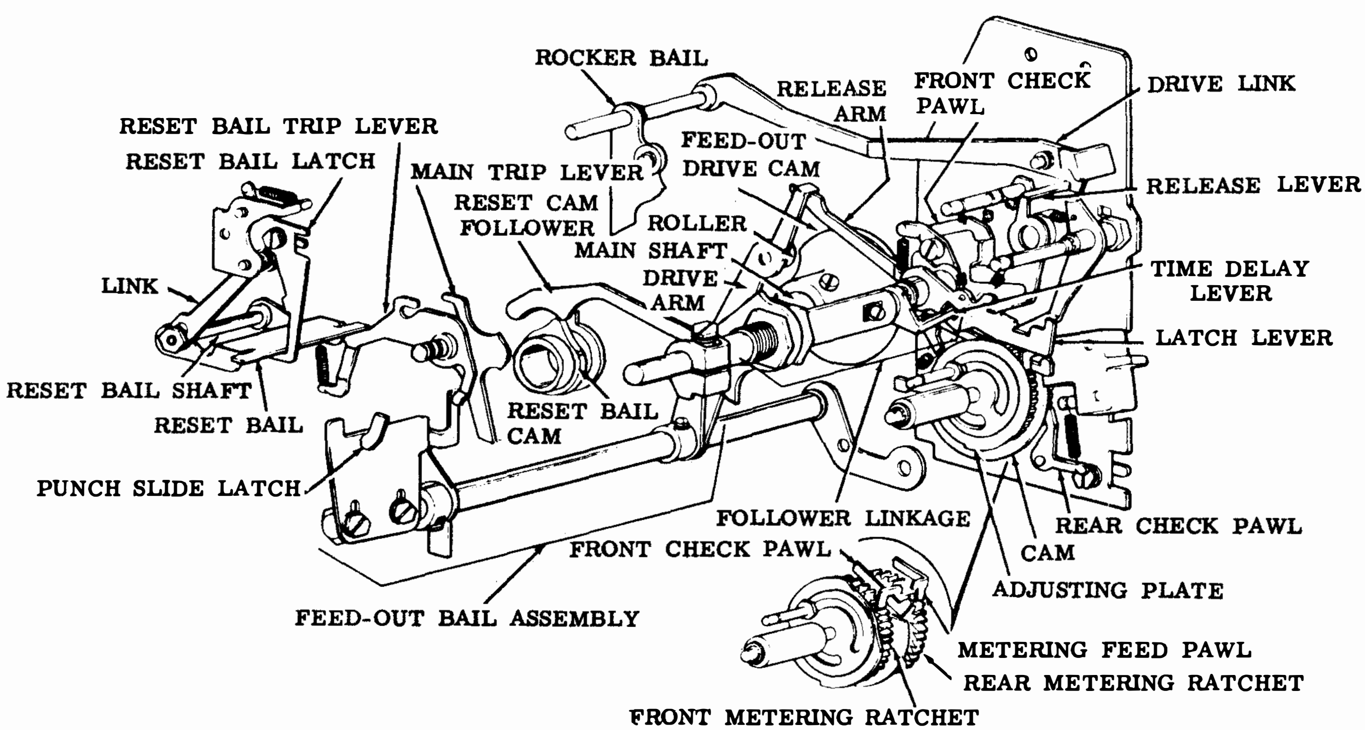


Figure 29 - Automatic Non-Interfering Letters Tape Feed Out Mechanism

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.

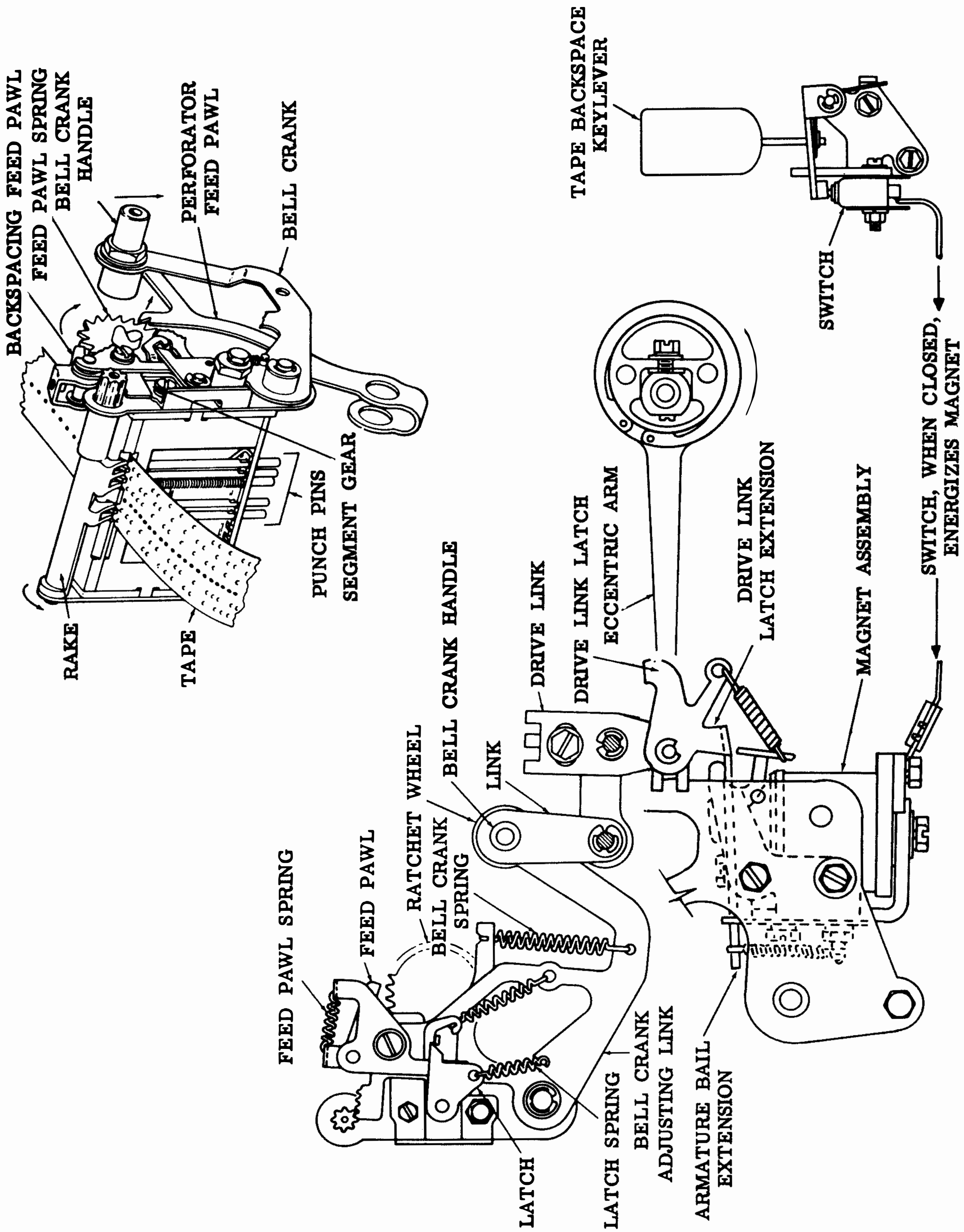


Figure 30 - Back Space Mechanisms

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 .

28 TYPING REPERFORATOR KEYBOARDS AND BASES

DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 The 28 typing reperforator keyboards provide mounting and transmission facilities for the 28 Keyboard Send-Receive Typing Reperforator Set. The 28 receive-only bases provide mounting facilities for 28 Receive-Only Reperforator Sets.

2. DESCRIPTION

KEYBOARD (Figures 1, 2 and 3)

2.01 The keyboard is a device for converting the mechanical action resulting from the depression of a key into electrical pulses that are transmitted over a signal line. In addition, it provides mounting facilities for a typing reperforator unit and a motor unit, as well as for a variety of accessories.

2.02 Motive force for activating the keyboard is derived from the motor unit by way of an intermediate shaft assembly. Electrical wiring to and from the keyboard is terminated in a 16-point connector and three terminal boards.

2.03 The keyboard is operable on line at the following speeds; 60, 75 and 100 words-per-minute; or 368, 460, and 600 operations-per-minute. Operating speeds are varied by interchanging sets of gears that are supplied as optional components. The signal generator contact box may be adapted to provide either polar or neutral signals. It may also be adapted for synchronous pulsed transmission.

2.04 The major sections of the keyboard are the base assembly, keyboard mechanism, and the signal generator mechanism.

A. Base Assembly

2.05 The base assembly provides mounting facilities for the keyboard and signal generator mechanisms, the intermediate gear shaft assembly, tape container, tape out switch, a base casting for support of the typing reper-

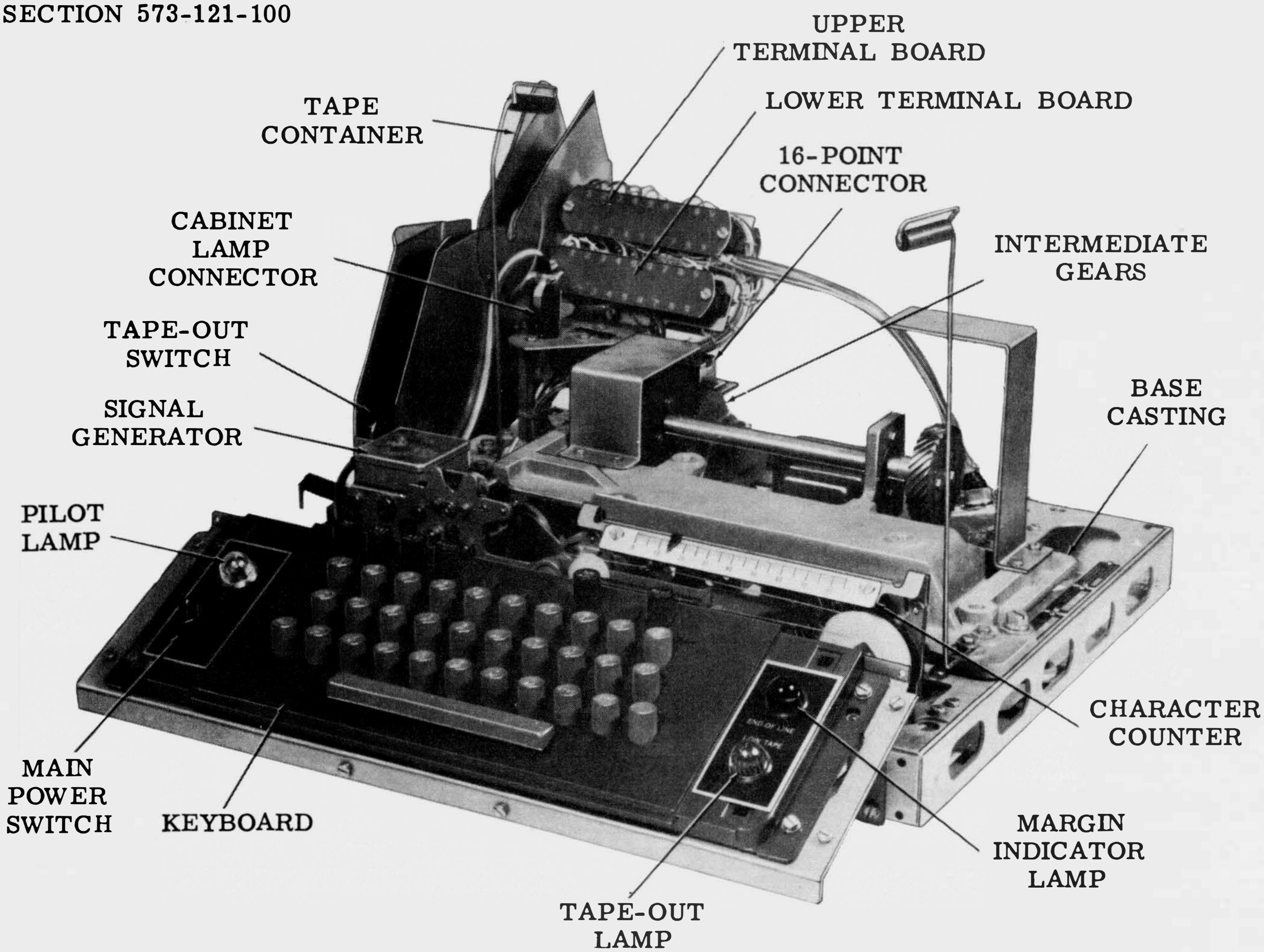

Figure 1 - Send-Receive Typing Reperforator Keyboard

forator unit, a character counter mechanism, and optional accessories.

2.06 The intermediate gear shaft assembly includes three gears and a shaft. The assembly transfers motive power through a gear to the typing reperforator unit. Through a shaft connected to this gear motive power is conveyed to a pair of helical gears which in turn drive the signal generator mechanism.

2.07 The character counter mechanism contains a scale which records in increments of one character the length of the message transmitted, up to the 72-character equivalent of a page-printed teletypewriter line. When 66 to 68 characters have been typed, an end of line indicator lamp lights. Depressing the carriage return (CAR RET) key returns the counter to zero and opens the lamp circuit.

B. Keyboard Mechanism

2.08 The keyboard mechanism contains the keytops, keylevers, code bars and levers and other code selecting parts that transform the intelligence contained in the manual selection of a keytop into a teletypewriter code combination, represented by code bar positions. The code combination for the selected character is transferred from the code bars through transfer levers to the signal generator mechanism. In addition, this mechanism contains a rotary-type main power switch and power, tape out, and margin indicator lamps.

2.09 The keytops are positioned in the conventional three-bank arrangement, with numerals, punctuation marks, and special symbols available in upper case positions. The space bar is located centrally below these keys. Keytops for local operations provided above the

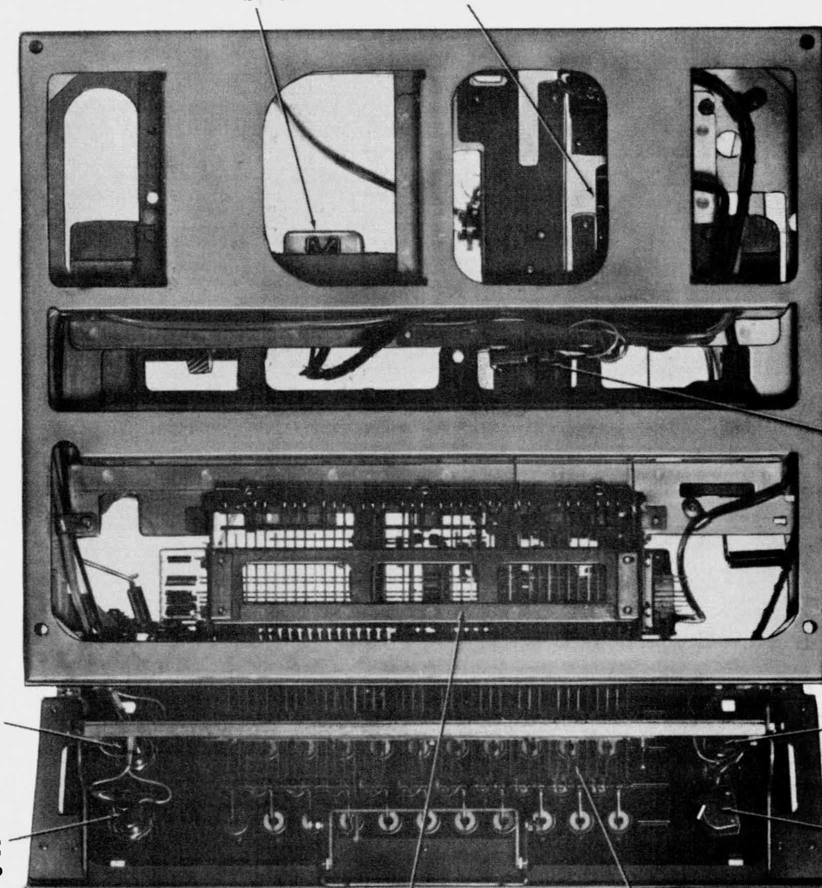

Figure 2 - Send-Receive Typing Reperforator Keyboard (Bottom View)

standard keytops for facility of operation. This row has provisions for 11 keys. A wedge lock assembly prevents the simultaneous depression of more than one keytop.

C. Signal Generator Mechanism

2.10 The signal generator mechanism generates the start-stop teletypewriter signal. It consists of, basically, an enclosed contact box containing a set of fulcrum-type transmitting contacts, a transfer bail that controls the opening and closing of the contacts, selector levers that engage the transfer bail in a sequence determined by the position of the code bars, and a multi-lobe cam which determines the pulse duration of the signal code elements. A shaft, which mounts a gear and clutch, receives motive power to drive the mechanism from a gear on the intermediate gear shaft assembly.

2.11 The contact box may be adapted to generate either neutral or polar signals, and may be equipped with an rf or arc suppression network.

BASES

2.12 The typing reperforator bases are available in several variations. They provide a foundation for a motor unit and either one or three typing reperforator units, and also for

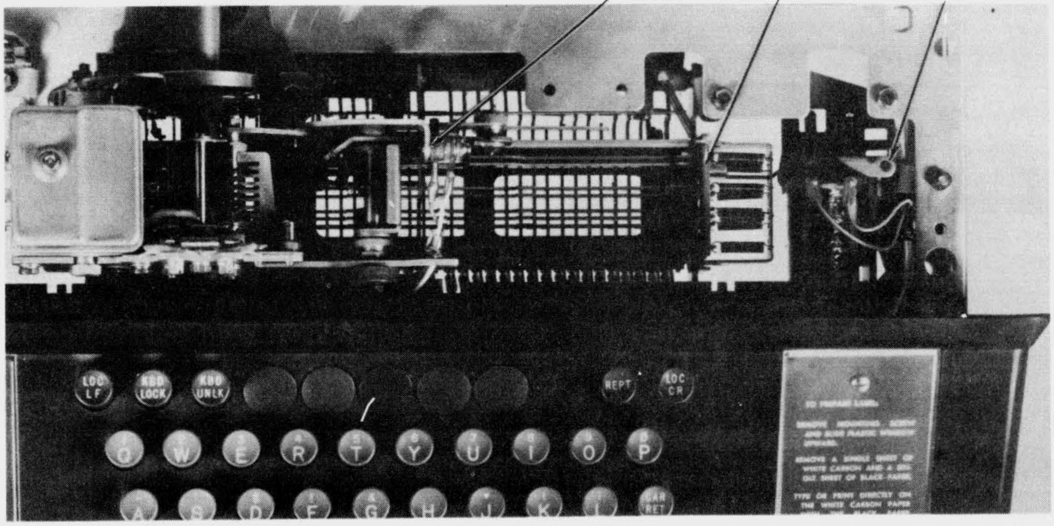

Figure 3 - Send-Receive Typing Reperforator Keyboard (Top View)

electrical and mechanical operational devices and accessories. Four typical bases are described below.

A. Single-Plate Base

2.13 This base contains a plate that rests on four metal feet and serves as a foundation for the other elements. Wiring, a power switch, a four-point terminal board, and a three-point power connector are part of the power circuitry. All other wiring terminates in a 32-point connector mounted by a bracket at the rear of the plate. Three nine-point terminal boards provide intermediate connecting points for this wiring which includes two selector magnet leads. The typing reperforator unit is mounted by four tapped holes at the left front of the plate. The motor unit is supported by three posts and an adjusting plate. Motion is transferred from the motor unit to the typing reperforator unit by a single-speed drive mechanism (Fig. 7). Gear sets may be interchanged to obtain different operating speeds. A tape container with a roller, a wire guide and a wooden filler for a tape roll is attached to the extreme right of the plate. A low tape mechanism incorporating two switches which may be connected to visual or audible alarms is located in the rear of the container. The base may be carried by a front handle and the connector mounting bracket which serves as a rear handle.

B. Double-Plate Base (Fig. 4)

2.14 In this base, an upper plate is separated from a somewhat larger lower plate by rubber vibration mounts. The lower plate rests on four leather feet and has two handles and four slots for mounting a cover. Wiring, a power switch and a three-point connector are part of the power circuitry. All other wiring terminates in a 16-point connector. Two nine-point terminal boards provide intermediate connecting points for all wiring except two selector magnet leads. A clamp with keeper secures cables where they leave the base. The tape container and the mounting facilities for the motor unit and the typing reperforator unit are identical to those of the single-plate base (see above). A low tape lamp is mounted by a bracket on the tape container. Motion can be transferred from the motor unit to the typing reperforator unit through a single-speed drive mechanism (Fig. 7). Gear sets may be interchanged to obtain different speeds, available as an optional feature, a variable-speed drive mechanism, which permits manual selection of operating speeds (60, 75, or 100 wpm) by movement of a lever, may be used with this base (Fig. 20).

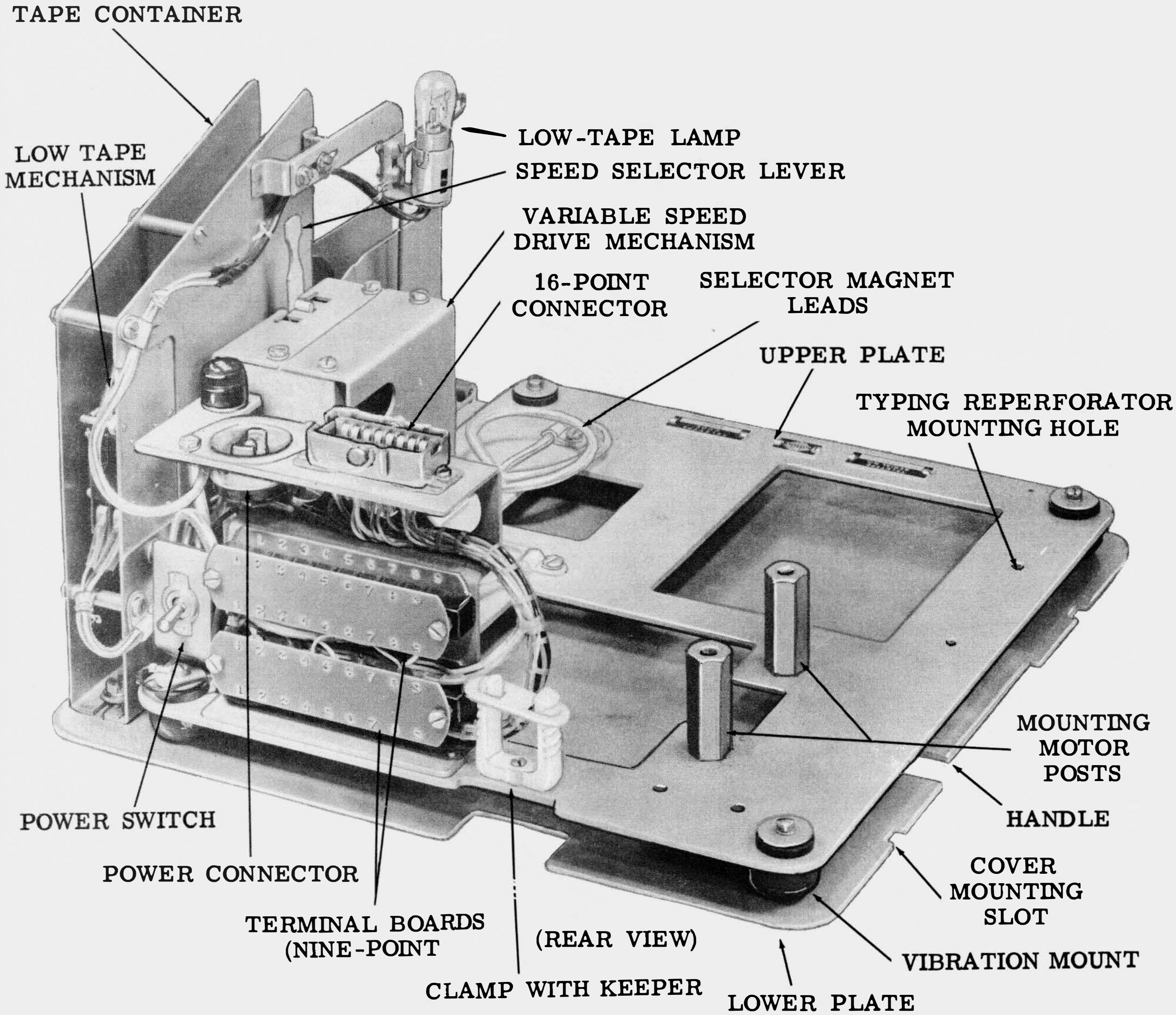

Figure 4 - Double-Plate Receive-Only Base

C. Miniaturized Base (Fig. 5)

2.15 This base is similar to the base described in 2.14 in that it is of double-plate construction and contains essentially the same features. It is, however, lighter in weight and smaller in size, and the mechanisms are arranged differently to conserve space.

2.16 The base contains two rectangularly shaped plates, separated by vibration isolators, and equipped with four feet. A casting provides mounting facilities for a motor unit. A tape container, equipped with a tape out switch, is supported by brackets above the motor unit mounting. A control panel contains a main power switch, a tape out lamp, and provisions for a tape feed out switch. Its mounting bracket also contains a fuse holder. Terminal boards, cable clamps, a reperforator connector, and the necessary electrical wiring are included. The base is normally equipped with a variable speed drive mechanism, which permits manual selection of operating speeds (60, 75, or 100 wpm) by movement of a lever. A single-speed drive mechanism with which speed changes are made by changing gears may be used with this base.

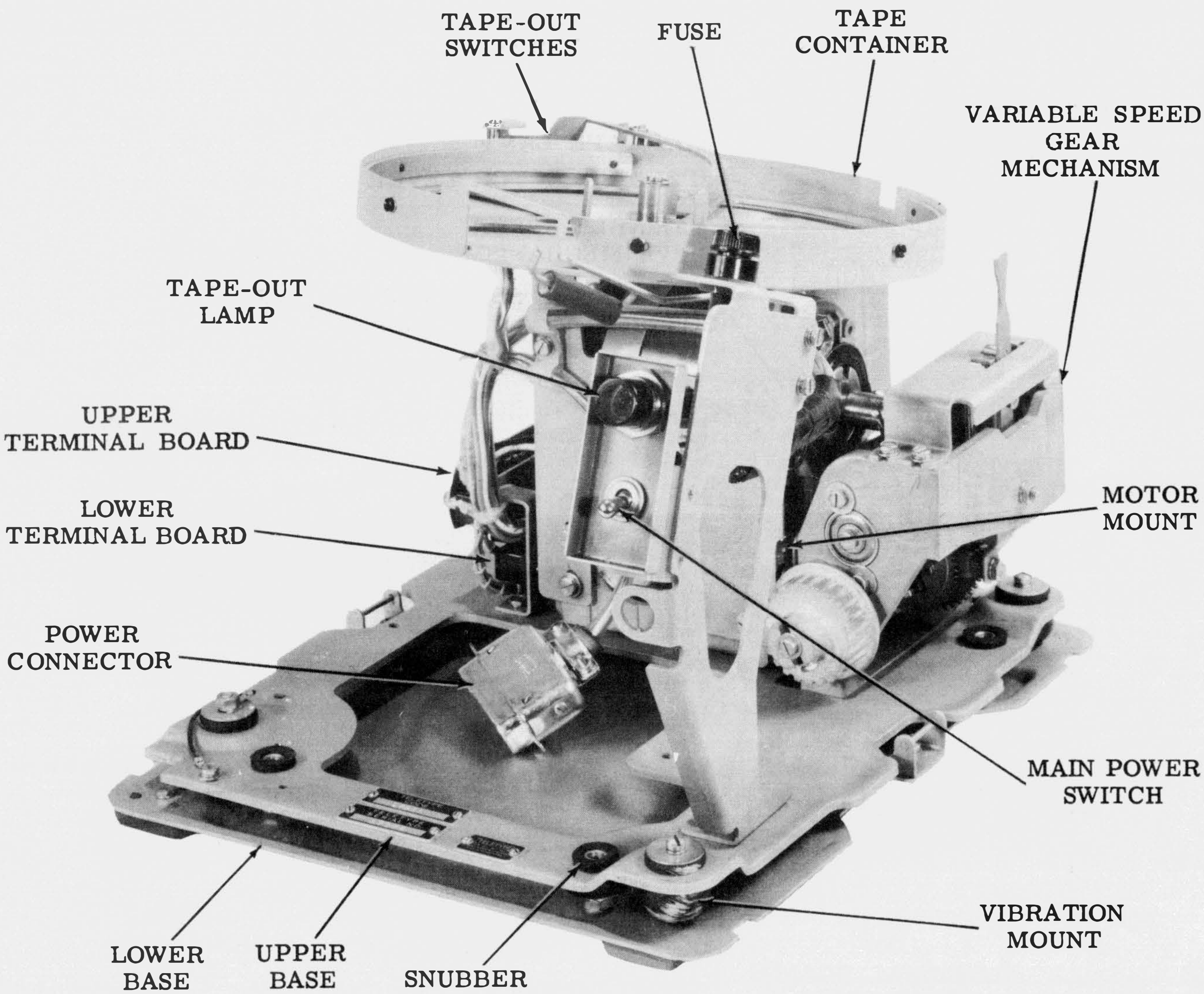

Figure 5 - Miniaturized Base

D. Multiple Reperforator Base (Fig. 6)

2.17 This base provides mounting facilities for three typing reperforator units and one motor unit, and for the necessary auxiliary equipment. A plate upon which the components are installed is separated from an oil pan by resilient mountings. Side rails are provided for installation of the base in a cabinet. Posts on an adjustment plate are provided for mounting a motor unit. Three tape containers equipped with tape out switches, a 14-point connector, terminal blocks, a main power switch, are also included. Three chad containers are provided on bases accommodating fully-perforated tape output typing reperforator units. The typing reperforator units, which are mounted near the front of the base, receive rotary motion from the motor unit through a cross-shaft assembly and timing belts. On some bases, intermediate gear assemblies transfer the motion from the cross shaft to the typing reperforator units via timing belts. The units may operate at a common speed or at independently varied speeds. Speed changes are made by interchanging gears at the motor unit and cross-shaft assembly; by changing the sprocket and timing belt at the reperforator units; or on bases so equipped, by changing gears in the intermediate gear assemblies.

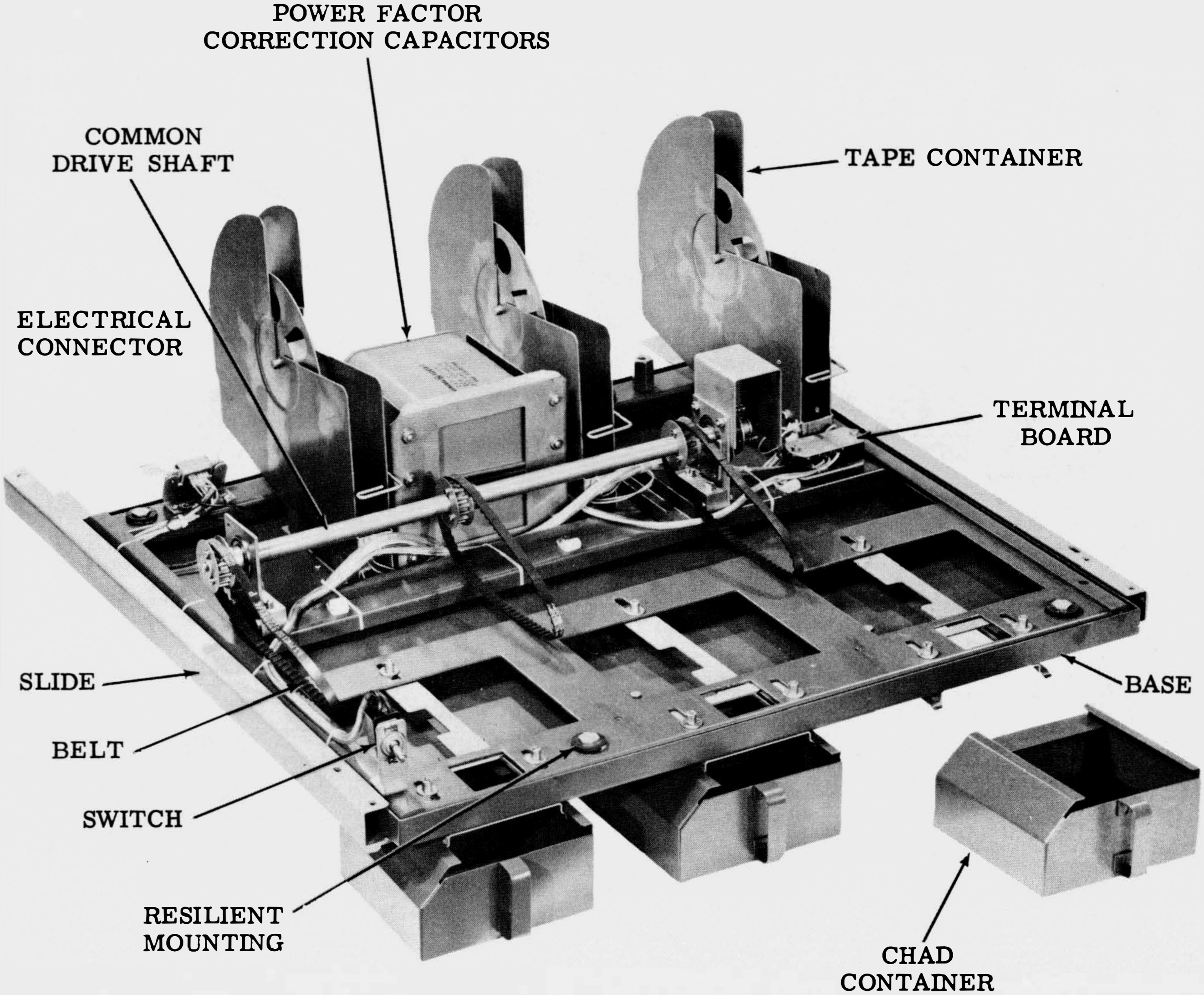

Figure 6 - Multiple Reperforator Base

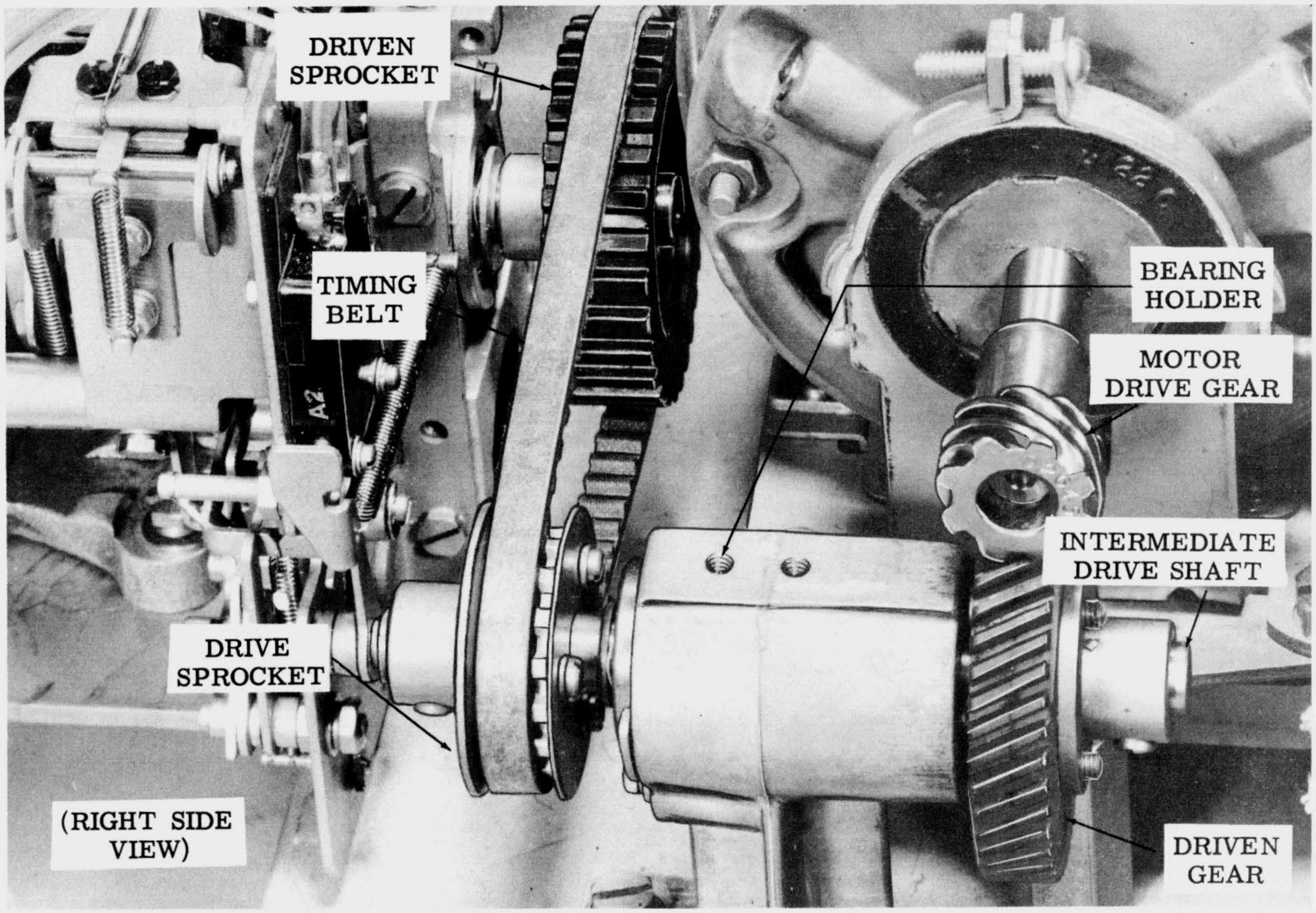

Figure 7 - Single-Speed Drive Mechanism

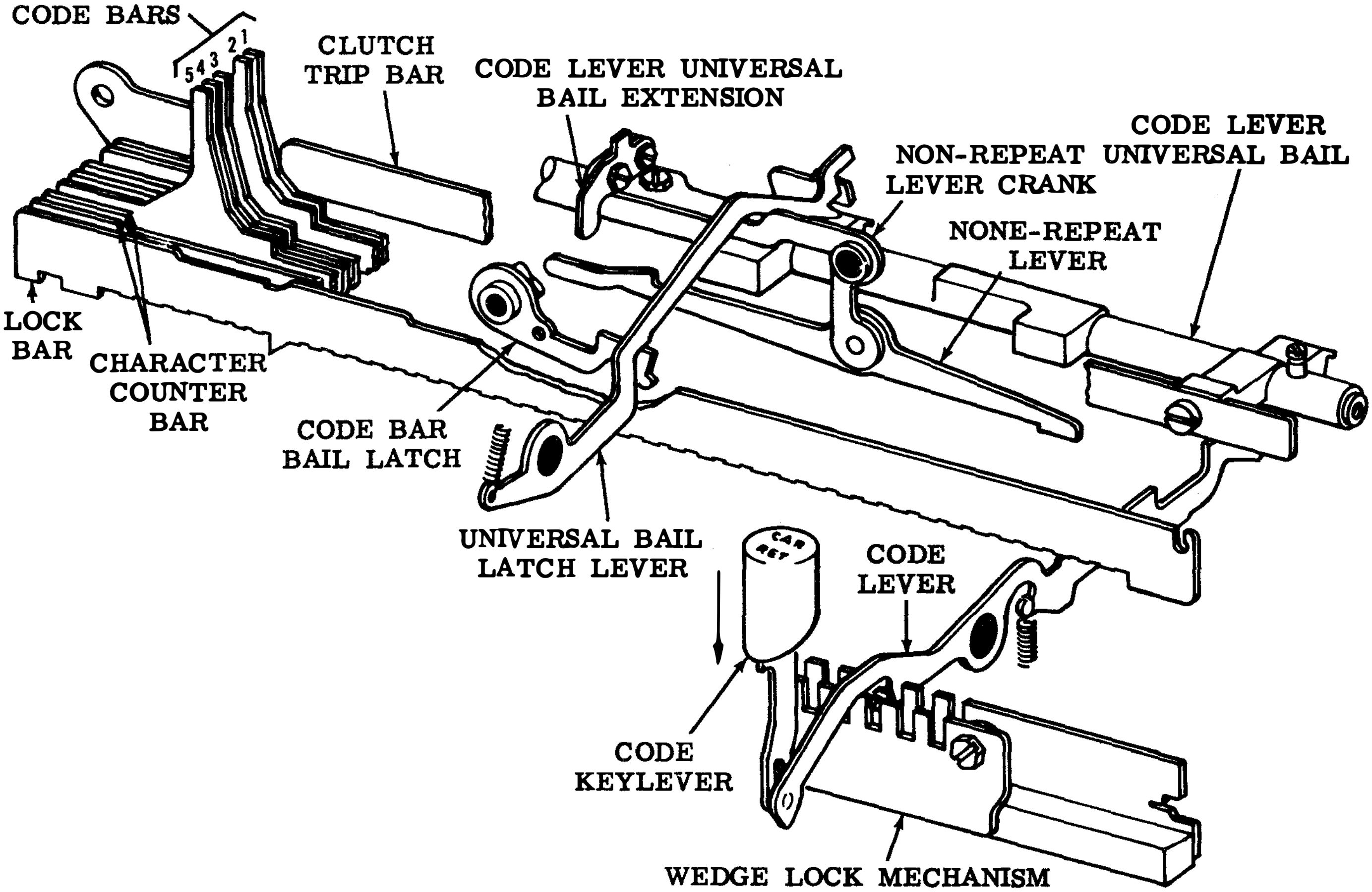

Figure 8 - Code Bar and Code Lever Universal Bail Mechanism

3. SEND-RECEIVE KEYBOARD

SEQUENCE OF OPERATION

A. Depression of Keys (Figs. 8, 10, 11 and 12)

3.01 As a code selecting keytop is depressed, the corresponding code lever rotates about its pivot point. The rear end of the code lever comes up and rotates the universal bail. The extension arm on the top of the universal bail moves out of engagement with the step at the rear end of the universal bail latch. This occurs when the key and corresponding code lever are about two-thirds of the way toward full stroke. The universal bail latch then moves downward under spring force developed by the universal bail latch spring. As this latch comes down, it strikes the code bar reset bail latch lever and carries it downward. When the corner of the reset bail latch descends beyond the center line of the needle bearing (mounted on the reset bail), the various spring forces acting on the reset bail cause it to swing to the right. This in turn allows the various code bars to move to the right (in the direction of the spring forces acting on each code bar). During this time, the code lever is moved up to its full position. Therefore, the code lever may stop some of the code bars from moving to their extreme right hand position. The code bars have vertical extensions that engage a curved part of the signal generator transfer levers. Those code bars that are permitted to move to the extreme right also move the corresponding transfer lever to the right. However, those code bars that are stopped, because their teeth engage the actuated code lever, do not quite touch or move their corresponding transfer levers. Therefore, these transfer levers remain in their normal left hand position (Figure 12).

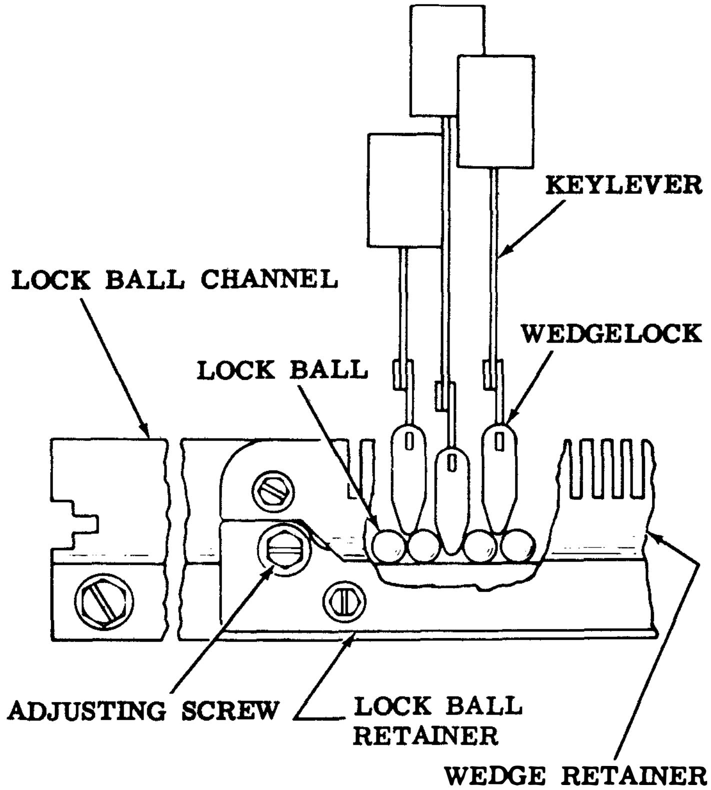

Figure 9 - Wedge Lock Mechanism

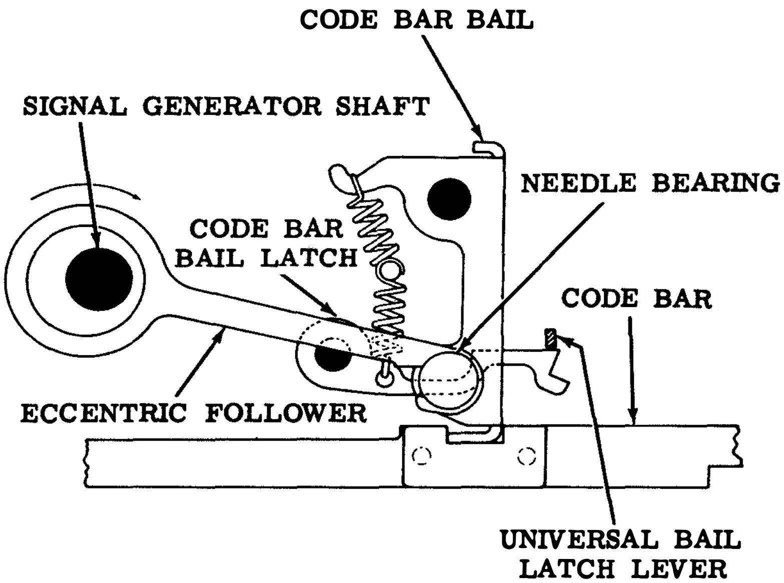

Figure 10 - Code Bar Bail Mechanism

3.02 A locking wedge is mounted on the projection of the lower position of all code levers and function levers (Fig. 9). When the lever is operated, its locking wedge moves downward between the lock balls in the lock ball channel preventing the simultaneous operation of more than one keylever.

3.03 Simultaneously with the trip-off of the reset bail and the movement of the code bars to the right, the clutch trip bar (located in the rear slots of the code bar guides) moves to the right (Fig. 10). This clutch trip bar engages the clutch stop lever and moves it out of latch with the clutch stop lug. Up to this point, all of the action has been caused by manual operation of the keytop and its associated code lever (Figure 8).

3.04 The motor unit supplies the mechanical power to drive the associated typing reperforator unit and the signal generator shaft. Refer to the appropriate section for description and principles of operation for the motor unit.

B. Positioning of Code Bars (Figs. 11 and 12)

3.05 Once the clutch is tripped, it rotates continuously as long as the keyboard is turned on. Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam begins to rotate (clockwise when viewed from the front of the keyboard).

3.06 The arrangement of the cam assembly is such that the third cam from the rear begins to push downward on its corresponding transfer lever. At almost the same time, the eighth cam from the rear begins to move the transfer lever locking bail upward. The blade portion of this locking bail goes up beside a downward projection on each transfer lever. The locking projection is left or right of the locking bail, depending upon the position of the transfer lever (as set up by the permutation action of the code bars). Thus, in the first few degrees of cam rotation, the permutated position of the transfer levers is located into position and the code bars are free to be reset in their normal latched position.

3.07 The cams and their corresponding transfer levers are numbered from rear to front. The number 3 cam engages its transfer lever first; and moves it down. Since the start pulse is always spacing, no code bar is required to engage this lever and it is always held to the left by its spring. Therefore, as the third cam moves the lever down, the hook at the upper right side of the transfer lever engages the right

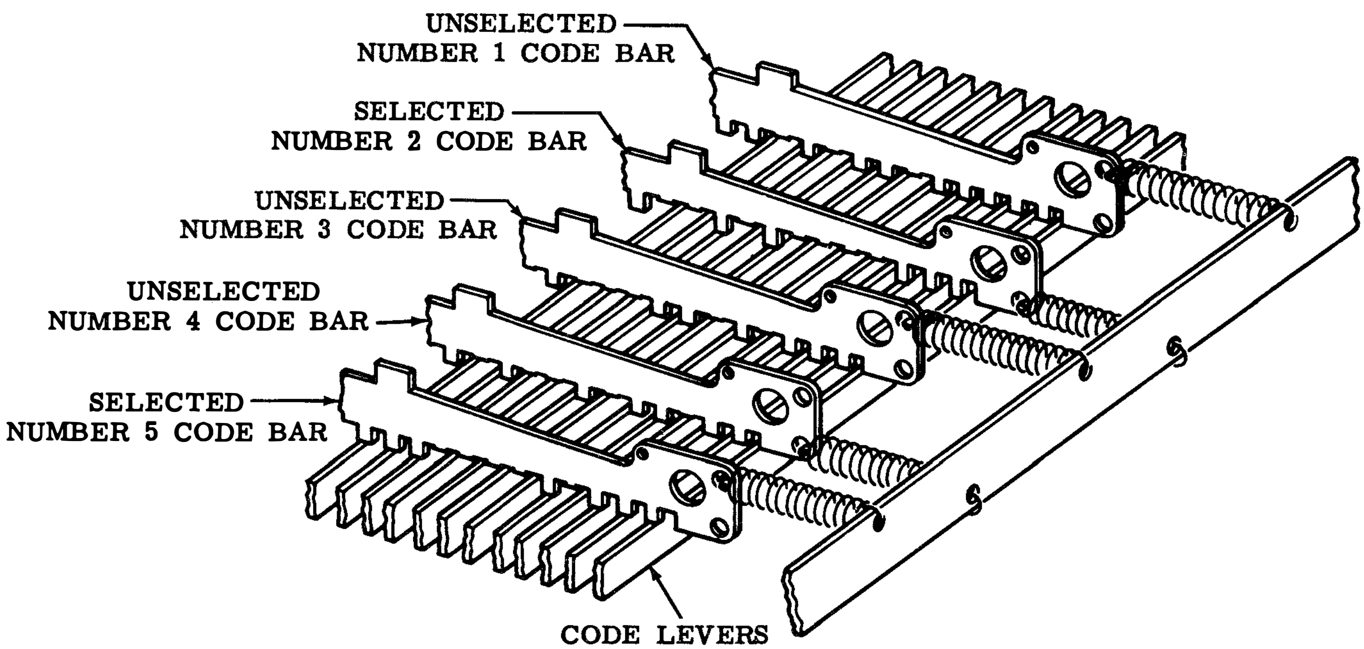

Figure 11 - Code Bar Selection

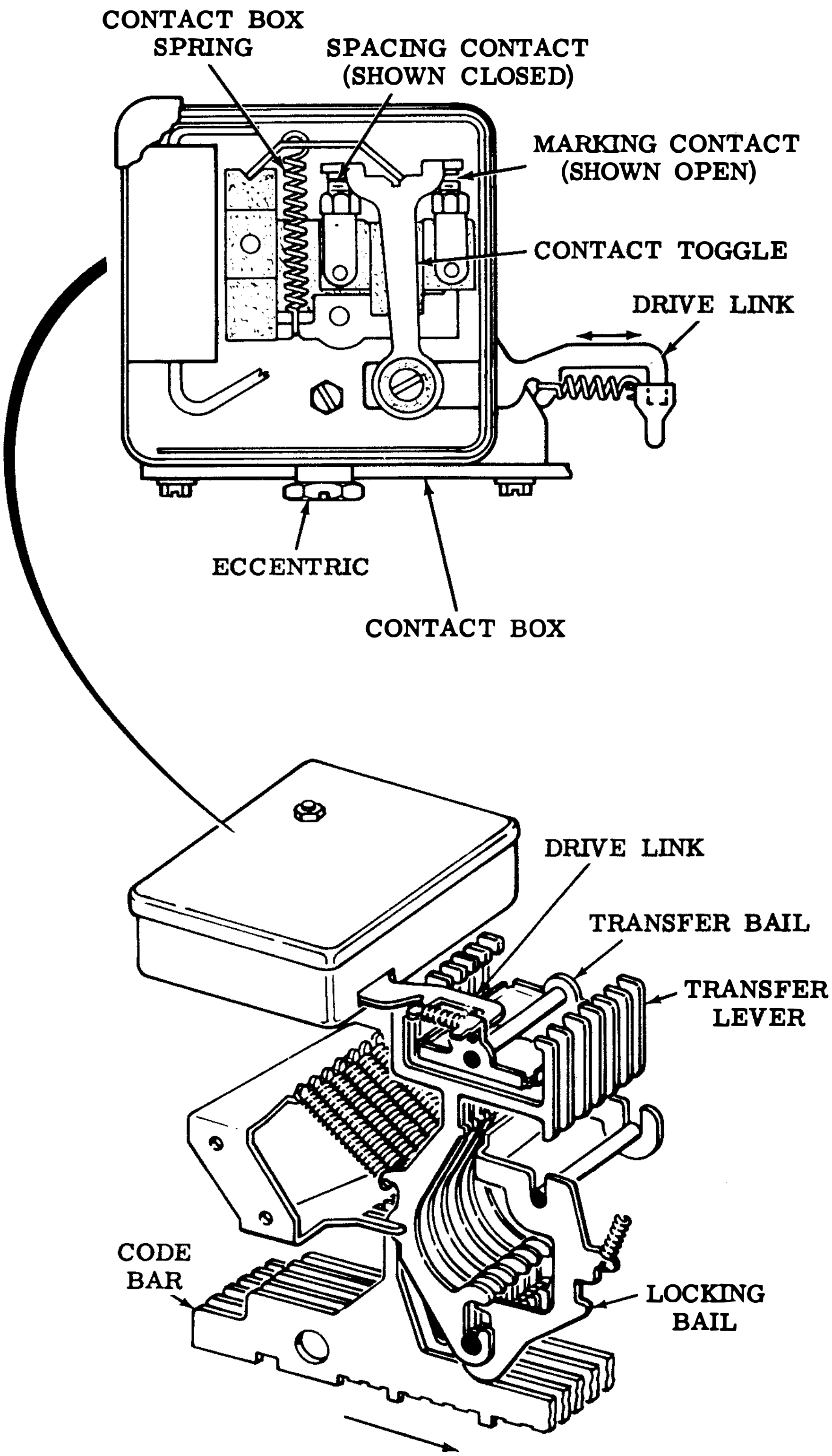

Figure 12 - Transfer Lever Mechanism and Contact Box Mechanism

side of the transfer (rocker) bail. This tips the transfer bail to the right and pulls the contact drive link to the right. The resulting action of the contact toggle is such that the left set of contacts acts as a pivot and the right hand contacts begin to open. The right hand contacts control the signal current in single contact type operation. When these contacts are open, the result is no current in the signal circuit. Therefore, the first pulse, the start pulse of any character code is a spacing (no current) pulse.

3.08 The number 1 cam and the transfer lever move downward next. In turn, the upper left hook of the associated transfer lever pulls down on the rocker bail (holding it to the right or tilting it back to the left). This pushes the drive link to the left (or right) resulting in closing the right (or left) contacts and allowing a marking (or spacing) pulse to be transmitted.

3.09 Similarly, the remaining transfer levers 2, 4, 5 and 6 are pulled downward by their respective cams. The resulting pulse is marking if the transfer lever is to the right or spacing if it is to the left. The number 7 transfer lever is held to the right by a stop pin. Therefore, the last pulse (the stop pulse) is always marking (current on).

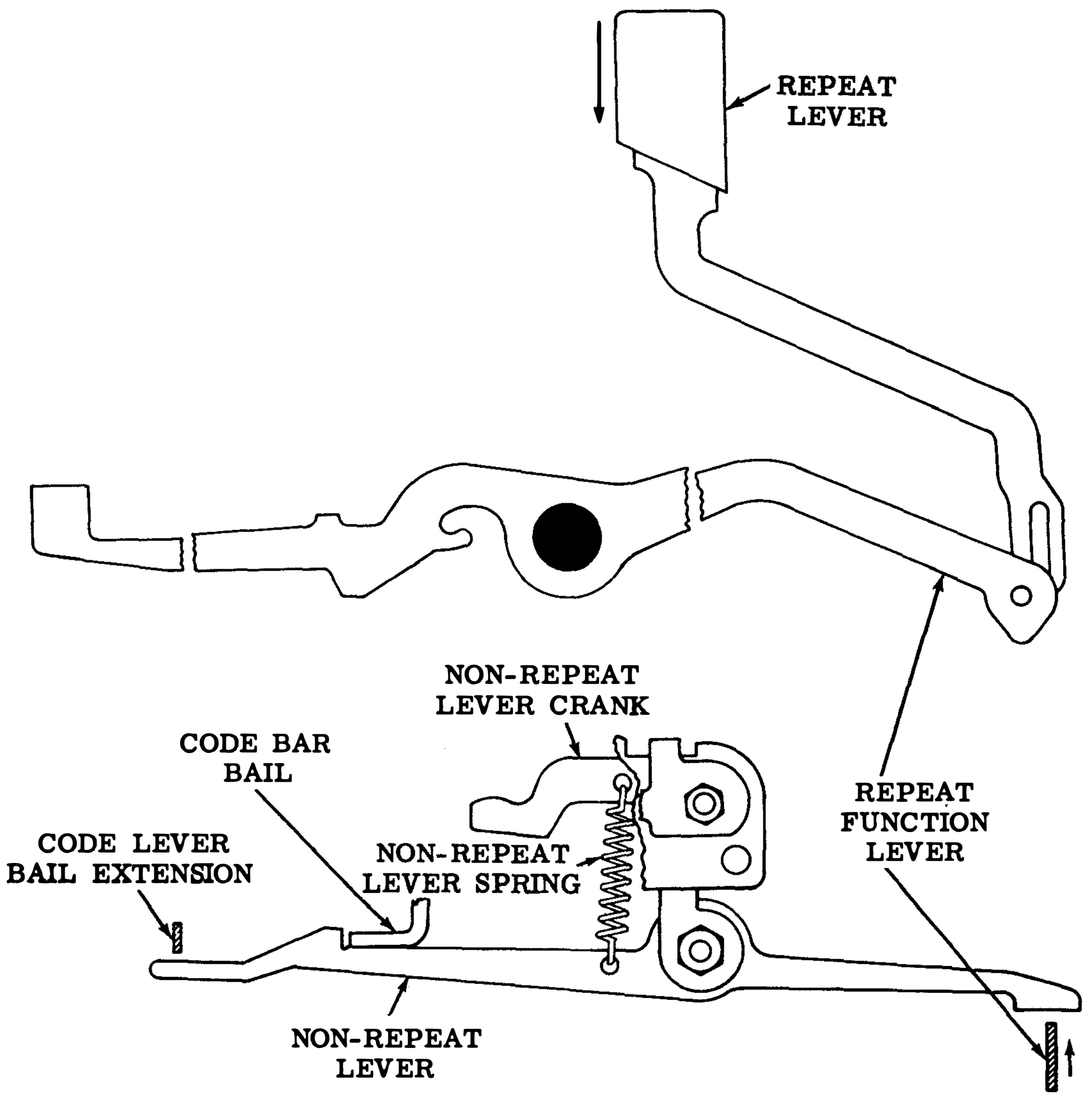

Figure 13 - Repeat Mechanism

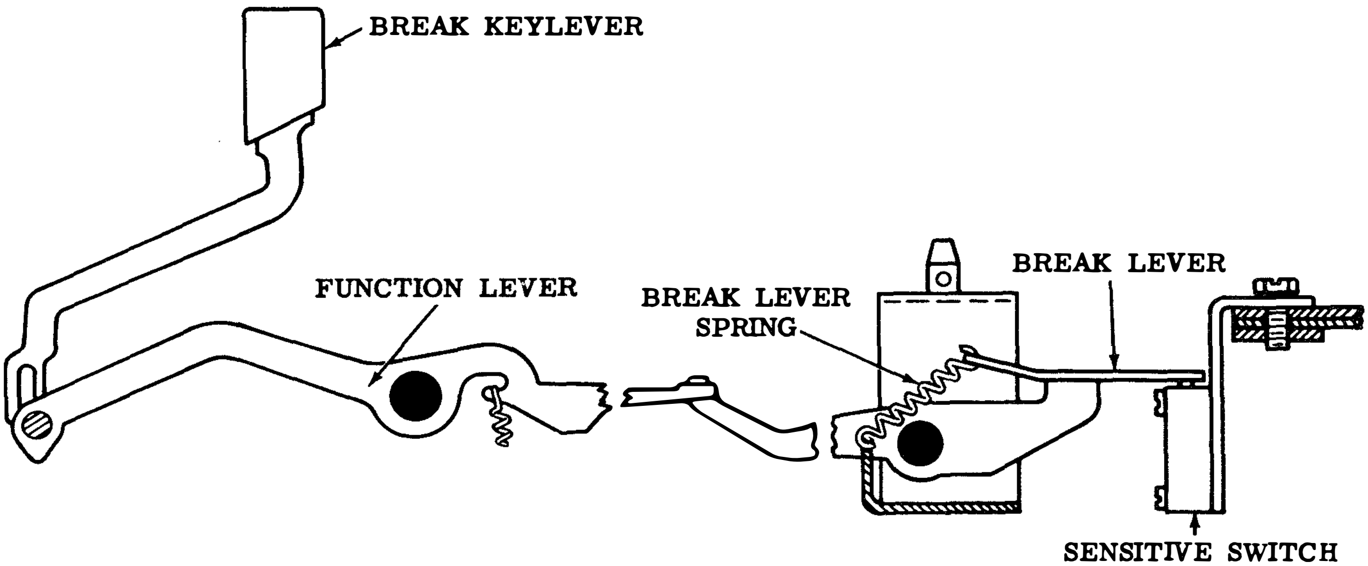

Figure 14 - Electrical Line Break Mechanism

3.10 The locking bail is actuated by the number 8 cam lobe. This cam begins to move the locking bail up into its locking position almost as soon as the cam starts to rotate (Figure 12). Full lock position occurs approximately at the half-way point of the start pulse (48-1/2 degrees of rotation). The dwell on the eighth cam from the front holds the lock bail in its lock position until after the beginning of the number 5 pulse. Then the cam pulls the bail down out of lock, and all transfer levers are free to return to their initial positions at a point about halfway through the stop pulse.

C. Resetting of the Code Bars (Figs. 10 and 13)

3.11 Reset of the code bars is accomplished by means of an eccentric on the front of the cam assembly, which drives an eccentric follower arm (Figure 10). This arm engages a stud on the side of the reset bail and pulls the reset bail to the left as the cam rotates. At the peak position of the reset eccentric, the code bar reset bail latch is clear of the needle bearing stud. This permits the latch spring to pull the latch up into locking position and the code bar reset bail is latched as the eccentric drives the follower arm back to its initial position. As the code bar reset bail is moved to the left (into reset), it engages projections on the permutation code bars, clutch trip bar, and a step on the non-repeat lever. Thus, all of these elements are moved to the left into latched reset position.

3.12 The reset eccentric is positioned in angular relationship to the remainder of the cam so that pick-up of the code bars and non-repeat lever begins. Just after the number 2 pulse begins, near the end of the start pulse, the code bars have been moved to the left a sufficient distance to permit the code lever (that determined the permutation) to drop down out of the universal bail. This permits the universal bail to rotate forward and move the non-repeat lever down and off the reset bail. At the same time, the extension of the universal bail moves in under its latch lever and holds this latch lever up almost in the same position that the pawl on the non-repeat lever had held it in the early reset movement. With the universal bail latch held up, the reset bail continues to move to the left. Full rest occurs at approximately 180 degrees of cam rotation (1/4 through the number 3 pulse). As soon as the universal bail is permitted to move forward, a second keytop can be depressed. However, from that point on, full time of cam rotation must expire before a third and successive keytops can be operated.

FUNCTION KEYS

A. Repeat Mechanism (Fig. 13)

3.13 Operation of the REPT keylever simultaneously with one of the keylevers in the three lower rows or the space bar disables the non-repeat mechanism and causes the character or function selected to be repeated as long as the

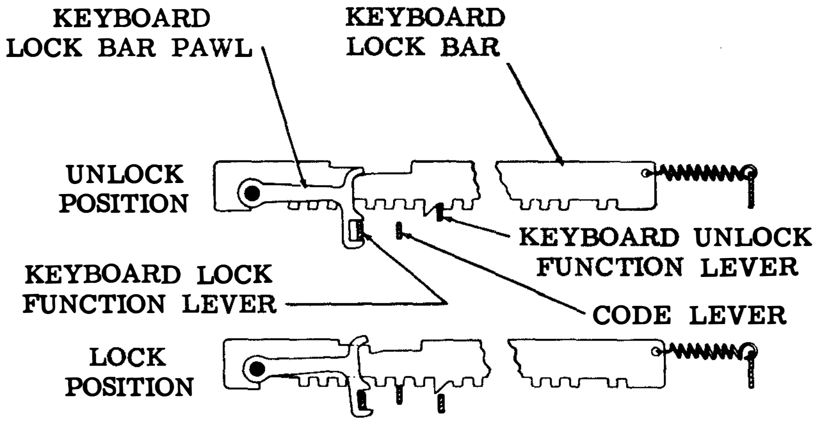

Figure 15 - Keyboard Lock Mechanism

REPT keylever is held operated. The operated REPT keylever causes its function lever to raise the right end of the non-repeat lever (Fig. 13) and rotates it about its pivot point. In this position, the non-repeat lever cannot be engaged and operated by the code bar bail; therefore, the non-repeat lever crank will not reset the operated code bar bail latch. The code bar bail and universal bail latch lever are thus maintained in their operated positions, and the code bar bail follows the eccentric movement back and forth until the REPT keylever is released.

B. Electrical Line Break Mechanism (Fig. 14)

3.14 The electrical line break mechanism provides a means of interrupting signal circuit as an alerting signal for automatic equipment sometimes used in the teletypewriter system. Interruption of the line current is accomplished by depressing the BREAK keylever.

3.15 When the BREAK keylever is depressed, its function lever pivots and raises the front end of the break lever. The rear portion of the break lever depresses the actuator pin of the sensitive switch, which opens the normally closed contacts. This action breaks the continuity of the signal line, causing transmission of a break (no current) signal.

3.16 When the BREAK keylever is released, the tension of the switch spring and the break lever spring cause the function lever to return the keylever to its normal position, and the switch contacts to their normal closed condition.

C. Keyboard Lock-Unlock Mechanisms (Figs. 15 and 16)

3.17 Operation of the (red) KYBD LOCK keylever causes its function lever to raise the keyboard lock bar pawl. In its upper position, the pawl releases the keyboard lock bar, and a spring pulls the bar to the right. In this position, projections on the lower side of the bar block the upward movement of any code lever and the repeat function lever.

3.18 Operation of the (red) KYBD UNLK keylever causes its function lever to rise against a camming surface on the keyboard lock bar and drive the bar toward the left until the lock bar pawl drops into a notch in the lock bar. In this position, the projections on the lock bar lie between the code levers and offer no interference with their operation.

D. Tape Back Space (Fig. 1)

3.19 Depressing the TAPE B.SP. keylever directly activates a switch which controls the back space function on the typing reperforator. The keylever is spring loaded to return to its unoperated position after each operation. There is no associated function lever for this keylever, and the code bar mechanism is not affected by its operation. The operation is isolated from the signal generator mechanism and does not affect other units in the line circuit. The purpose of the back space function is to permit eradication of an erroneous character code, or codes, by reperforating such codes, using the five-hole perforated letters code.

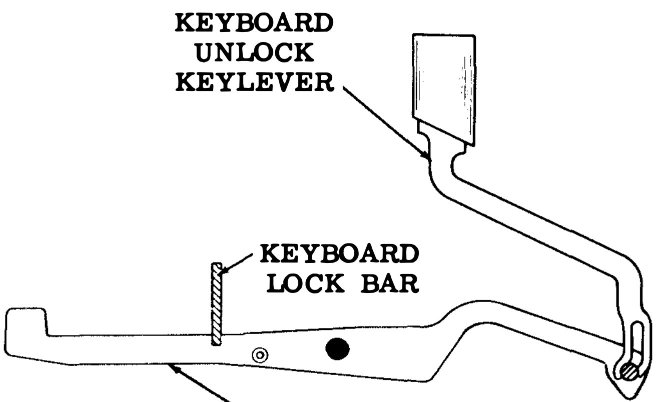

Figure 16 - Keyboard Unlock Mechanism

E. Tape Feed Out (Fig. 1)

3.20 The TAPE F.O. keylever operates a sensitive switch located at the rear of the base. Although the switch is actuated through a function lever, the use of this key is an off-line operation and has no effect on the code bars.

CHARACTER COUNTER MECHANISM (Figs. 17, 18 and 19)

3.21 The character counter is driven mechanically from the code bar mechanisms through the counter and counter reset code bars located in the second and third (from front) slots of the code bar basket. These code bars have drive projections which engage the forks of the feed and reset bails of the counter. As the code bars fall to the right when a key on the keyboard is struck, the counter mechanism is tripped. These functions may be divided into three distinct phases of operation of the counter mechanism, stepping, counter reset and restart.

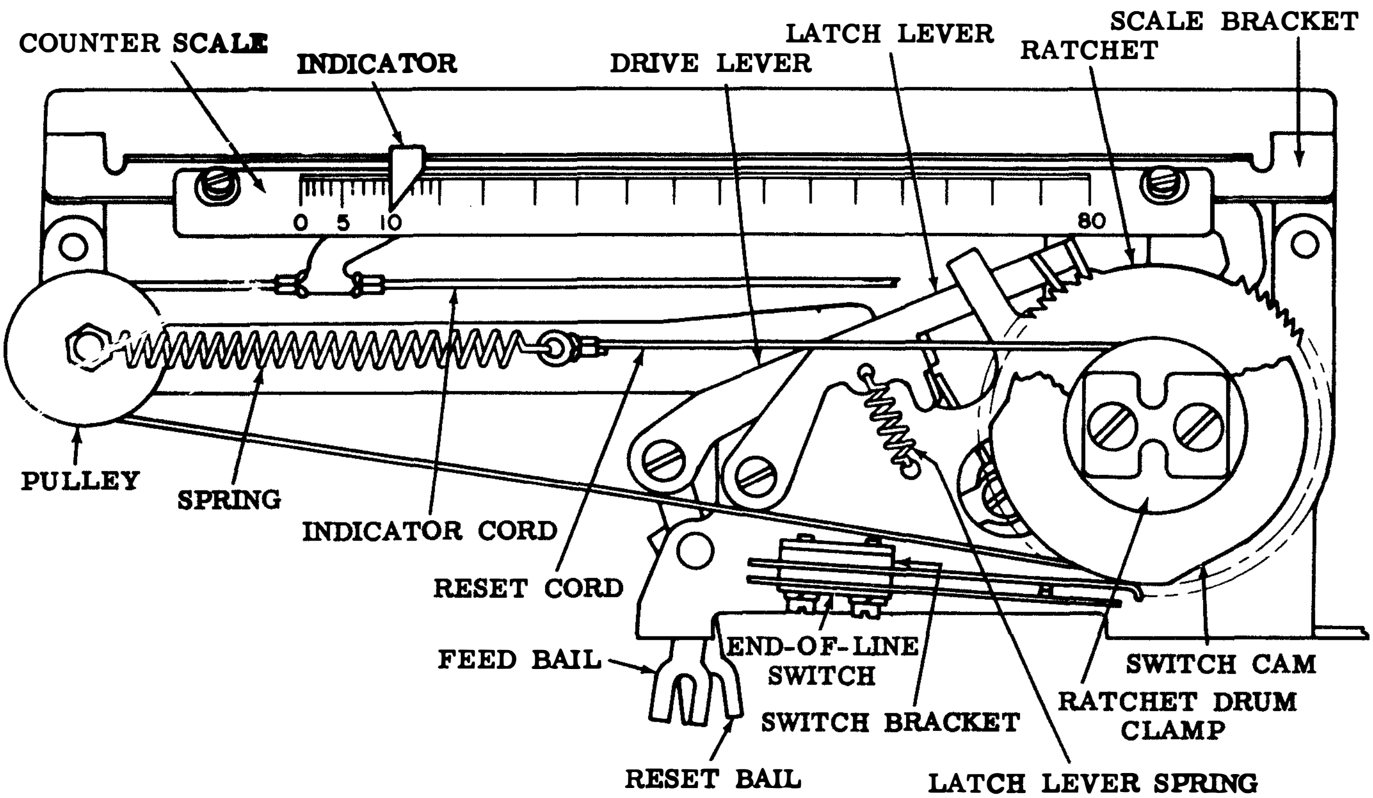

Figure 17 - Character Counter Mechanism (Front View)

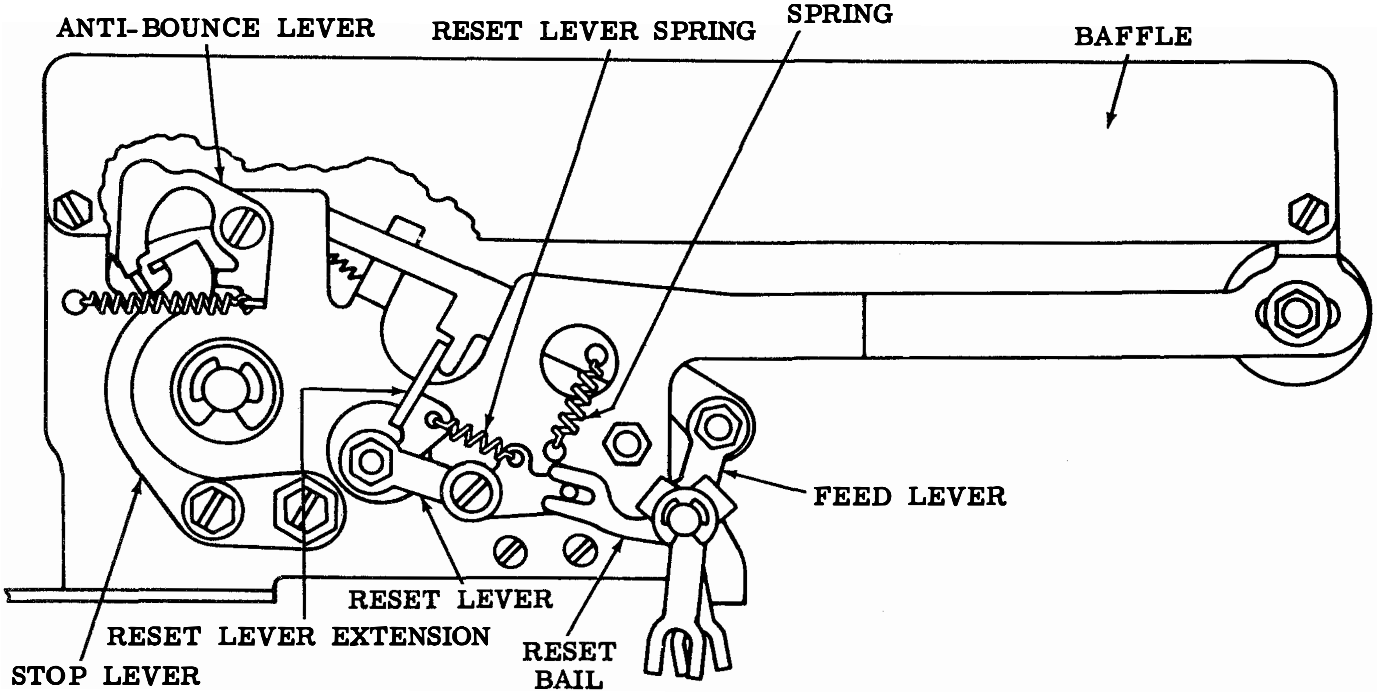

Figure 18 - Character Counter Mechanism (Rear View)

A. Stepping

3.22 Referring to sequence A (Fig. 19), as a key is struck, the code bars fall to the right, carrying with them feed bail (1). The drive bail, which is linked to the feed bail, moves to the left slightly more than one tooth. As the code bars are reset under power, stepping bail (1) moves clockwise, causing the drive lever to advance the ratchet drum one tooth. The drive pawl prevents the ratchet drum from rotating counterclockwise until it is again tripped for the following character. When this occurs, the ratchet drum rotates slightly counterclockwise, coming to rest against the latch lever.

B. Counter Reset

3.23 Sequence B (Fig. 19) illustrates the tripped position of the counter mechanism for a reset function. Reset bail (2) moves counterclockwise as its code bar falls to the right, causing the reset lever in turn to rotate clockwise. As the reset lever rotates clockwise, the reset lever extension moves downward until it falls under the shoulder of the projection on the drive and latch levers under the action of its spring. When the counter bars are reset, as in C (Fig. 19), the reset bail is rotated clockwise to its original position, causing the reset lever to rotate counterclockwise, carrying both the drive and latch levers out of engagement with the ratchet teeth. The mechanism remains in this condition, and the ratchet drum assembly rotates rapidly counterclockwise (under the action of its return spring) until it reaches its zero position.

3.24 As the ratchet drum reaches its zero position, a stop on the ratchet strikes a stop lever fastened to the frame. The elastic impact is transmitted through the stop lever to the anti-bounce lever, whose lower end is normally in contact with the stop lever. The anti-bounce lever rotates counterclockwise, dropping in behind the ratchet stop. As the ratchet drum rebounds from the stop lever, its stop strikes the anti-bounce lever, preventing further motion and maintaining the anti-bounce lever in its actuated position. The ratchet continues to operate between the stop lever and anti-bounce lever until the energy in the system has been largely dissipated. The ratchet stop then remains in contact with the stop lever, permitting the anti-bounce lever to return to its normal position.

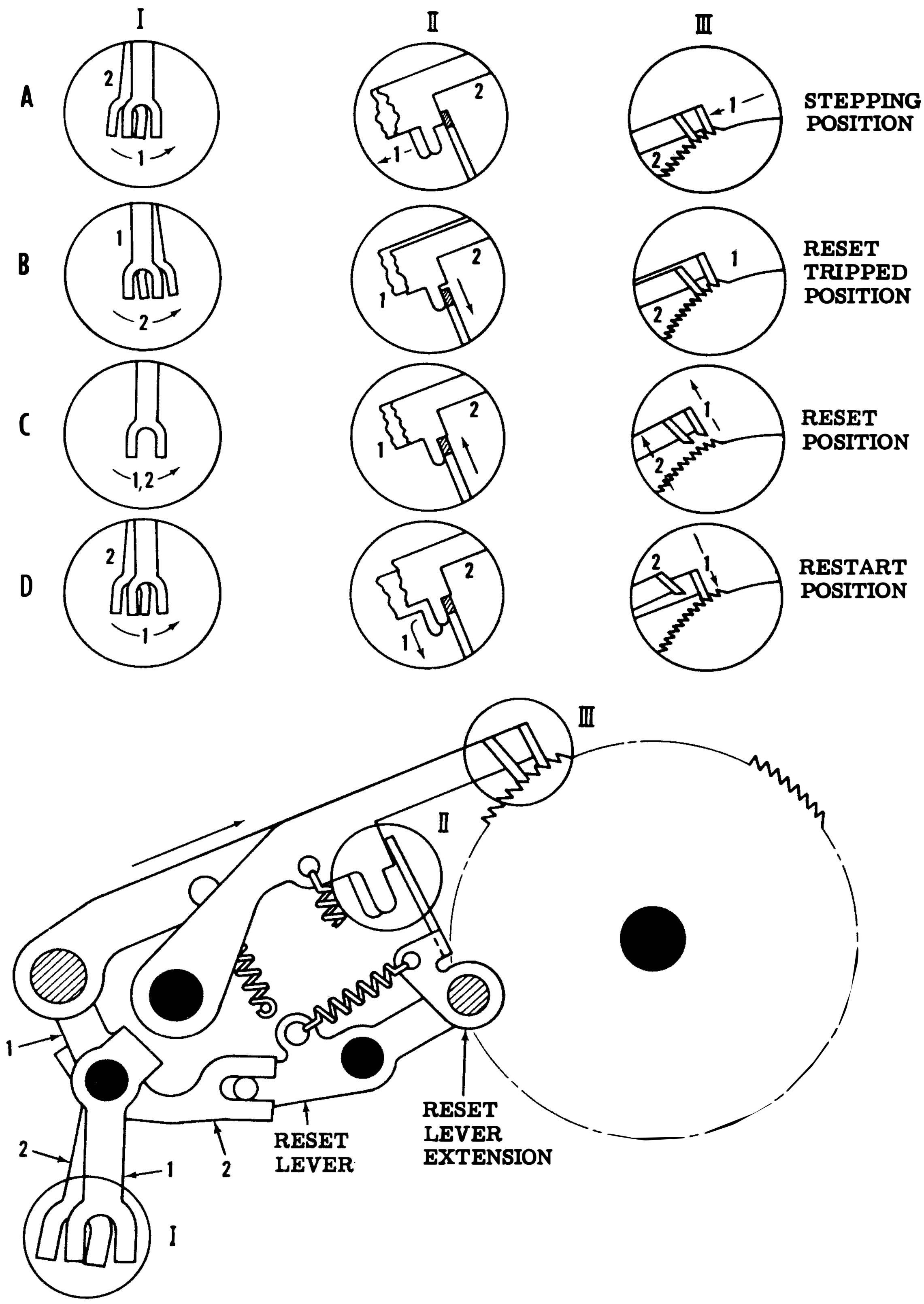

Figure 19 - Operation of Character Counter Mechanism

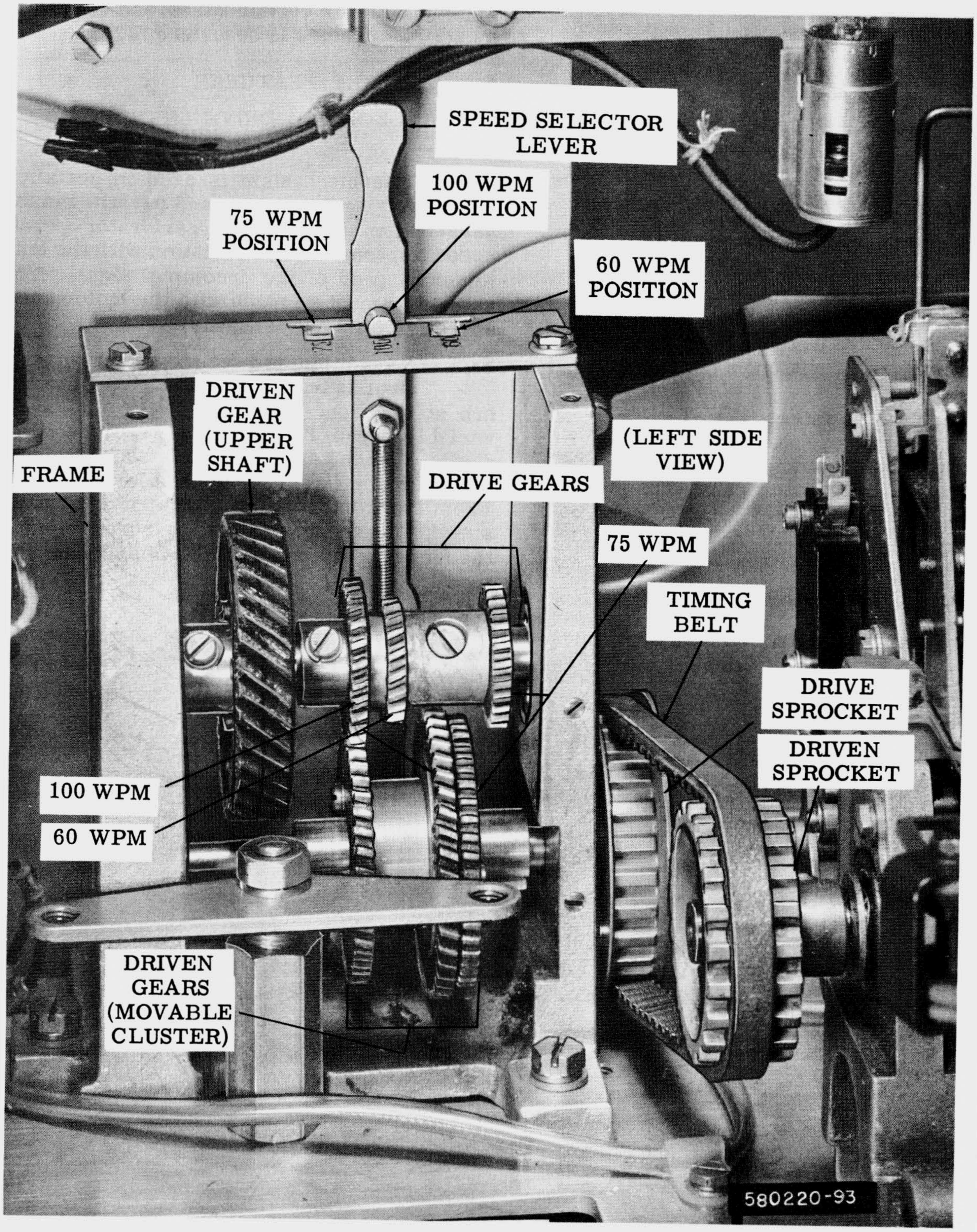

Figure 20 - Variable Speed Drive Mechanism

C. Restart

3.25 Sequence D (Fig. 19) illustrates the restarting action of the counter mechanism for the character following a carriage return. As a key on the keyboard is depressed, the counter code bar falls to the right, the feed bail moves counterclockwise and the drive lever moves to the left. As the drive lever moves to the left, it is disengaged from the reset lever extension and falls into engagement with the ratchet tooth. As the code bars are reset under power, the feed bail rotates clockwise, and the feed lever begins to move to the right. As it does, its projection pushes the reset lever extension to the right and out of engagement with the latch lever, which falls into engagement with the ratchet drum. As the drive lever completes its stroke, it steps the ratchet one tooth, as in the normal stepping operation.

D. End-of-Line Switch (Fig. 17)

3.26 Operation of the end-of-line switch is controlled by a switch cam. The switch cam rotates with the ratchet drum and can be adjusted to close the switch at any typed line length from 10 to 80 characters.

4. BASES

4.01 The receiving-only typing reperforator bases are composed basically of passive mechanisms. The variable-speed drive mechanism, used with certain bases, and available as an optional feature is described below.

5. VARIABLE FEATURES

VARIABLE SPEED DRIVE MECHANISM (Fig. 20)

5.01 This mechanism is used on certain receiving-only bases and permits the manual selection of the typing reperforator operating speed to permit synchronization with the transmission speed of the incoming signal. Speed selections must be made with the motor unit inoperative.

5.02 A motor pinion gear attached to the motor shaft drives the main driving gear on a hub at the front end of the lower of two of the variable speed intermediate gear mechanism shafts. Three gears fastened to hubs which rotate with the lower shaft are driving gears. From the front, the first gear drives at 75 wpm speed; the second, smallest gear at 60 wpm; and the largest gear, at the right, at 100 wpm.

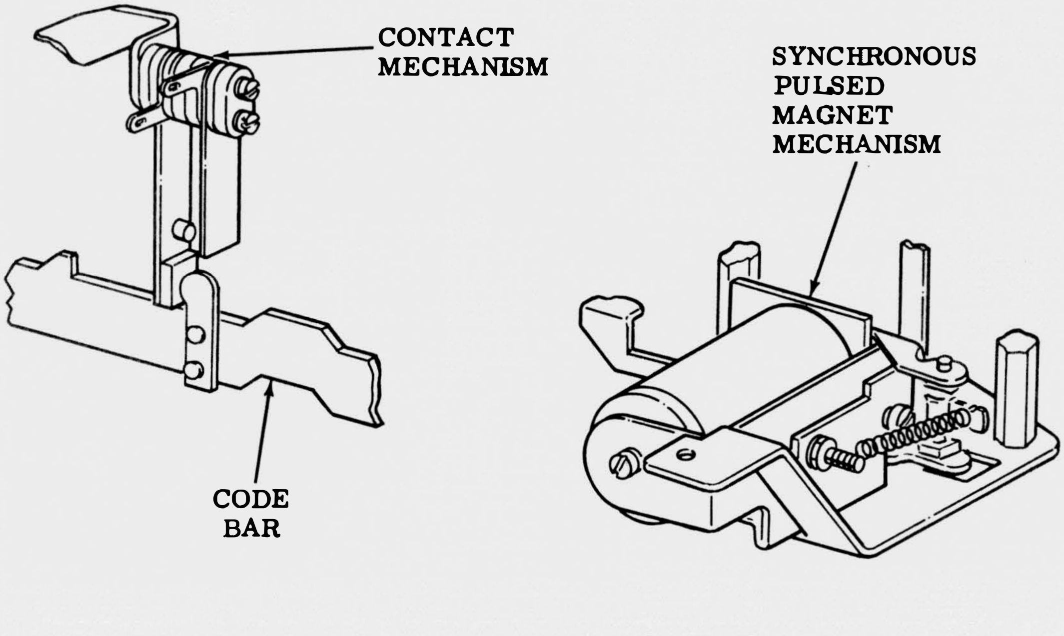

Figure 21 - Synchronous Pulsed Transmission Mechanism

5.03 On the upper shaft, spaced so the gears will clear the non-mating driving gears in the shifting operation but will mate for the selected gear ratio, are three driven gears. The driven gears slide freely horizontally on a hub fastened to the shaft but are keyed to rotate the shaft, regardless of which gear combination has been selected. From the front, the gears on the top shaft are first, the driven gear for 75 wpm operation; second, the largest gear, for 60 wpm; and third, the smallest gear, for 100 wpm.

5.04 Between the second and third gear and separated from the gears by spacers is a gear block on which the shift lever slides. Manually positioning the gear shift handle releases the three position detent in the bottom of the housing and permits the movement of the handle to the right or left, as required to select a gear ratio. The selected ratio is indicated by indexed detents in the grease retainer covering the mechanism. At the rear, the mechanism is in position for 75 wpm operation. The center position is for 100 wpm, and the front index is for 60 wpm.

5.05 The gear ratio selected must be the same as that on the distant station transmitting equipment. The upper shaft drives a hub and driving sprocket at its front end. The sprocket is connected through a timing belt to operate the typing reperforator at the selected speed.

SYNCHRONOUS PULSED TRANSMISSION (Fig. 21)

5.06 The synchronous pulsed transmission mechanism provides a means of initiating signal transmission from the keyboard, at a predetermined rate, upon reception of an 0.050 ampere external clocking pulse of 20 millisecond duration.

5.07 When any green key on the keyboard is depressed, the reset bail moves right and releases all selected code bars. Also released is the universal code bar which moves right and closes the clutch magnet conditioning contacts setting up the clutch trip magnet to receive the external clocking pulse.

5.08 Upon reception of the external clocking pulse, the clutch trip magnet energizes and unlocks the clutch trip bar. As the clutch trip bar moves to the right it engages the clutch trip bail extension and trips the signal generator clutch, allowing the signal generator cam shaft to rotate and transmit the proper sequential signal. After one complete revolution of the signal generator cam shaft, the reset bail returns to the starting position, resetting all code bars and the clutch trip bar.

28 ELECTRICAL SERVICE UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 The 28 electrical service units serve as an area of concentration for the wiring of 28-type apparatus and provide mounting facilities for various electrical assemblies and components.

1.02 The operational facilities provided by the electrical service unit vary, depending upon the number and complexity of functions performed by the set.

1.03 Complete operation of an electrical service unit requires connection with other components of the set with which it is used. Additional information concerning the support functions of the unit may be found in sections discussing specific components and complete sets. Only independent features of the electrical service unit are discussed in this section, under Principles of Operation.

2. DESCRIPTION

2.01 The electrical service unit (Figure 1) consists, basically, of a metal frame, or chassis, and a number of mounting plate assemblies. The chassis has four legs that permit the unit to be turned upside down for maintenance purposes. Cutouts for routing cables or mounting switches and controls, as required, are provided. The mounting plate assemblies are installed on the blank top of the chassis. Unused positions are occupied by blank mounting plates. Terminal boards and cables, required for interconnection of the assemblies with other components, are provided by the installed assemblies.

2.02 Some of the features that may be mounted on the unit are listed below:

(a) Line shunt relay assembly.

(b) Line (polar) relay assembly.

(c) Rectifier assembly.

(d) Line test key assembly.

(e) Capacitor-resistor assembly.

(f) Motor control assembly.

(g) Signal line limiting resistance.

(h) Convenience outlets (115 ac).

(i) Convenience outlet fuses.

(j) Power switch (may be installed directly on chassis).

(k) Selector magnet driver.

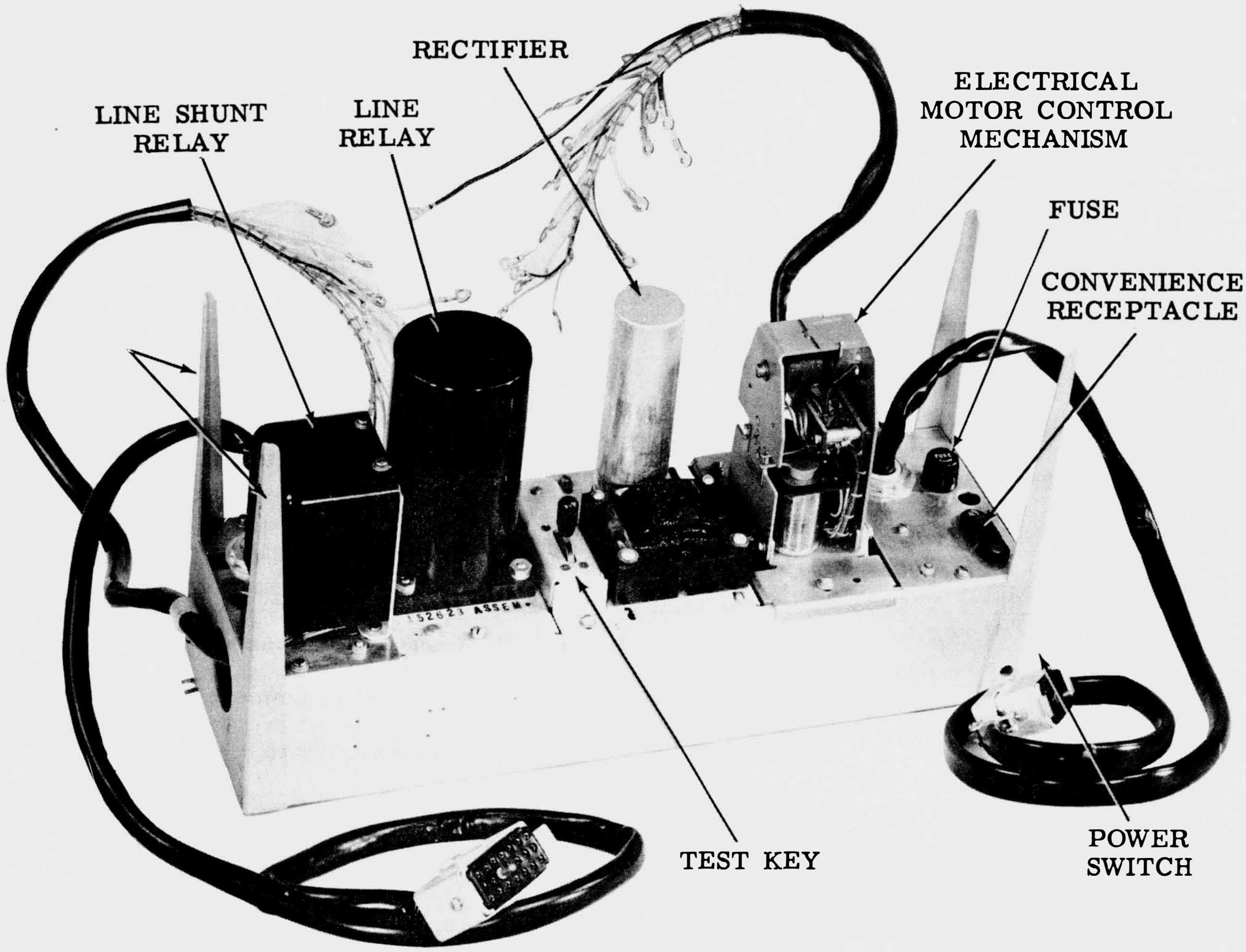

Figure 1 - Typical 28 Electrical Service Unit

3. PRINCIPLES OF OPERATION

LINE SHUNT RELAY (Figures 1 and 2)

3.01 The signal line is connected through the line shunt relay contacts, either to the line relay or directly to the selector magnets of a receiving unit; eg, a typing unit is shown in Figure 2. The solenoid of this relay is controlled by the main power switch and, if present, the motor control mechanism. If power is removed from the set, through opening of the main power switch or by action of the motor control mechanism (3.09), the relay releases and maintains signal line continuity while bypassing the local unit.

LINE RELAY (Figures 1 and 2)

3.02 The line relay is used to reduce the effects of line distortion or to convert a polar signal to the neutral form required by the selector magnets. The relay has two windings: one, the line winding, is operated by the signal line and the other, the bias winding, is operated by a local dc source, such as the rectifier assembly (3.05). Operation of the relay is as follows:

3.03 Signal Line Spacing: During a spacing (no current) pulse, current from the local dc source energizes the bias winding, causing the armature to be attracted to the space contact. In this position, no current is supplied to the selector magnets.

3.04 Signal Line Marking: During a marking (current) pulse, the signal line current applied to the line winding is of sufficient magnitude to create a magnetic flux that overcomes the attraction of the bias winding. The relay armature is attracted to the mark contact, which connects the local dc source to the selector magnets.

RECTIFIER ASSEMBLY (Figure 1)

3.05 The rectifier assembly (Figure 1) consists of a power transformer, two semiconductor type rectifiers arranged for full-wave

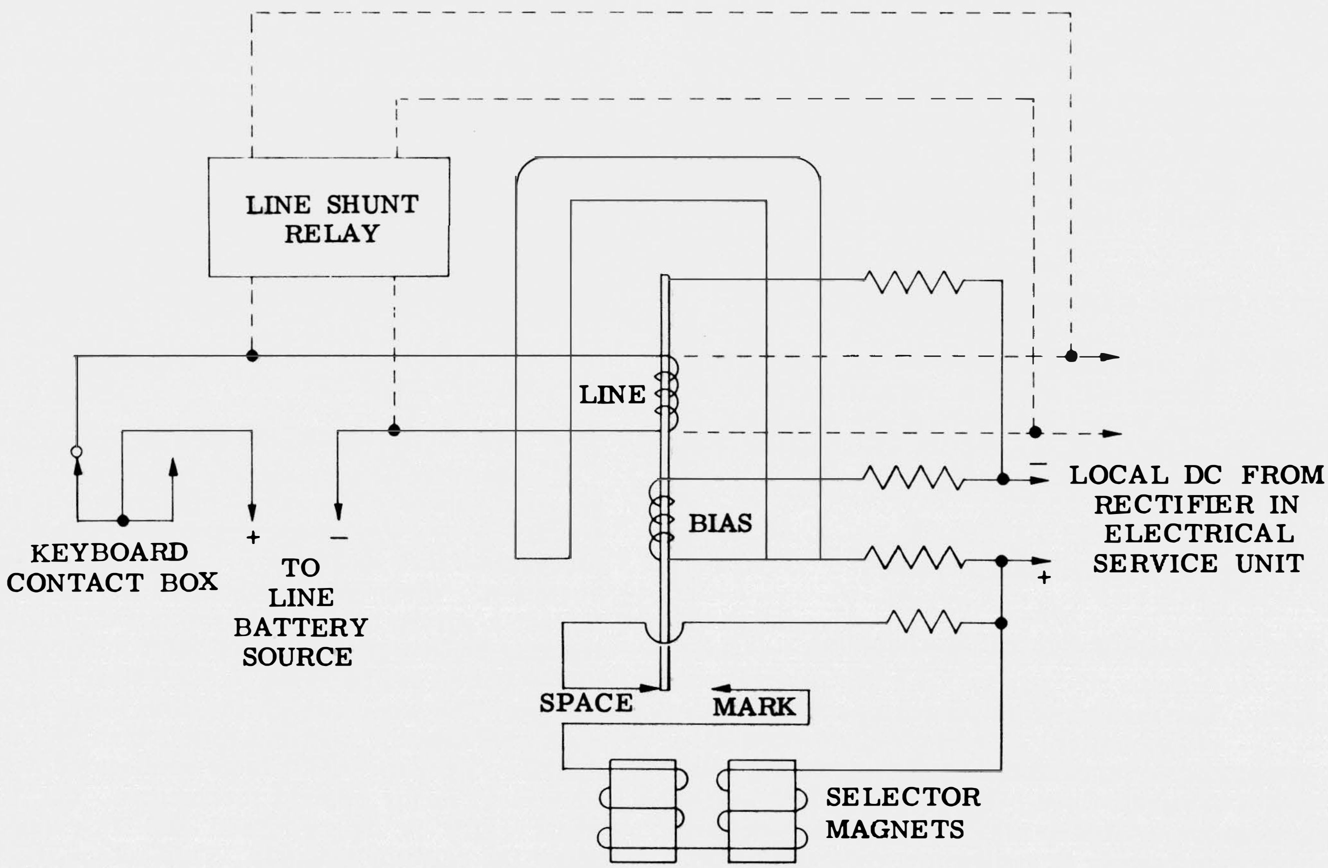

Figure 2 - Line Relay Circuit

rectification, and a filter capacitor. Rectifier assemblies are available providing outputs of 120, 300, and 500 ma., respectively. Each provides 120 vdc from an input of 115 vac (± 5v), 50 to 60 cps, single phase. The output of the rectifier is normally used in local circuits, such as the receiving unit selector magnets (3.01), the line relay bias winding (3.02), and the line test key assembly (3.07). The rectifier supplying 120 ma is generally adequate for applications such as the KSR, ROTR etc. The 300 ma and the 500 ma rectifier assemblies are necessary when additional external equipment are used.

SIGNAL LINE LIMITING RESISTANCE

3.06 Used in place of the line relay (3.02), an assembly containing a fixed or variable resistor (rheostat) may be installed to limit the signal line current to either 0.020 or 0.060 amperes.

LINE TEST KEY ASSEMBLY

3.07 The line test key assembly permits manual shunting of the signal line for independent operation of the set. The assembly may be wired to draw 0.020 or 0.060 amperes from the local dc supply. It contains an additional set of contacts that may be used to provide audible or visual indications.

CAPACITOR-RESISTOR ASSEMBLY

3.08 An assembly composed of a capacitor and resistor may be used to permit the operation of such local components as the ac/dc series governed motor unit or the line test key assembly from a direct dc source.

MOTOR CONTROL MECHANISMS

A. Relay Motor Control Mechanism

3.09 The relay motor control mechanism provides control of motors under two different operating conditions. Connected to control a separate loop, the relay motor control mechanism will stop all motors in the loop each time loop battery is applied or removed. Connected in the signal line circuit, the mechanism will stop all motors in the circuit whenever the signal line current is reversed.

3.10 The relay motor control mechanism consists of a solenoid operator, a single-pole, double-throw enclosed switch, a terminal block, and a cable for interconnection with the motor control and power terminal block of the electrical service unit. A rectifier assembly which mounts on the terminal block is required for reversed signal line operation.

3.11 In separate motor control loop operation, the contacts of the switch are placed in the motor power circuit. Control power, which is externally supplied, energizes the solenoid causing the switch contacts to change position. The switch contacts may be connected for motor start when the solenoid is energized and motor stop when the solenoid is de-energized, or motor start when the solenoid is de-energized and motor stop when the solenoid is energized. Resistors may be required to limit the control line current.

3.12 In reversed signal line current operation, the solenoid is inserted in the signal line circuit. The rectifier assembly is bridged across the solenoid coil with polarization that permits current flow when signals are being received. The rectifier exhibits a very low resistance in the forward direction, resulting in a negligible current flow through the solenoid coil, and minimum distortion of the signal. The switch contacts are connected in the motor power circuit to provide a closed circuit when the solenoid is de-energized. Reversing the polarity of the signal line current causes the solenoid to operate and the switch contacts to change position and open the motor power circuit.

B. Electrical Motor Control Mechanism (Figures 1 and 3)

3.13 The electrical motor control mechanism is controlled by signals generated by an external source such as a typing unit stunt box contact or by a keyboard or base unit time delay mechanism that responds to an idle signal line condition. When the mechanism is installed, the set's wiring is such that the circuit through the line shunt relay is under the control of the motor power switch in the motor control mechanism. The contacts of the line shunt relay shunt the selector magnets rather than the signal line. When the motor is de-energized by the electrical motor control mechanism, the line shunt relay is de-energized and its contacts shunt the selector magnets. This automatically sets up the double blank function in the typing unit stunt box and results in the locking up of the keyboard. The following description covers the

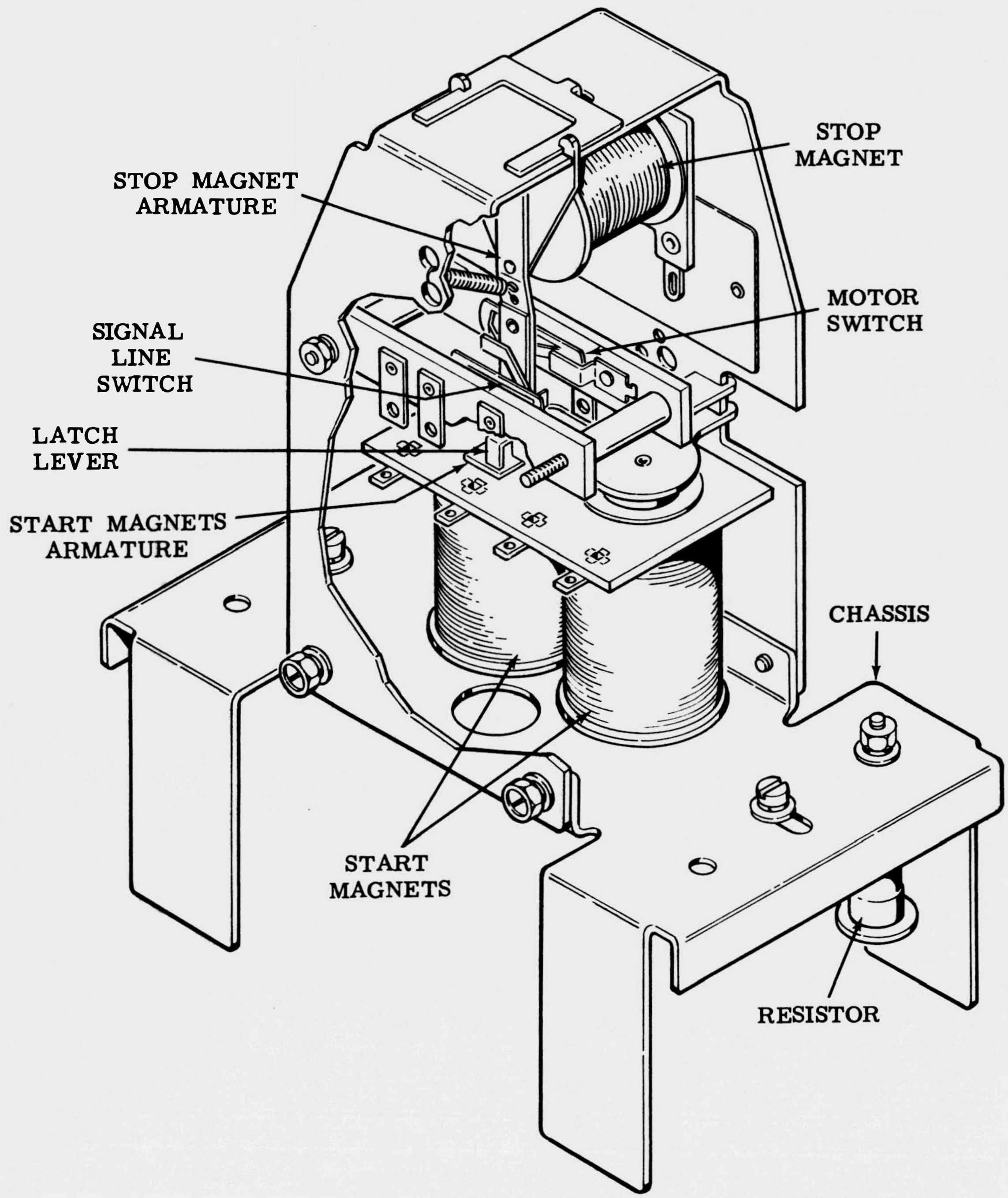

Figure 3 - Electrical Motor Control Mechanism

operation of the electrical motor control mechanism through a complete cycle.

Stop Position

3.14 In this position the motor is shut down, the line shunt relay is de-energized, the selector magnets are shunted, and the constant signal line current holds the start magnets energized. The start magnet armature is positioned toward the right, where it is held by the latch lever. The motor power switch, operated by the stop magnet armature, is open and the original line switch completes the start magnet circuit.

Open Line Position

3.15 In this position, the signal line is open, the start magnets are de-energized, and the start magnet armature is released. With the release of the start magnet armature, the latch lever is also released, permitting the stop magnet armature to swing toward the left. The movement of the stop magnet armature is blocked, however, by the start magnet armature and is not sufficient to change the positions of the motor power and signal line switches.

Start Position

3.16 In this position, the signal line is closed, and the start magnets have been energized, the start magnet armature moved downward and the stop magnet armature released. The release of the stop magnet armature enabled the motor power and signal line switches to operate. The operated signal line switch shunted the start magnets from the signal line circuit. The operated motor power switch completed the circuit through the line shunt relay, removed the shunt from the selector magnets, and completed the circuit to the motor unit.

Stop Position

3.17 The electrical motor control mechanism will return to the stop position and stop the motor unit when a pulse is received from the control circuit (3.13). The pulse momentarily energizes the stop magnet, causing the stop magnet armature to swing to the right and operate the motor power and signal line switches. The signal line switch places the start magnet coils into the signal line circuit. The start magnet coils are then energized and the start magnet armature is pulled downward. This permits the latch lever to engage the stop magnet and hold it in the stop position. The operated motor power switch opens the circuit through the line shunt relay, shunting the selector magnets and opening the circuit to the motor unit.

SELECTOR MAGNET DRIVER ASSEMBLY

3.18 The selector magnet driver assembly is a solid-state device which repeats the line signals in a form that will effectively operate a selector mechanism. The assembly is normally used in place of the line relay for this equipment. For a detailed description of the selector magnet driver operation, refer to the applicable publications.

28 REPERFORATOR ENCLOSURES

DESCRIPTION

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1. GENERAL 1

2. COVERS 1

KEYBOARD SEND-RECEIVE TYPING REPERFORATOR SET COVER 1

RECEIVE-ONLY REPERFORATOR SET COVER 2

RECEIVE-ONLY MINIATURIZED TYPING REPERFORATOR SET COVER 2

3. REPERFORATOR TABLES 4

4. MULTIPLE REPERFORATOR SET CABINETS 6

1. GENERAL

1.01 The components of 28 Reperforator Sets may be installed in the following enclosures: The keyboard send-receive typing reperforator set cover, the receive-only reperforator set cover, the receive-only miniaturized set cover, and the multiple reperforator set cabinet. In addition, tables are available for supporting the cover-enclosed equipment.

1.02 Physical dimensions of the enclosure and tables are listed in Table 1.

TABLE 1. APPROXIMATE DIMENSIONS

Enclosure	Height (Inches)	Width (Inches)	Depth (Inches)
Keyboard Send-Receive Typing Reperforator Cover	13-3/4	17	18-3/4
Receive-Only Reperforator Set Cover	9-1/2	13	14-1/2
Receive-Only Miniaturized Reperforator Cover	9-1/4	10	12
Multiple Reperforator Set Cabinet	57-1/2	25-1/2**	26*
Table	35	20-1/2	18-1/2

* 32-1/2 with tape bins
** 27-1/2 with end enclosures (1-inch each side)

2. COVERS

KEYBOARD SEND-RECEIVE TYPING REPERFORATOR SET COVER (Fig. 1)

2.01 This cover provides a protective enclosure for the typing reperforator, motor, and keyboard units of the Keyboard Send-Receive Typing Reperforator Set. It is a two-piece, sheet metal enclosure consisting of a base and a cover. The keyboard is accessible for operation through an opening in the cover. A hinged door opens forward over the keys, and permits access to the equipment for tape loading and ribbon replacement. Windows are provided for viewing tape preparation and for viewing the character counter scale. Both the tape and the character counter scale are illuminated by means of lamps. An aperture is provided for tape emission and cut-off. A copy holder is available as an accessory.

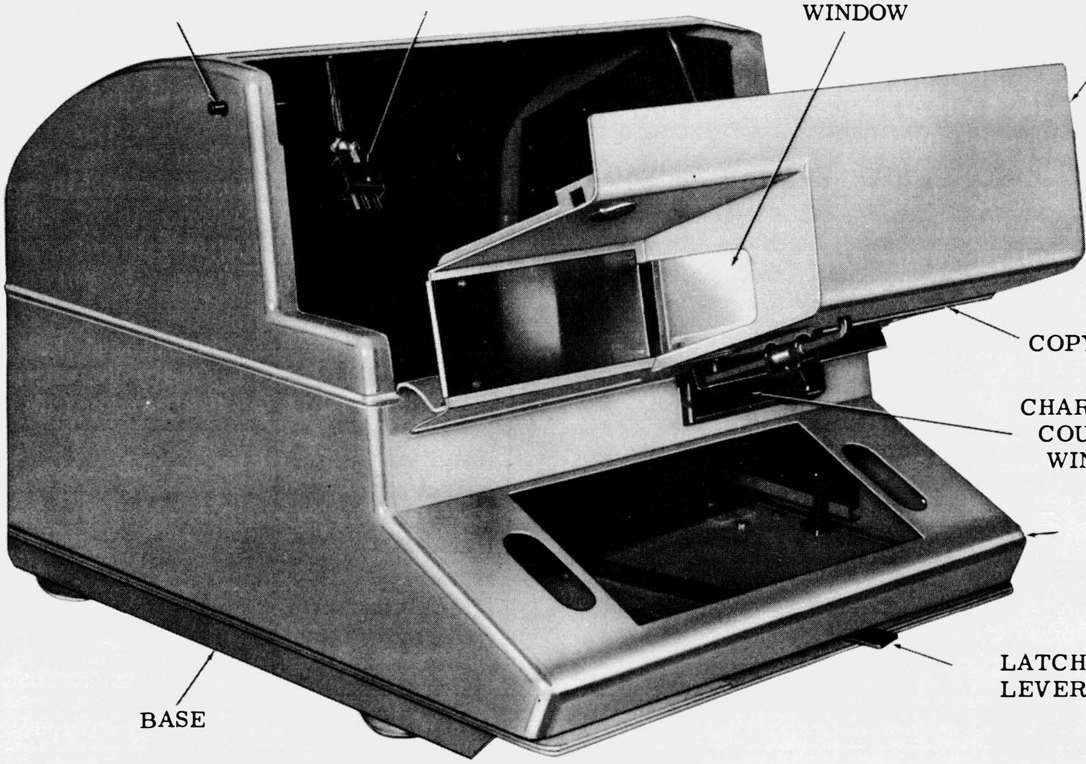

Figure 1 - 28 Keyboard Send-Receive Typing Reperforator Set Cover

RECEIVE-ONLY REPERFORATOR SET COVER (Fig. 2)

2.02 This cover serves as a protective enclosure for the reperforator, motor, and base units of a Receive-Only Reperforator Set. It is made of lightweight sheet steel and is available in a number of finishes. The cover fits closely around the reperforator unit and rests on the plate of the base unit.

2.03 A lid which is held in its open position by a friction arm permits access to the reperforator unit to load tape and change ribbons. The lid is also equipped with a paper emission slot, a chrome-finished handle, and a window through which tape printing and perforating may be viewed.

2.04 A red translucent button on the lid is positioned for illumination by the low-tape lamp on the base unit. Openings in the rear and side permit the admission of cables and access to the power switch.

RECEIVE-ONLY MINIATURIZED TYPING REPERFORATOR SET COVER (Fig. 3)

2.05 This cover provides a compact, protective enclosure for the typing reperforator, motor and base units of the Miniaturized Typing Reperforator Set. It is made of lightweight sheet steel and is available in a number of finishes. A hinged lid, held open by a friction arm, permits access to the typing reperforator to load tape or change ribbons. The lid is equipped with a tape-viewing window and a tape emission and cut-off slot. Openings at the front and rear permit the admission of cables and access to the main power switch and tape-out lamp.

2.06 The cover contains an opening on Sets equipped with a panel-mounted power switch, tape-out lamp and tape feed out button.

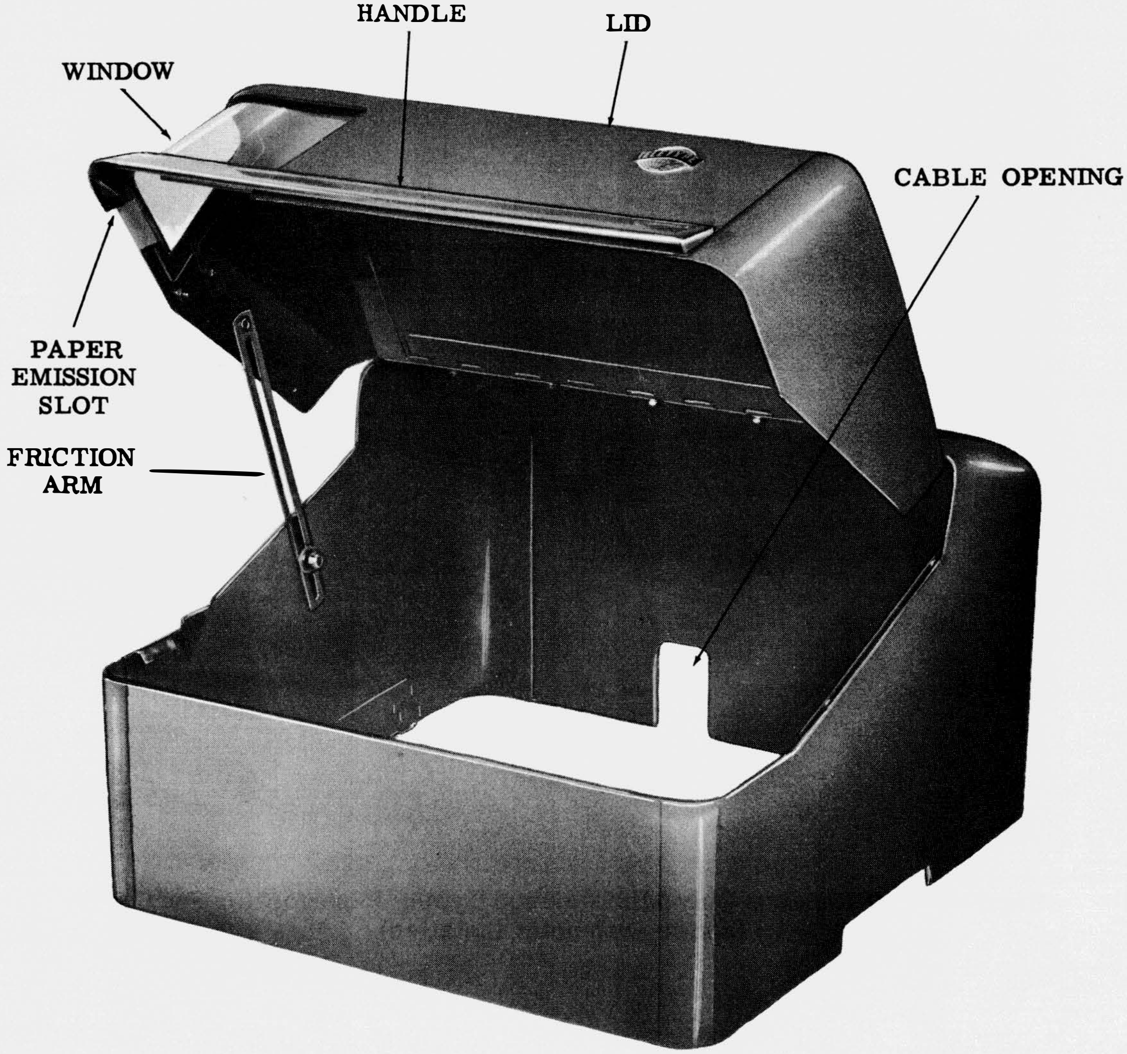

Figure 2 - 28 Receive-Only Reperforator Set Cover

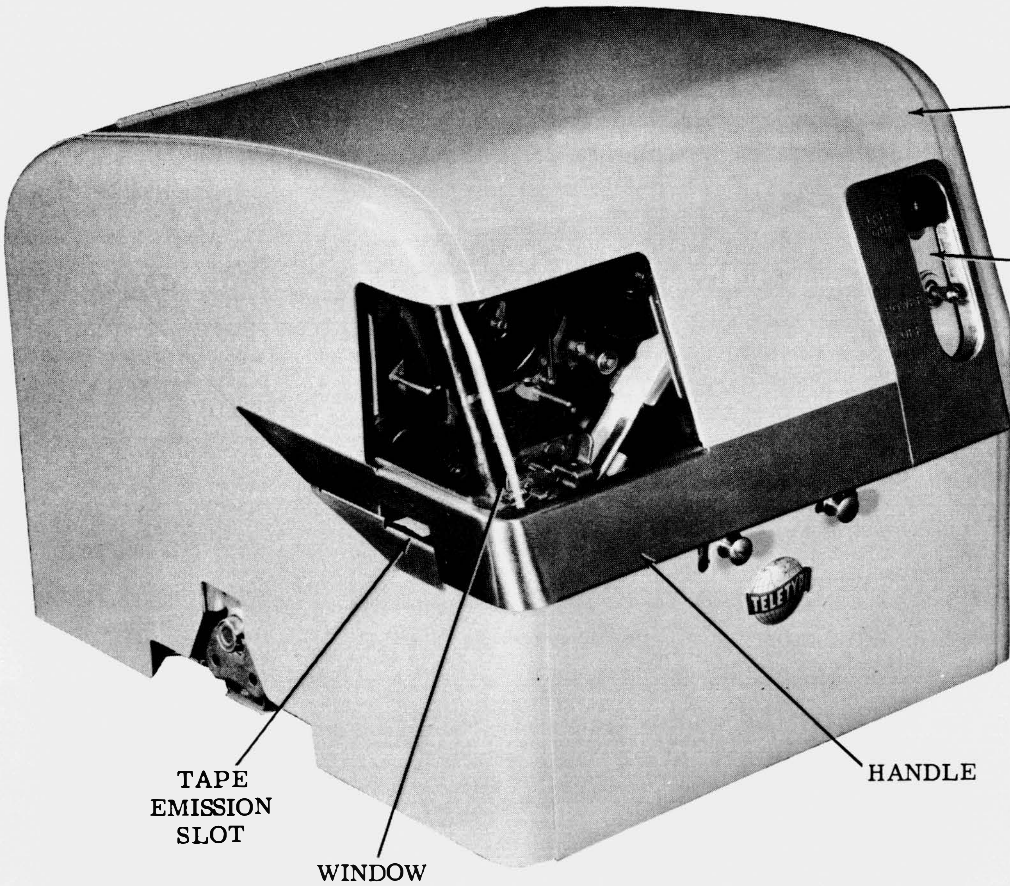

Figure 3 - 28 Receive-Only Miniaturized Typing Reperforator Set Cover
(shown with units installed)

3. REPERFORATOR TABLES (Fig. 4)

3.01 The reperforator table provides mounting facilities for either a Send-Receive or Receive-Only Typing Reperforator Set. It is constructed basically of sheet steel and is available in a variety of finishes.

3.02 The top on which the Set rests is grey, desk top linoleum cemented to a sound-attenuating steel subtop. Stainless steel molding protects the linoleum edges. A 2-1/2 inch cable entry hole is located at the rear center of the top.

3.03 A lower compartment accommodates the electrical service unit and has additional space for optional accessories. A nine-point terminal board for external electrical connections is mounted on the rear panel inside the compartment. A door covers the compartment and is held in its closed position by quarter-turn fasteners.

3.04 The table may rest on adjustable feet which permit leveling and varying the height; it may be bolted directly to the floor by tapped holes in the bottom; or it may be supported by shock mounts.

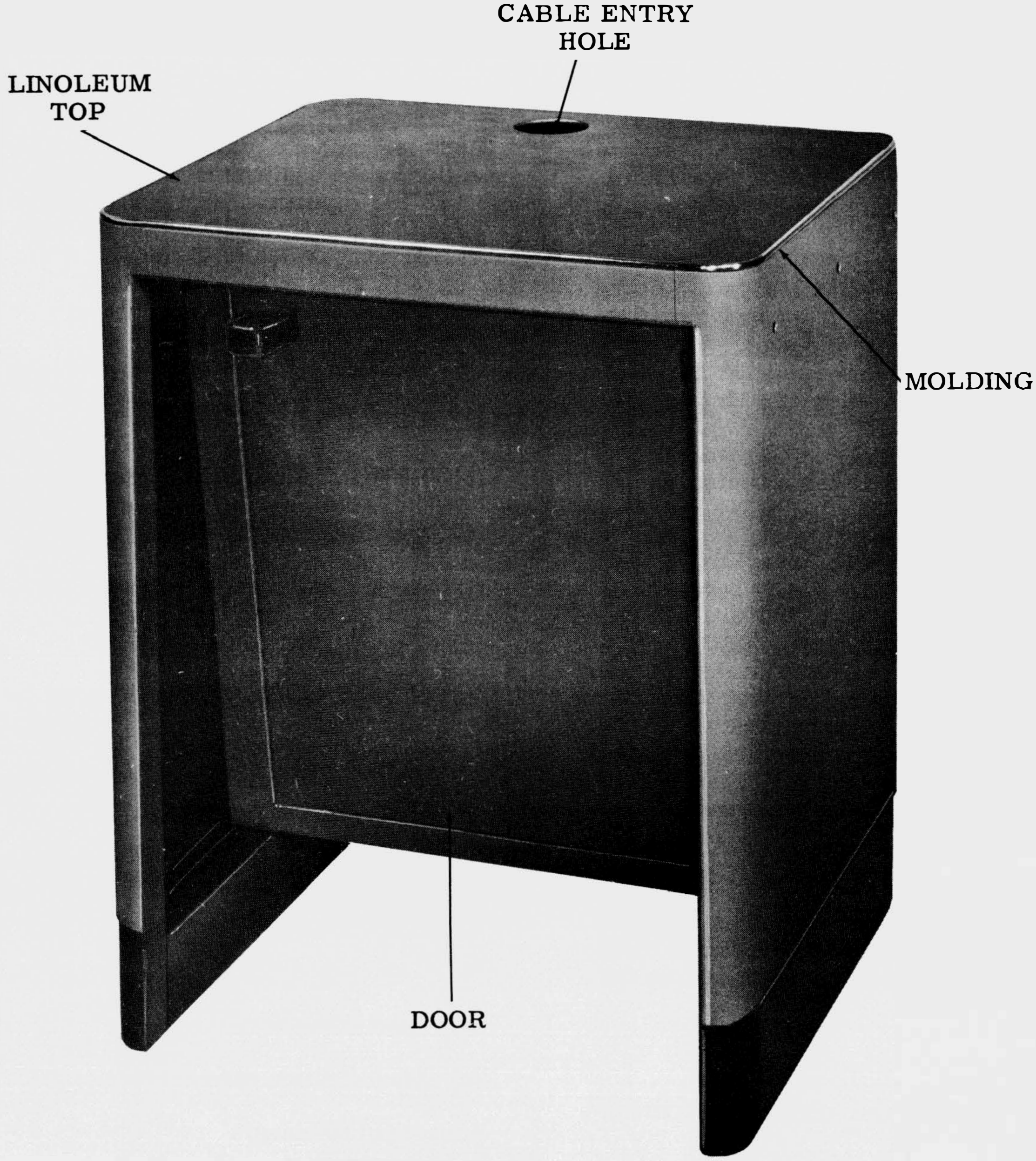

Figure 4 - 28 Reperforator Table

4. MULTIPLE REPERFORATOR SET CABINETS (Figs. 5, 6, and 7)

4.01 A number of cabinets are available for housing Multiple Typing Reperforator Sets and associated equipment. Basically of the same construction, they differ primarily in the means provided for accommodating the equipment and the various operational accessories. The cabinets are installed individually or side-by-side in groups of two or more. They are used, for example, in the Receiving and Monitor Groups of the Universal Torn Tape Switching System.

4.02 The cabinets accommodate two Multiple Typing Reperforator Sets and the associated power and control equipment. Two multiple tape winder sets may also be included. Typically, a cabinet is of double-frame construction. The outer shell provides protection against dust and minimizes the transmission of noise. The inner shell provides mounting facilities for the equipment.

4.03 The Multiple Typing Reperforator Sets are installed on slides that permit their partial withdrawal. The tape winders are secured to a shelf. Magnetically-latched, dual doors at the front and rear permit access to the interior. On some cabinets, the front doors are nearly full-length and are equipped with windows. On others, these doors are shorter and permit access to a storage area in the lower part of the cabinet. In these cabinets, separate windows are provided for the slide-mounted Sets.

4.04 A dome, which may be raised, covers a swivel-mounted electrical control rack. The electrical control rack may include the following:

(a) Fuses.

(b) Power switch and convenience receptacles.

(c) AC power failure alarm relays.

(d) Open line alarm relays (and associated circuit components).

(e) Line relays or selector magnet drivers with open line detectors.

(f) Terminal boards.

4.05 The selector magnet driver is a solid-state device which repeats the line signals in a form that will effectively operate a selector mechanism. It is normally used in place of a line relay. For a detailed description of the selector magnet driver, refer to the applicable publication.

4.06 A control panel is provided and contains the necessary switches, alarm lamps, receptacles and other devices required for local operation of the equipment. The panel is divided into two parts, with separate controls in each part for independent operation of the Sets. The panel may provide the following features:

(a) OPEN LINE indicating lamps.

(b) WINDER FULL alarm lamps.

(c) LOCAL SEIZURE lamps.

(d) REMOTE LINE SEIZURE lamps.

(e) Signal line rerun jacks.

(f) AC and DC convenience receptacles.

(g) Tape winder power switches.

(h) NUMBER-NO NUMBER line seizure switches.

(i) Switches for remote tape feedout actuation.

4.07 A number of operational accessories may be provided, determined by the application, such as the following:

(a) Tape bins.

(b) Chad containers.

(c) Identification card holders.

(d) Paper holders.

End enclosures are available optionally. For multiple cabinet installations, they are required only for the two end cabinets; for single-cabinet installation, two are required for the cabinet.

4.08 The cabinets provide the necessary cabling for interconnecting the Sets with the control circuits. Provisions are included for grounding the cabinet.

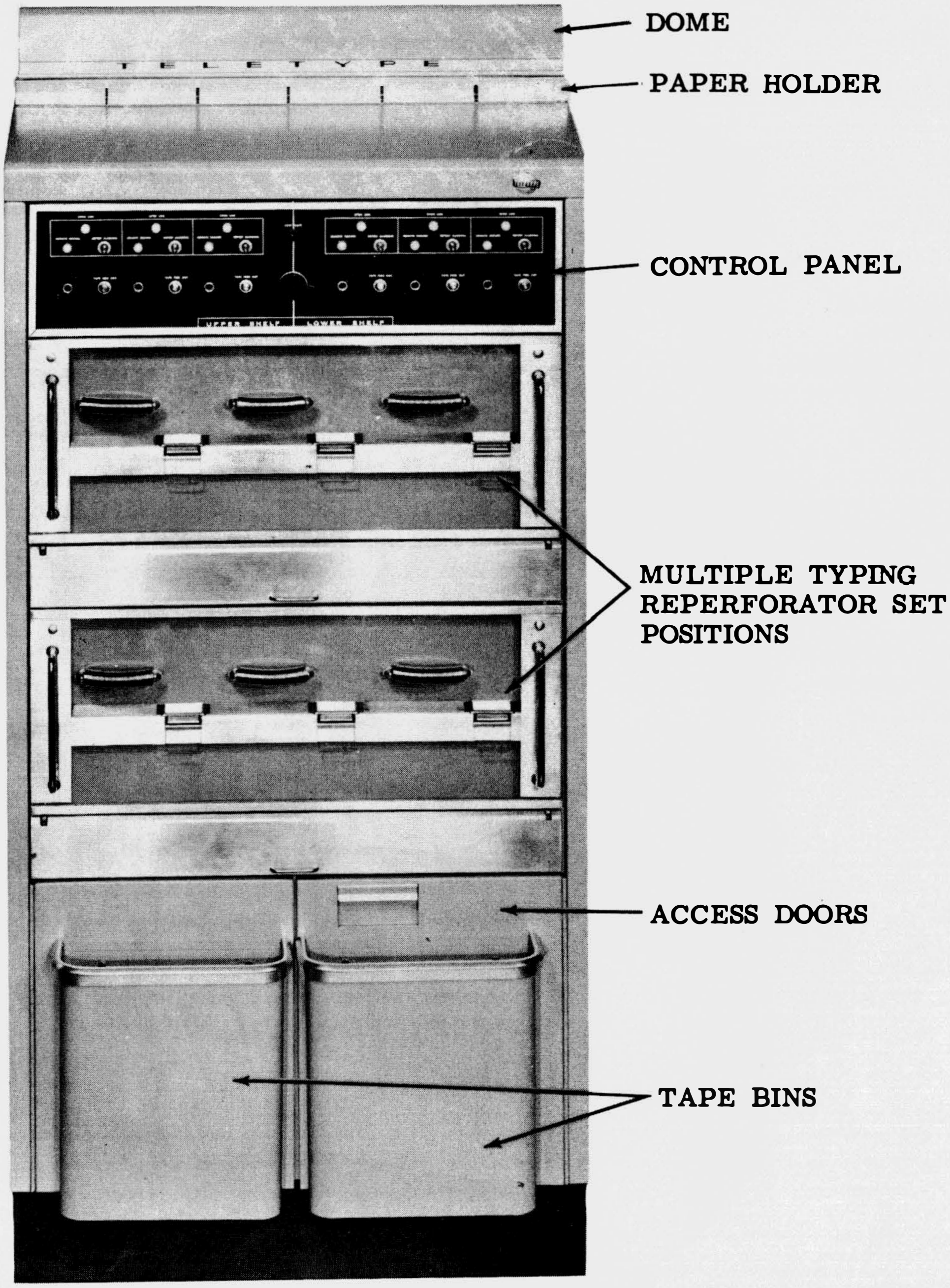

Figure 5 - Typical 28 Multiple Reperforator Set Cabinet

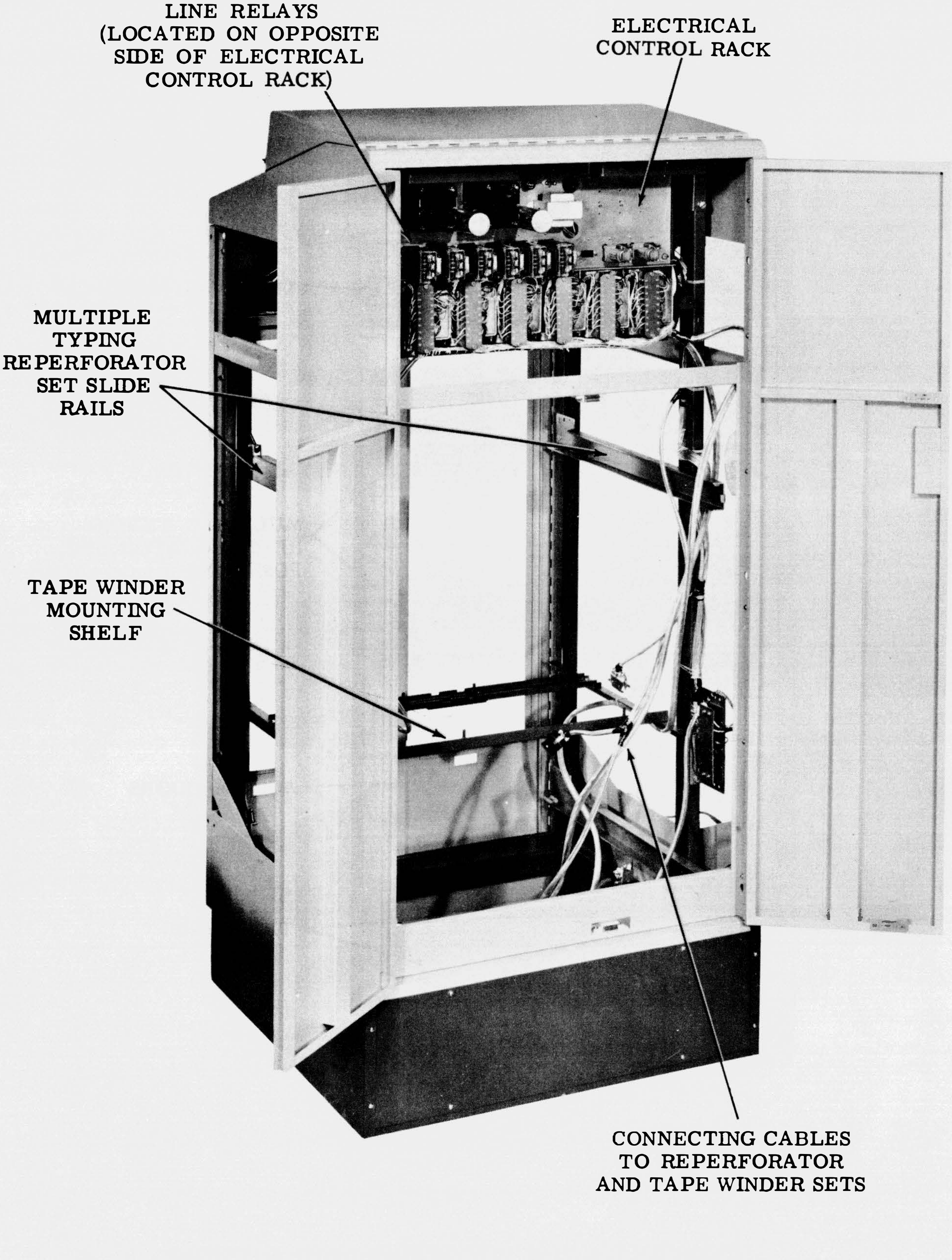

Figure 6 - Typical 28 Multiple Reperforator Set Cabinet (Rear View)

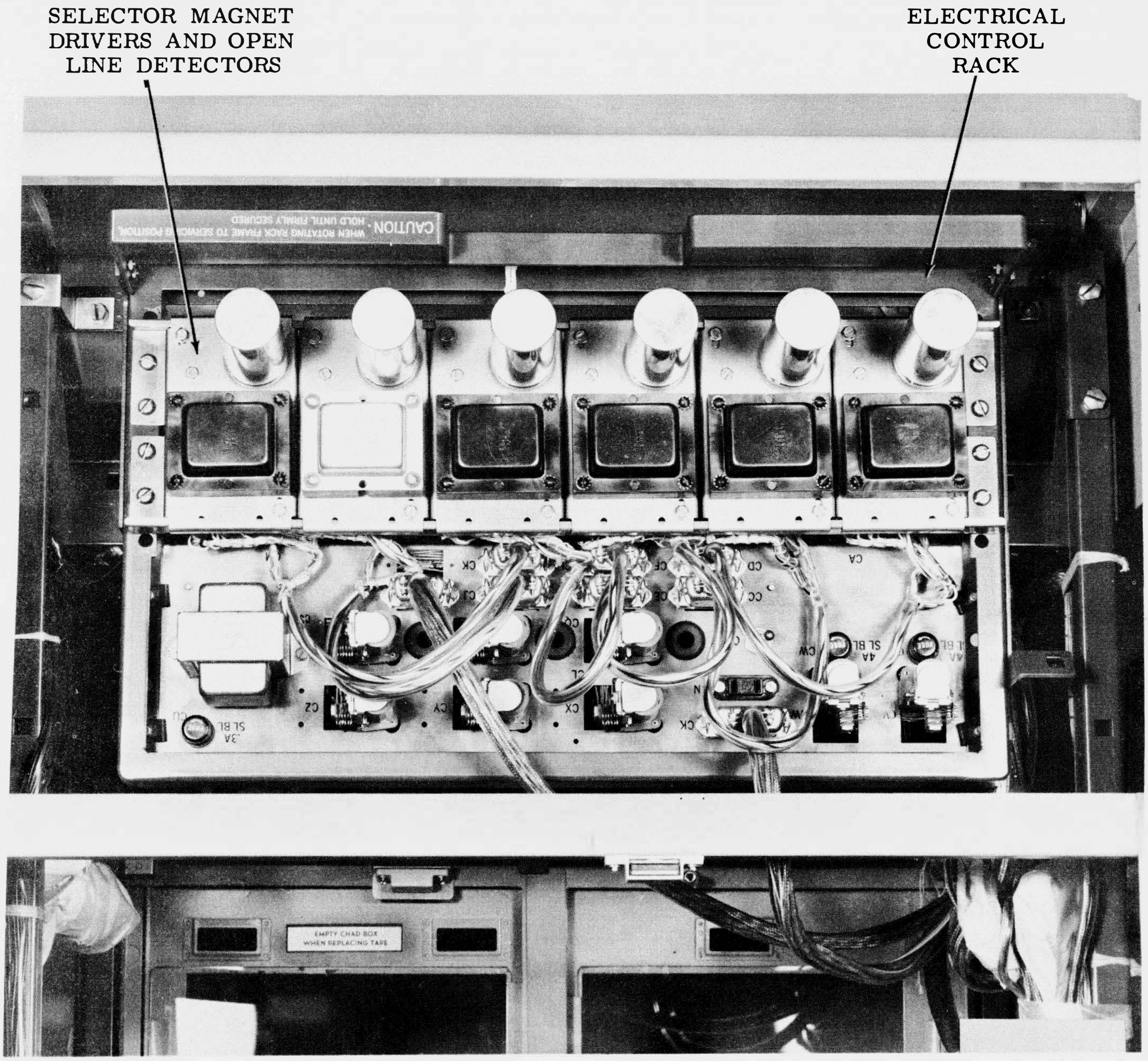

Figure 7 - Typical 28 Multiple Reperforator Set Cabinet (Top Rear View)