38 TYPING UNIT

DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section provides the description and principles of operation for the 38 typing unit (Figure 1). The 38 typing unit is an electromechanical device which prints graphics on a paper copy according to a code, and performs nonprinting functions. It is reissued to make some corrections and to add a description of the backspace mechanism used on APL sets. Marginal arrows indicate the changes and additions.

1.02 In the illustrations, fixed pivot points are shown solid black, and floating pivot points (those mounted on parts that move) are shown crosshatched.

1.03 References to right or left, front or rear, consider the typing unit as viewed by the operator with the printing mechanism in the front, and the distributor on the right side toward the rear.

2. TECHNICAL DATA

2.01 Some of the data that follows is approximate. Also, the dimensions and weight given for the typing unit are for a standard unit, less options.

2.02 This equipment is intended to be operated in a room environment within the temperature range of 40°F to 110°F. Serious damage to it could result if this range is exceeded. In this connection, particular caution should be exercised in using acoustical or other enclosures.

DIMENSIONS AND WEIGHT

2.03 The physical dimensions and weight of the 38 typing unit are as follows:

Width	19 inches
Depth	13-1/2 inches
Height	8 inches
Weight	35 pounds

ELECTRICAL REQUIREMENTS

2.04 In addition to the following data, a convenience outlet is provided in the electrical service unit (part of the set) which permits up to 100 watts of additional load.

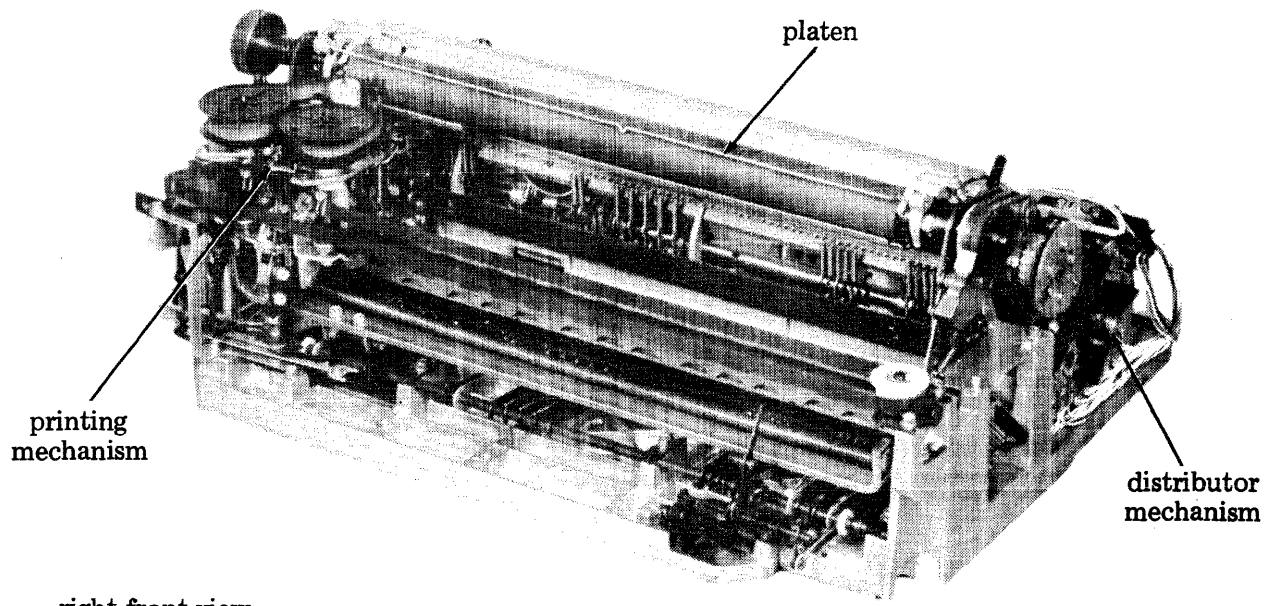
Input Voltages

- 115 v ac ±10%, 60 Hz ±0.5 Hz, single phase
- 115 v ac ±10%, 50 Hz ±0.5 Hz, single phase

Operating Margins (All signal contacts and distributor)

Long telegraph loops

- 0.015 to 0.070 amp at 48 to 240 volts dc inductive



right front view

Figure 1 - 38 Typing Unit

Short telegraph loops
- 0.58 to 0.72 amp at 16 to 22 volts dc resistive

MOTIVE POWER

2.05 Three types of motors are available for use in the 38 typing unit. The three types, with specifications, are as follows:

Motor 181870

Type
- Synchronous, capacitor start

Input
- 115 v ac ±10%, 60 Hz, single phase

Input current
- 2 amperes

Output
- 33 millihorsepower

Speed
- 3600 rpm

Temperature rating
- 130° C

Power factor
- 40%

Motor 182241

Type
- Synchronous, capacitor start and run

Input
- 115 v ac ±10%, 60 Hz, single phase

Input current
- 1.6 ampere

Output
- 33 millihorsepower

Speed
- 3600 rpm

Temperature rating
- 130° C

Power factor
- 40%

Motor 182267

Type
- Synchronous, capacitor start and run

Input
- 115 v ac ±10%, 50 Hz, single phase

Input current
- 1.7 ampere

Output
- 35 millihorsepower

Speed
- 3000 rpm

Temperature rating
- 130° C

Power factor
- 40%

SPEED OF OPERATION

2.06 The 38 typing unit is capable of operating at 60, 66, 75, or 100 words per minute. The standard unit, as shipped from the factory, operates at 100 words per minute. Conversion from one speed to another is accomplished by changing the intermediate gear with pulley, and readjusting the motor unit.

PAPER AND FORM REQUIREMENTS

2.07 Both wide and standard platen printers are available. The wide platen printer is available only in sprocket feed. The standard platen is available in sprocket feed and friction feed. In addition, a modification kit is available which will convert a wide platen sprocket feed to a standard platen friction feed.

- Wide Platen, Sprocket Feed: This printer accepts 14-7/8 inch continuous sprocket feed forms with a maximum line capacity of 132 characters at 10 characters per inch horizontal spacing.

- Standard Platen, Sprocket Feed: This printer accepts 8-1/2 inch continuous sprocket feed business forms with a maximum line capacity of 72 characters at 10 characters per inch horizontal spacing.

- Standard Platen, Friction Feed: This printer accepts 8-1/2 inch continuous friction feed teletypewriter roll paper with a maximum line capacity of 72 characters at 10 characters per inch horizontal spacing.

Either printer is capable of handling a maximum of two copies (one original plus two tissues including the necessary interleaved carbons or carbon backed sheets).

SIGNAL CODE

2.08 The code used is the 1968 version of ASCII (American National Standard Code for Information Interchange — X3.4-1968). A code chart is given in Figure 2.

2.09 The 38 typing unit responds to an ASCII configuration in the form of an 8-level, 11-unit code. The code consists of a one unit start bit, seven intelligence bits, one parity bit (eighth level), and two stop bits. Figure 3 illustrates the 8-level, 11-unit code for the character "M."

Bits b_7 b_6 b_5 / b_4 b_3 b_2 b_1 / ROW / COLUMN	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0 0 0 0 0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1 1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0 2	STX	DC2	"	2	B	R	b	r
0 0 1 1 3	ETX	DC3	#	3	C	S	c	s
0 1 0 0 4	EOT	DC4	$	4	D	T	d	t
0 1 0 1 5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0 6	ACK	SYN	&	6	F	V	f	v
0 1 1 1 7	BEL	ETB	'	7	G	W	g	w
1 0 0 0 8	BS	CAN	(	8	H	X	h	x
1 0 0 1 9	HT	EM	)	9	I	Y	i	y
1 0 1 0 10	LF	SUB	*	:	J	Z	j	z
1 0 1 1 11	VT	ESC	+	;	K	[	k	{
1 1 0 0 12	FF	FS	,	<	L	\	l	|
1 1 0 1 13	CR	GS	-	=	M	]	m	}
1 1 0 1 14	SO	RS	.	>	N	^	n	~
1 1 1 1 15	SI	US	/	?	O	_	o	DEL

Figure 2 - ASCII (X3.4-1968)

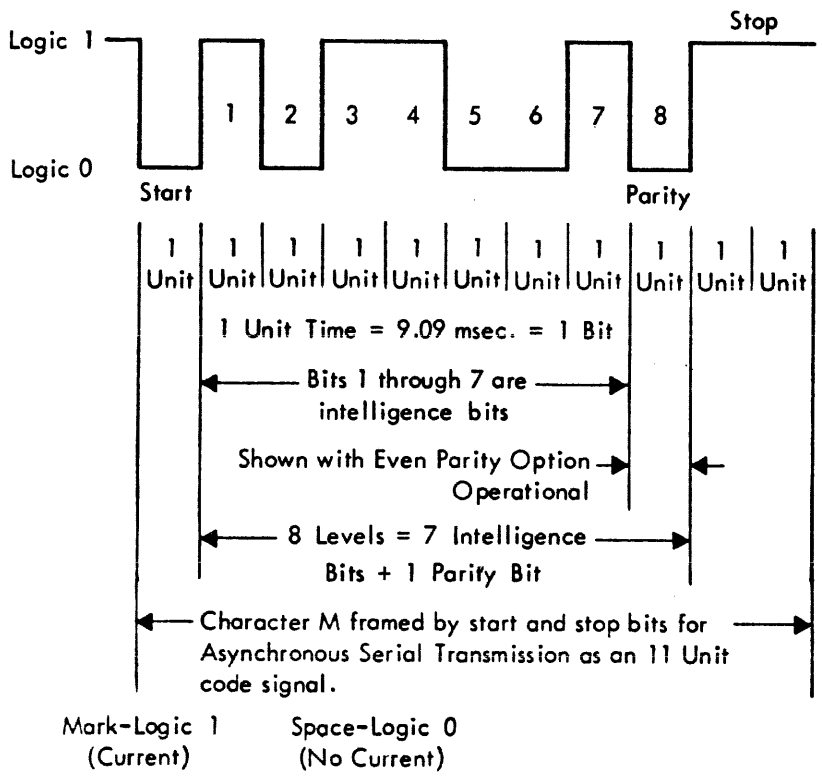


Figure 3 - 8-Level, 11-Unit Code for Character "M"

2.10 The signaling code is a start-stop code of current and no current intervals. Intervals during which the selector magnet is energized are known as marking pulses, and those during which the magnet is not energized are known as spacing pulses. Each group of selecting intervals is preceded by a start interval (no current), and is followed by a stop pulse (current). Both the start and stop pulses are used to maintain synchronism between the transmitting and receiving apparatus.

3. DESCRIPTION

DISTRIBUTOR

3.01 The distributor mechanism is located on the right side of the typing unit toward the rear (Figure 4). The distributor is a disc type with a multiwire input from the keyboard and answer-back mechanisms.

3.02 The code selection set-up in the keyboard contacts (parallel) are distributed sequentially (serial) by a rotating brush. The normal stop position of the brush is near the end of the stop segment to maintain continuous line current in the idle condition.

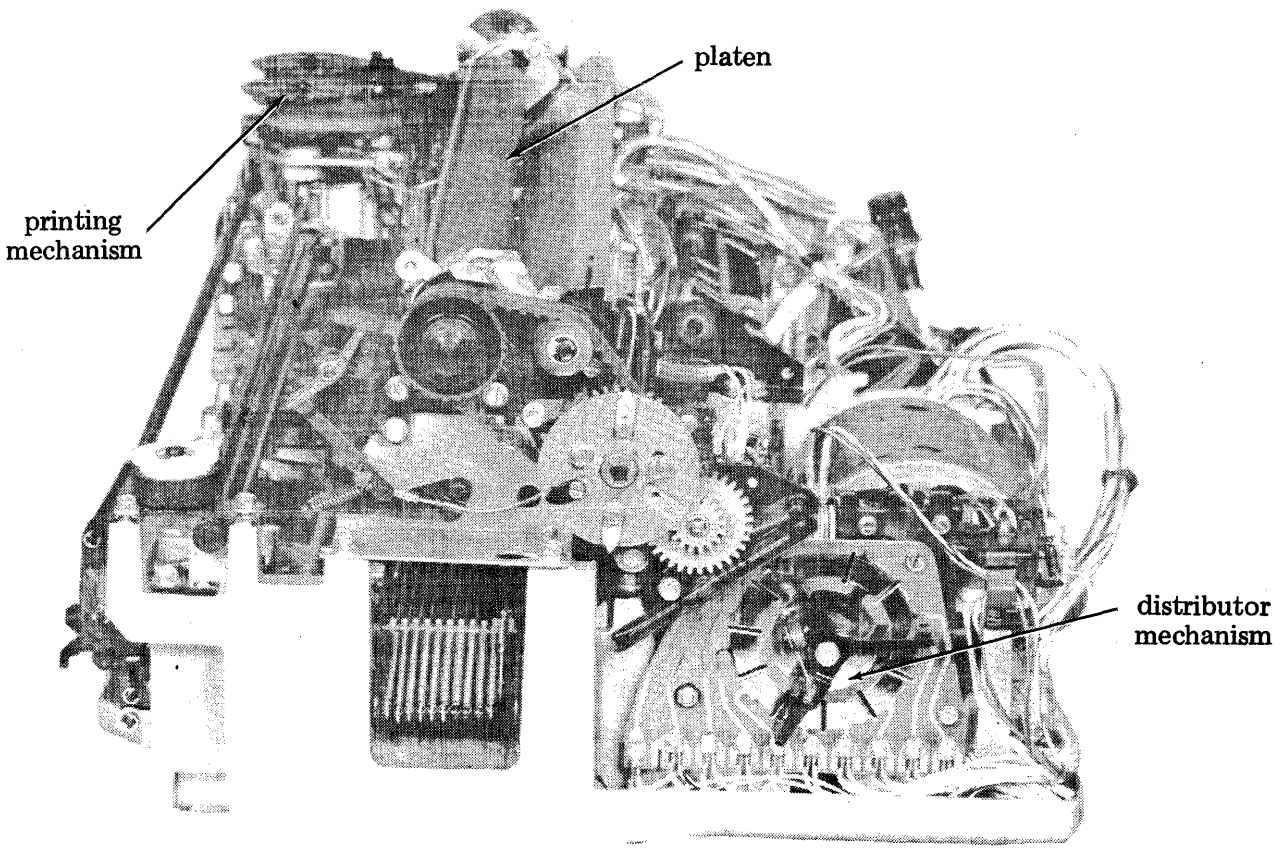
3.03 Like the keyboard contacts, the contacts in the answer-back mechanism produce a parallel output. The distributor also converts this output and distributes the signal in serial.

ANSWER-BACK MECHANISM

3.04 The answer-back mechanism is located at the rear of the typing unit toward the right side (Figure 5). The function of the answer-back unit is to generate a precoded message, usually a station identification sequence of 20 characters or less. Each character can include up to eight levels of binary information, and can accommodate applications using 5-, 6-, or 8-level codes.

3.05 The answer-back unit is provided with a code drum for encoding the desired character sequence. Complete instructions for encoding the drum are contained in Section 574-422-700TC.

3.06 The code drum has tines which can be easily removed for establishing marking bits in required code level positions. Depending upon the length of an answer-back message, the



right side view

Figure 4 - Distributor Mechanism

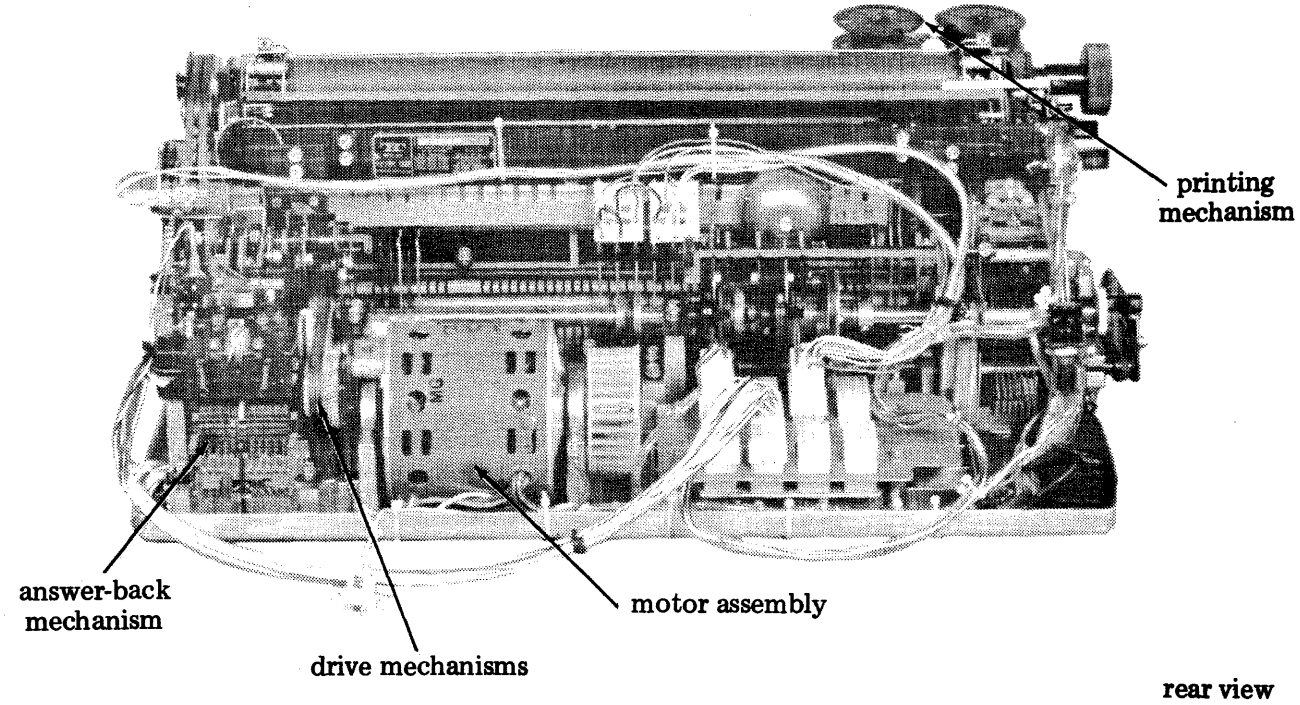


Figure 5 - Answer-Back, Motor, and Drive Mechanisms

answer-back unit can generate one, two, or three identical messages per revolution of the code drum.

MOTOR AND DRIVE MECHANISMS

3.07 The motor assembly and the associated drive mechanisms are located at the rear of the typing unit, to the right of the answer-back mechanism (Figure 5). The motor assembly provides the motive force required for the operations of the typing unit.

3.08 The various drive mechanisms are to the left of the motor. They consist of a motor pinion, an intermediate gear with pulley, a belt, another gear with pulley which drives the distributor, and a gear on the main shaft.

SELECTOR MECHANISM

3.09 The selector mechanism is located on the left side of the typing unit (Figure 6). The selector mechanism receives the code combinations from the selector magnet driver and converts them into mechanical arrangements. These mechanical arrangements control the codebar mechanism.

3.10 For optimum operation of the typing unit, the selector must sample the code elements at the most favorable time. The range finder (Figure 6) provides a means of determining this time by establishing a range of operating margins.

3.11 When the range finder knob is loosened, a pointer may be moved along the scale by a handle. This changes the angular position of the trip levers and latchlevers in the selector, with respect to the main shaft, and therefore changes the position where the selector clutch begins and ends its cycle. The effect of this operation is to change the time in the cycle when the selector samples each code pulse.

CODEBAR MECHANISM

3.12 The codebar mechanism is located in the front of the typing unit (Figure 7). A character to be printed is determined by the code combination set-up on eight codebars. In order to position the codebars, the code selection is first set up in the selector mechanism.

3.13 A code selection is therefore, transferred from the selector mechanism to the codebar mechanism. At the proper point, during the rotation of a codebar reset clutch, a second cam surface trips the function clutch.

FUNCTION MECHANISM

3.14 There are two types of operations performed by the typing unit. The first includes those mechanical actions which are

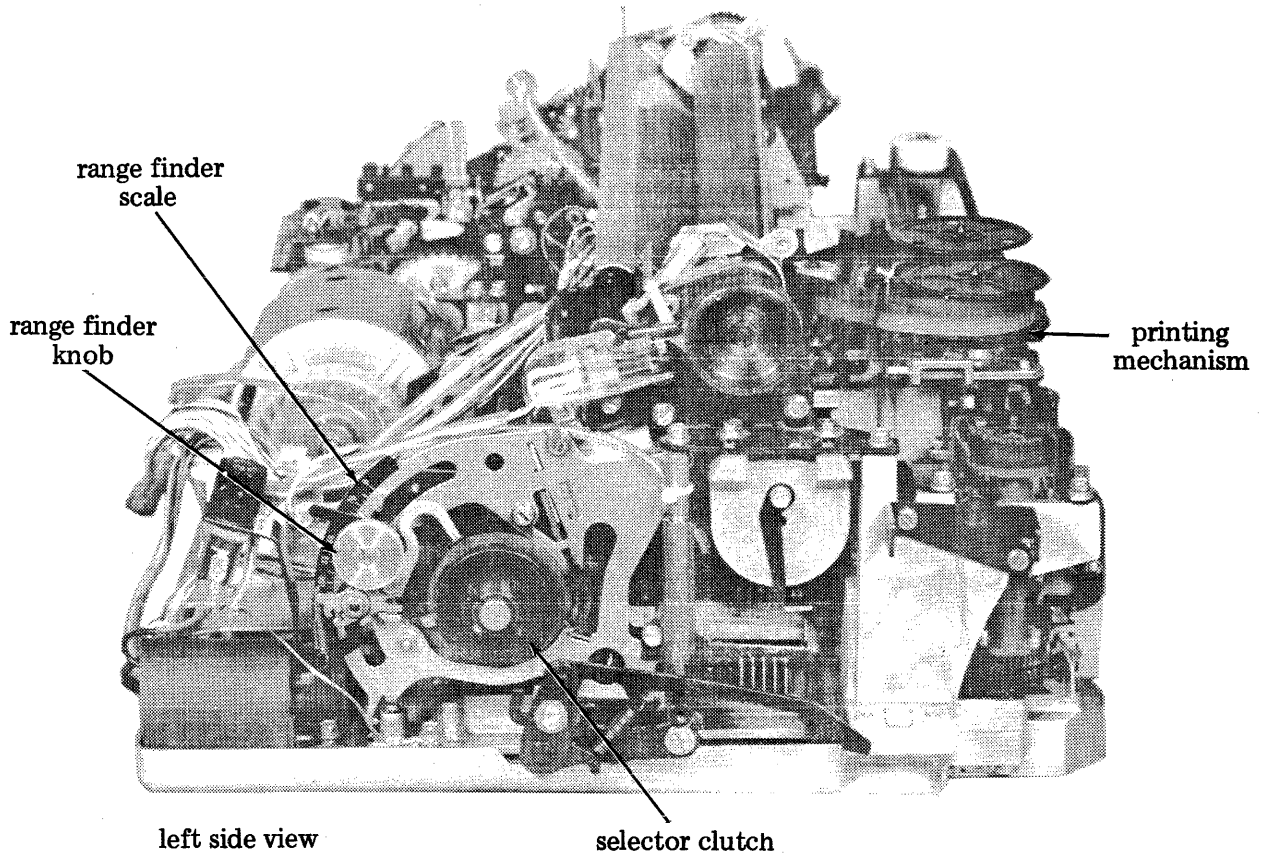


Figure 6 - Selector Mechanism

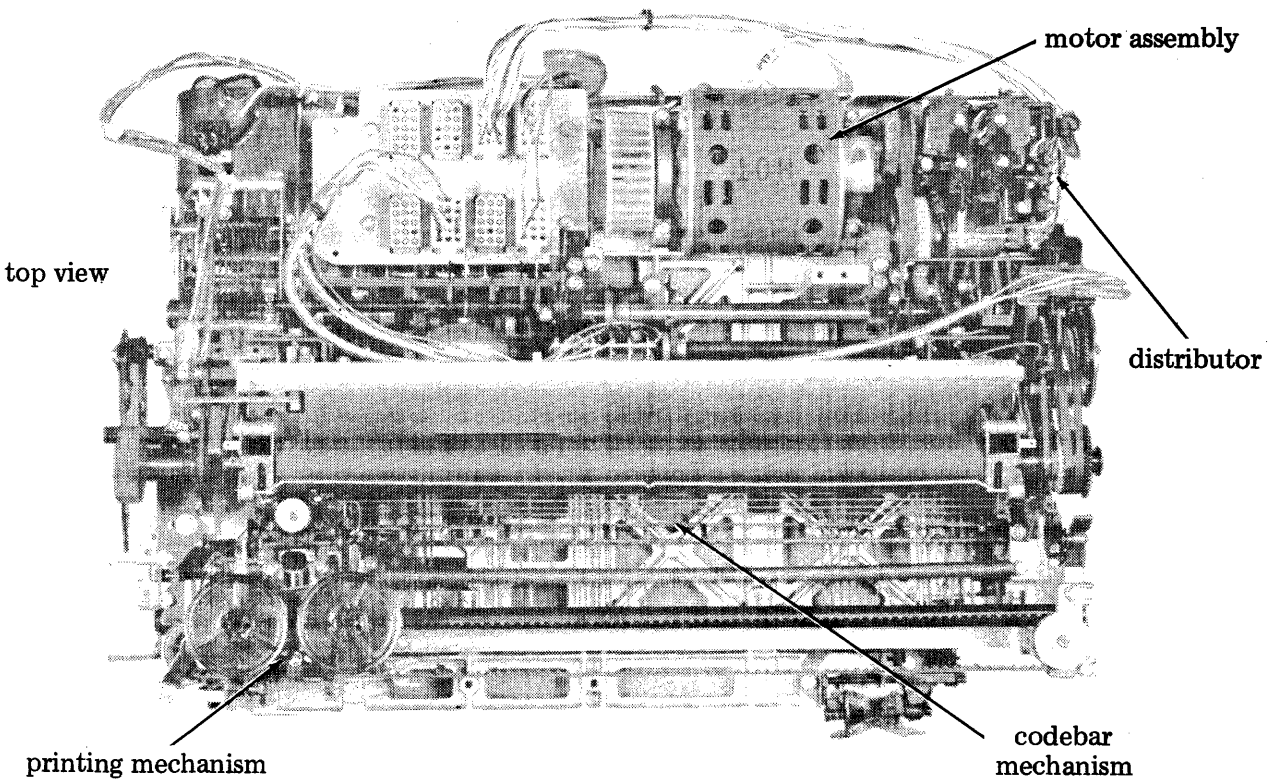


Figure 7 - Codebar Mechanism

necessary to the printing of a character. The second includes those mechanical actions which alter the positions of various mechanisms, but do not print a character.

3.15 The function mechanism, located below the codebar mechanism, derives its modes of operation from the function clutch assembly. The code selection set-up in the codebars, which is transferred below to the function mechanism, is responsible for either the printing of a character, or the performing of a function.

PRINTING MECHANISM

3.16 The printing of characters on paper is accomplished by the print carriage mechanism shown in Figure 8. The print carriage mechanism includes the type wheel, print hammer, ribbon mechanism, and the necessary slides and levers required for the printing of characters.

3.17 The type wheel contains the characters used in printing. The characters are embossed on the surface of the cylindrical type wheel. A typical type wheel character arrangement is given in Figure 9, and shows the characters as they would appear printed.

3.18 The characters are arranged in sixteen positions around the type wheel, and six positions vertically. The type wheel is divided into clockwise and counterclockwise fields to indicate the direction the type wheel is rotated to select the character row required. The rows are numbered 1 through 8 in each direction from the borderline between the fields. The vertical rows of characters are numbered 1 through 6 starting at the top.

3.19 The printing mechanism is capable of two-color printing, typically red and black. When the control sequence "ESCAPE" "3"

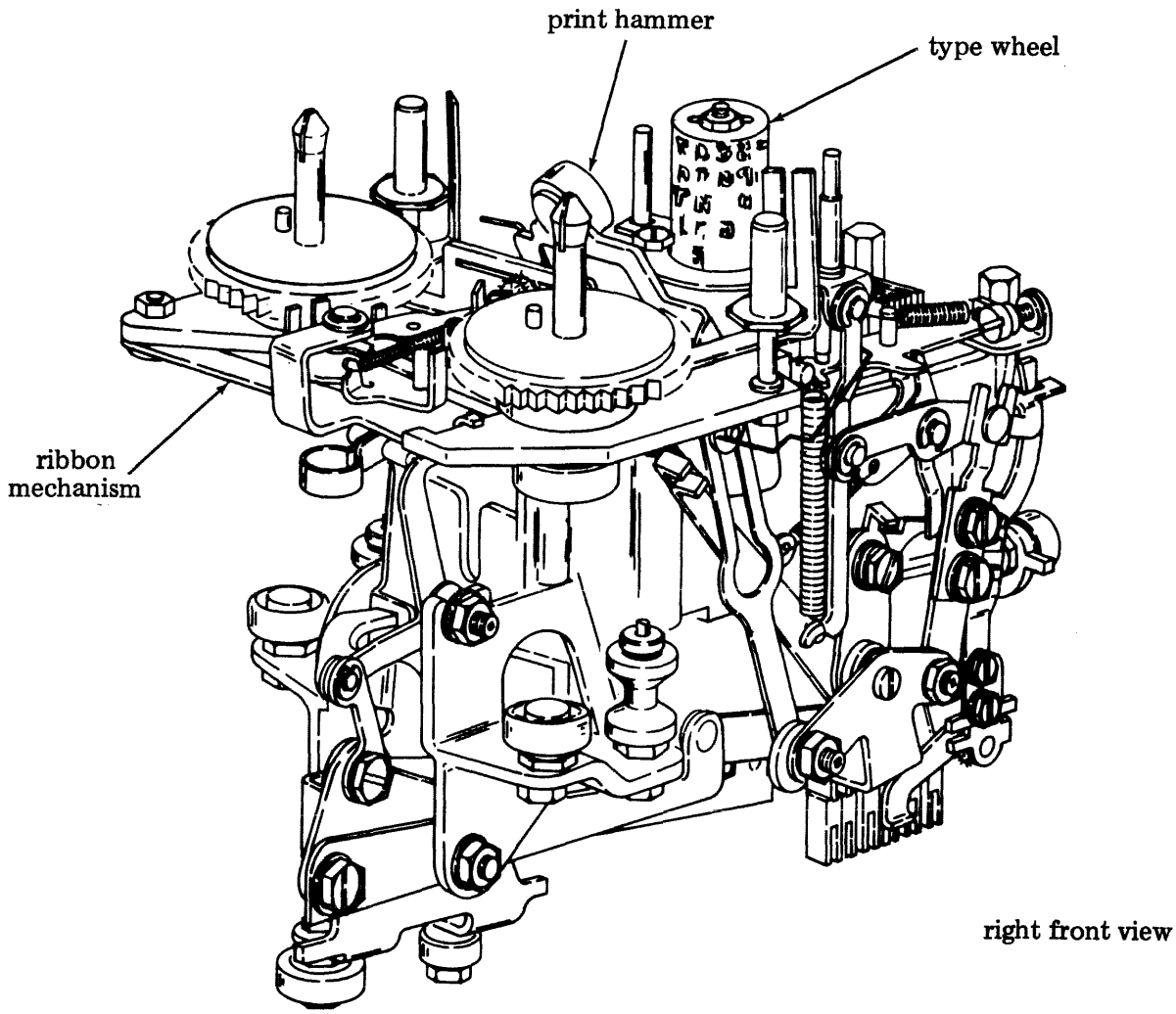
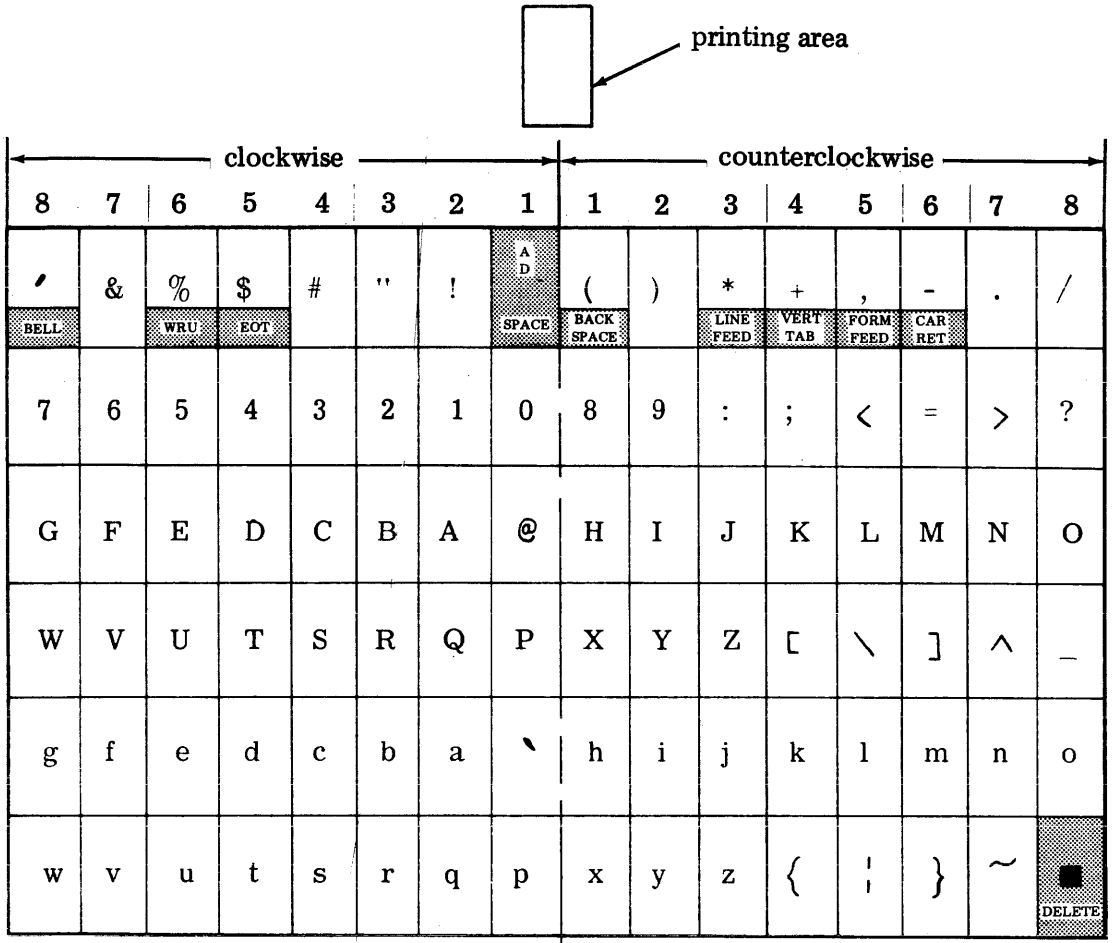


Figure 8 - Print Carriage Mechanism



NOTE 1: Shaded areas are nonprinting functions. However, the type wheel is positioned in the character area for the function shown.

NOTE 2: The type wheel arrangement ("AD" for example) is embossed in the area where the type wheel is positioned during the nonprinting function "SPACE." The arrangement (AD) does not print.

Figure 9 - Typical Type Wheel Character Arrangement (as Printed)

is received, the printing mechanism is conditioned to print all succeeding characters in red. When the control sequence "ESCAPE" "4" is received, the printing mechanism drops the red printing mode, and all succeeding characters are printed in black. During the control sequences (shifting from red to black, and black to red printing), printing and spacing is suppressed.

4. PRINCIPLES OF OPERATION

DISTRIBUTOR

A. General

4.01 The distributor mechanism, located on the right side of the typing unit, receives a code signal locally. The signal originates from an associated keyboard or a tape reader.

4.02 The distributor changes the parallel signal into a serial start-stop output to the selector magnet driver for current rectification. The signal goes from the selector magnet driver to the selector. The following discussion considers the signal originating locally from an associated keyboard.

B. Operation

4.03 The distributor mechanism is illustrated in Figures 10 and 11. When a keytop is depressed, the corresponding code combination is set up in the keyboard contacts. Simultaneously the universal lever moves up. An H-plate connects the universal lever of the keyboard to the distributor clutch trip linkage in the typing unit. As the universal lever moves up, the H-plate pivots the distributor trip linkage. The distributor

trip linkage is connected to the clutch trip lever. As the linkage moves rearward the trip lever is moved away from the shoe lever and the distributor clutch engages.

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

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

(a) In the stop position, the outer brush rests on the stop segment, and the current flows in the signal circuit which is closed. (The signal path is from one side of the line through the start segment, the inner ring, the brushes, the stop segment, the common terminal, and the break contact to the other side of the line.) Thus a marking condition exists. Assume that the D key is depressed. The (--3---7-) code combination is set up in the keyboard contacts.

(b) The distributor clutch is tripped, and the brush holder begins its revolution. While the brush is on the start segment, the circuit is open, no current flows, and a spacing element is transmitted. While it is on the no. 1 segment, the circuit is again open. Likewise the circuit is open for the no. 2 pulse. On the no. 3 segment the circuit is closed, current flows and a marking element is transmitted. For the nos. 4, 5, and 6 segments the circuit is open, transmitting spacing elements. The circuit closes for the no. 7 element and opens for the no. 8. When

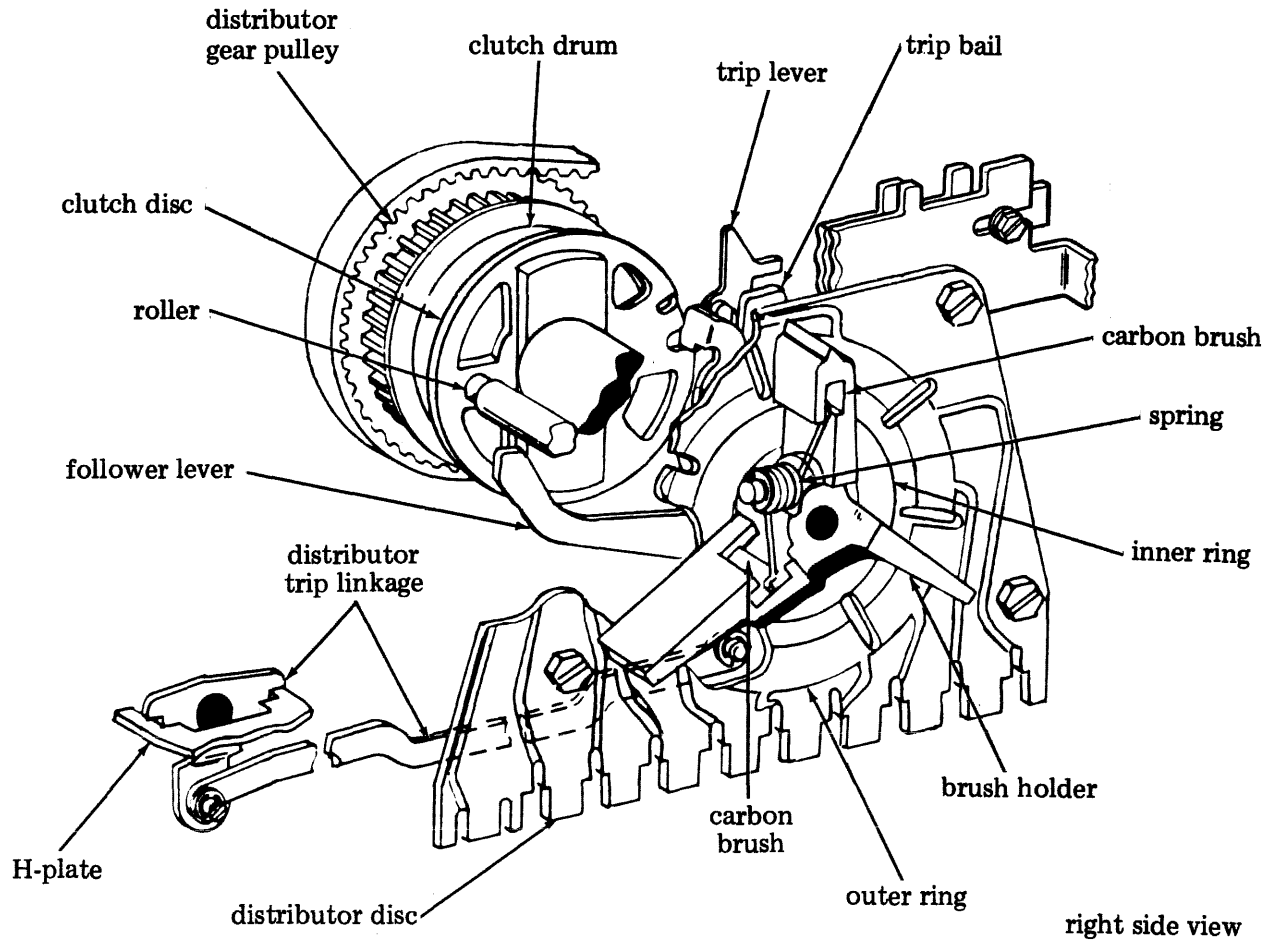


Figure 10 - Distributor Mechanism

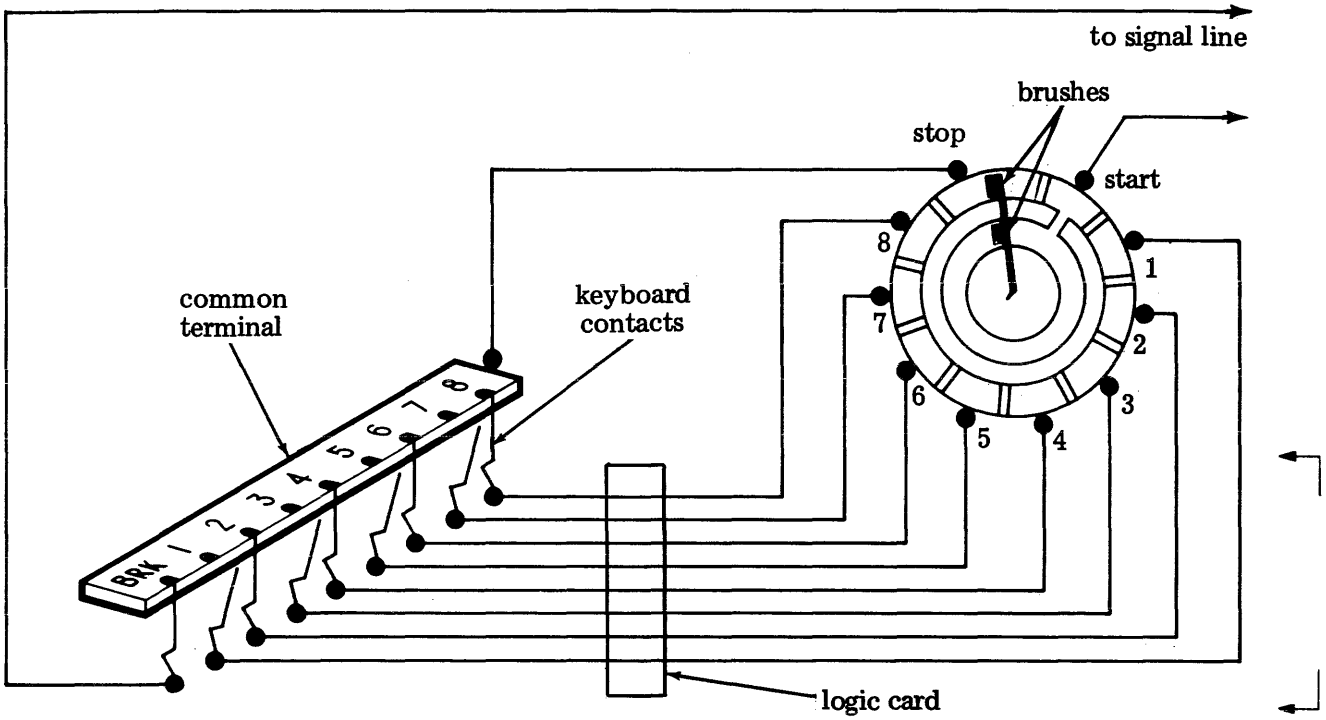


Figure 11 - Signal Wiring for 38 Typing Unit Distributor

the brush reaches the stop segment, the distributor clutch is disengaged, and the line again becomes marking.

ANSWER-BACK MECHANISM

4.06 The answer-back mechanism illustrated in Figures 12 through 15 automatically transmits a predetermined sequence of characters for identification purposes.

A. Answer-Back Drum

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

4.08 The answer-back drum illustrated in Figure 12 has 11 levels as follows:

(a) Five numbered levels

(b) Feed ratchet

(c) Stop cam

(d) Character suppression

(e) Three more numbered levels

4.09 Viewing it from the numbered end, the answer-back drum has 21 rows, ST (start) and 1 through 20. The feed ratchet serves to rotate the drum. The stop cam has tines which can be removed at various points so that the length of the answer-back message can be varied. The character suppression level is used to shunt the first answer-back character from the signal line. By breaking off tines in the various rows at the numbered intelligence levels, the drum may be coded to generate the proper answer-back characters. For example, if the first character of an answer-back message to be transmitted is the letter D code combination (–3---7-), tines at the no. 3 and no. 7 levels should be broken off in the appropriate row where the answer-back message is to start. The second character of the message would be coded into the next succeeding row.

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

NOTE 2: For details on answer-back drum coding refer to Section 574-422-700TC.

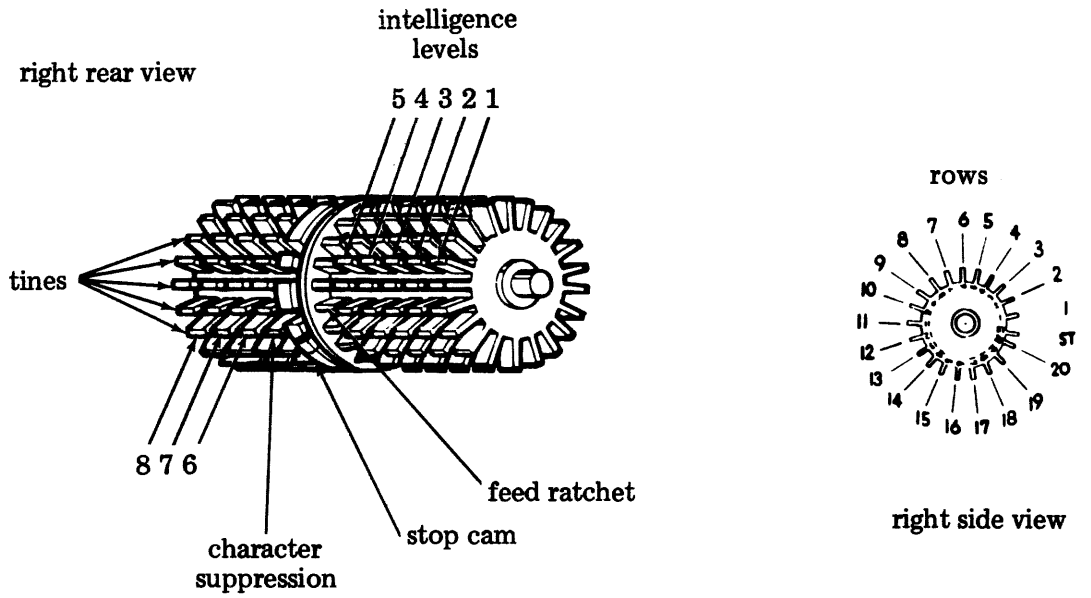


Figure 12 - Answer-Back Drum

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

(a) Remotely, by the reception of a predetermined call character.

(b) Locally, by depressing the HERE IS key.

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

B. Remote Actuation (Figure 13)

4.11 When the answer-back call character is received by the typing unit, the answer-back function lever moves up to engage its function pawl. As the function lever and pawl are moved down by the function bail, the pawl pivots the answer-back bail. In pivoting, the answer-back bail moves a trip link frontward. The trip link pivots the control lever out of the indentation on the stop cam. The control lever, through the stop bail, moves the trip lever rearward, out of engagement with the shoe lever, allowing the distributor clutch to engage.

4.12 When the distributor clutch begins to rotate, a cam roller moves up and permits the feed lever to pivot rearward against the control lever. The feed pawl attached to the feed lever moves rearward to engage the next tooth on the drum ratchet. Near the end of the function cycle the function pawl is stripped from its function lever by the stripper bail. The control lever, under spring tension, tends to return to its unoperated position in the indentation of the stop cam. This would terminate the answer-back operation by disengaging the distributor clutch. However, since the feed pawl is engaged with the next tooth on the ratchet, the spring tension on the control lever is not enough to overcome the combined tension of the feed lever spring and the drum detent. Thus the mechanism remains in its operated condition throughout the distributor cycle.

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

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

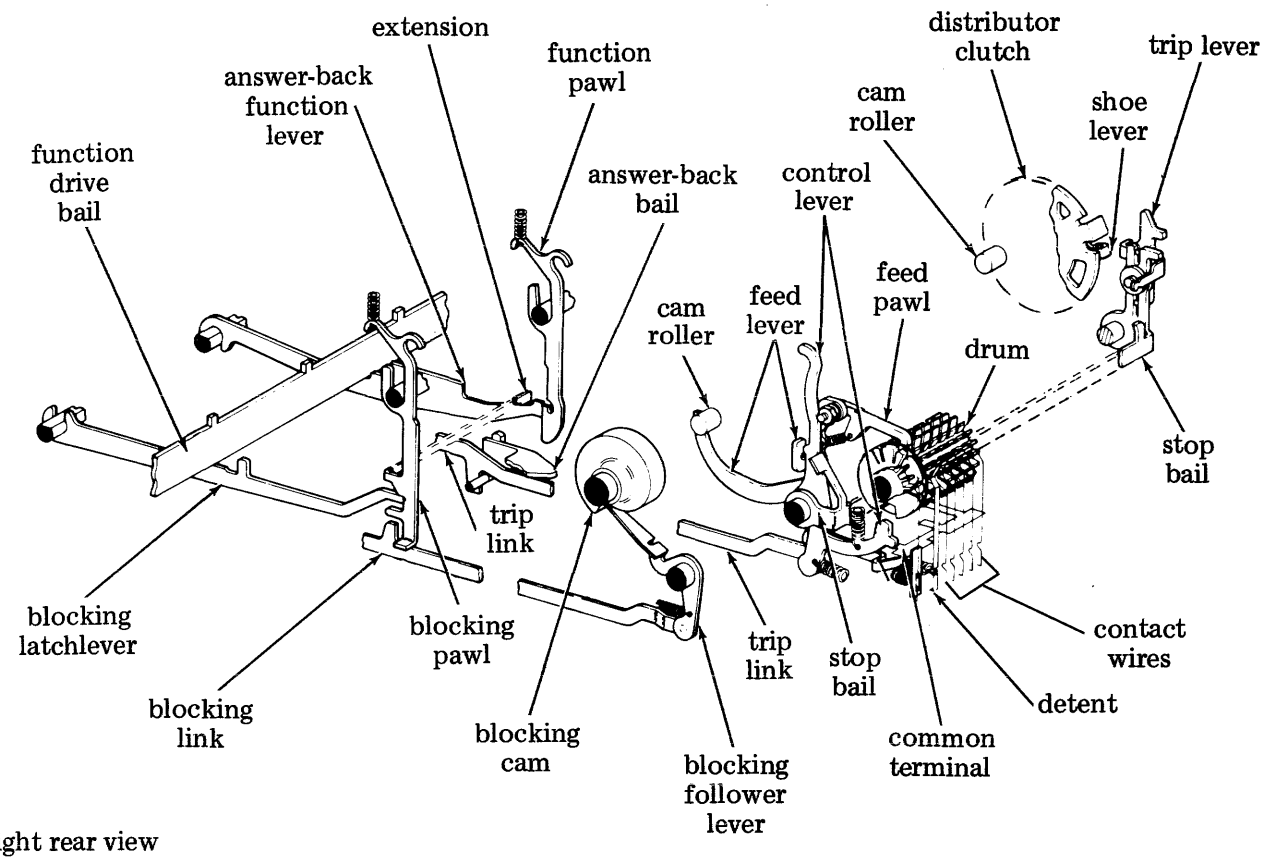


Figure 13 - Answer-Back Mechanism Remote Actuation

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

C. Automatic Actuation (Figure 14)

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

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

4.18 As mentioned, the trip link moves frontward when the answer-back sequence is initiated and remains there until it is terminated. In this position it permits a character suppression contact wire to sense the drum character suppression level. The character suppression contact is wired so that it shunts transmission from the outgoing signal line when it is closed. The tine at the character suppression level of the first character of each answer-back

cycle must always be broken off in order to accomplish this. Thus the character suppression contact wire is selected and keeps the line marking until the second character is sensed. The tines are left in the character suppression level in other rows, except for certain conditions, such as to correct coding errors and to vary the message length. This allows, in effect, one character delay before the message coded into the answer-back drum is transmitted. At the end of the operation, the trip link again moves rearward and holds the contact wire unselected while the mechanism is unoperated.

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

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

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

D. Local Actuation (Refer to Figure 14)

4.22 When the HERE IS pushbutton is depressed on the control panel, the trip magnet energizes. Being energized it attracts the trip magnet armature which allows the trip lever to move frontward. Operation then is similar to automatic operation as described in C.

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

(a) Stop Cam: The answer-back mechanism can be coded for either 1-, 2-, or 3-cycle operation by removing the appropriate tine(s) from the stop-cam level. In 1-cycle operation, the stop cam in row "6" is removed. This coding yields a maximum of 20 rows which are available for coding different characters into the answer-back drum. There are actually 21 rows on the answer-back drum, but only 20 rows can be used for coding since one row is suppressed. The number of rows available for message coding is summarized below for 1-, 2-, or 3-cycle operation:

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

*Alternately, one then the other.

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

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

NOTE: The character-suppression tine in the last row of a cycle should not be removed on 38 typing units used in systems where a response to each answer-back actuation signal must always be obtained. If the tine is removed, the answer-back mechanism will not respond to consecutive answer-back actuation signals. This is due to the operating characteristics of the typing unit which, when the character-suppression tine in the last

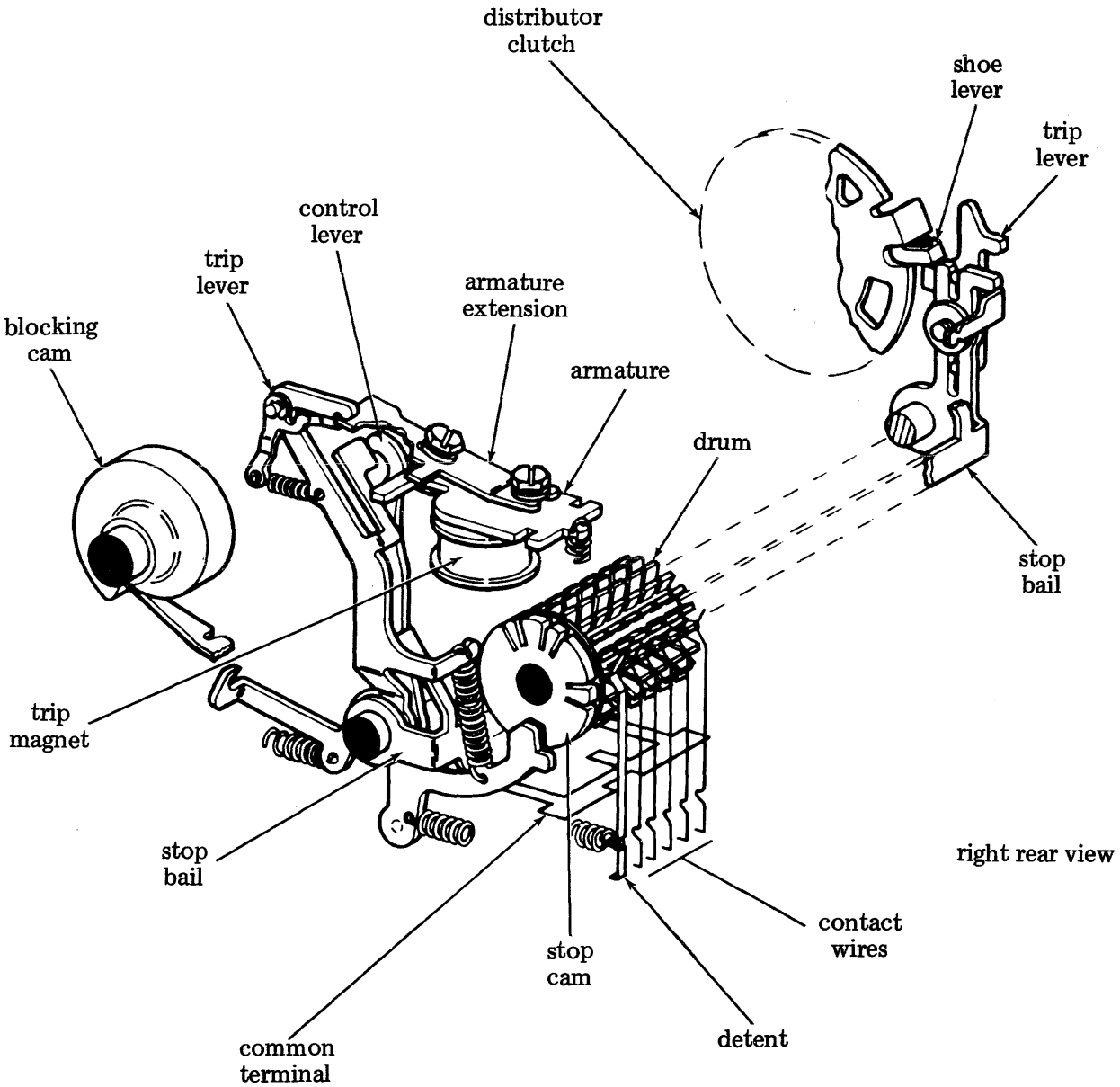


Figure 14 - Answer-Back Mechanism Automatic Actuation

row of a cycle is removed, leaves the answer-back blocking pawl blocking at the end of the answer-back drum cycle of operation. The answer-back blocking pawl will remain blocking until after another character is received through the selector mechanism. The subsequently received character causes the function mechanism to reset the answer-back blocking pawl to its unblocking position. After being reset and upon receipt of an answer-back actuation signal, the answer-back mechanism will only respond to every other answer-back actuation signal unless an intervening character is received through the selector mechanism.

MOTOR AND DRIVE MECHANISMS

A. Motor and Intermediate Gearing (Figure 15)

4.24 The motor used on the 38 typing unit has a run winding and a start winding connected in parallel. (See the appropriate schematic wiring diagram.) The start winding is in series with an electrolytic capacitor and the

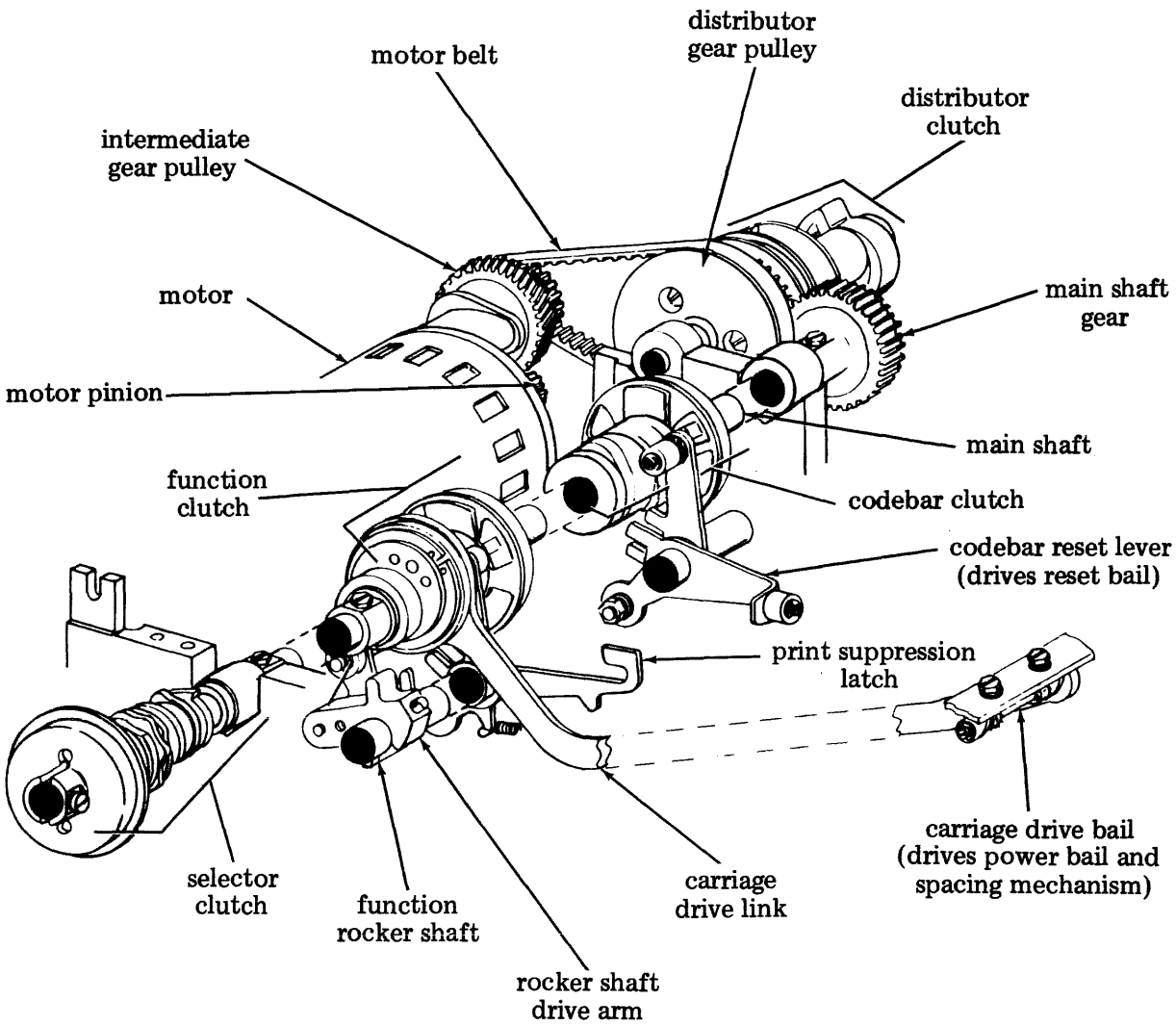


Figure 15 - Motor and Drive Mechanisms

contacts of a current-sensitive start relay. The run winding is connected to a run capacitor. When the motor circuit is closed, the initial surge of current energizes the relay coil, closing the relay contacts. The magnetic flux produced by the operating and start windings starts the motor turning. As the rotor accelerates, the current, through the windings, capacitor, and relay decreases. When it drops to a predetermined level, the relay coil opens the contacts and removes the start coil from the circuit. Using the operating coil alone, the motor continues to accelerate until it reaches synchronous speed.

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

B. Main Shaft

4.26 The main shaft illustrated in Figure 16 receives motion from the motor, and by means of clutches, distributes it to drive all the mechanisms in the typing unit except the distributor mechanism. The distributor mechanism is driven by the motor directly as explained in 4.25.

In friction feed typing units, the main shaft drives three clutches: the selector clutch, the function clutch, and the codebar clutch. In sprocket feed typing units the main shaft drives an additional clutch — the form feed clutch.

C. Clutches

4.27 The clutches used on the 38 typing unit are all metal internal expansion clutches. A clutch is illustrated in Figure 17. This type of clutch functions like brakes. When the clutch is tripped (engaged) two shoes expand against a notched drum. The force of the expanded shoes against the clutch drum is enough to engage the drum. As the drum rotates, the whole clutch and any mechanism attached to it will rotate.

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

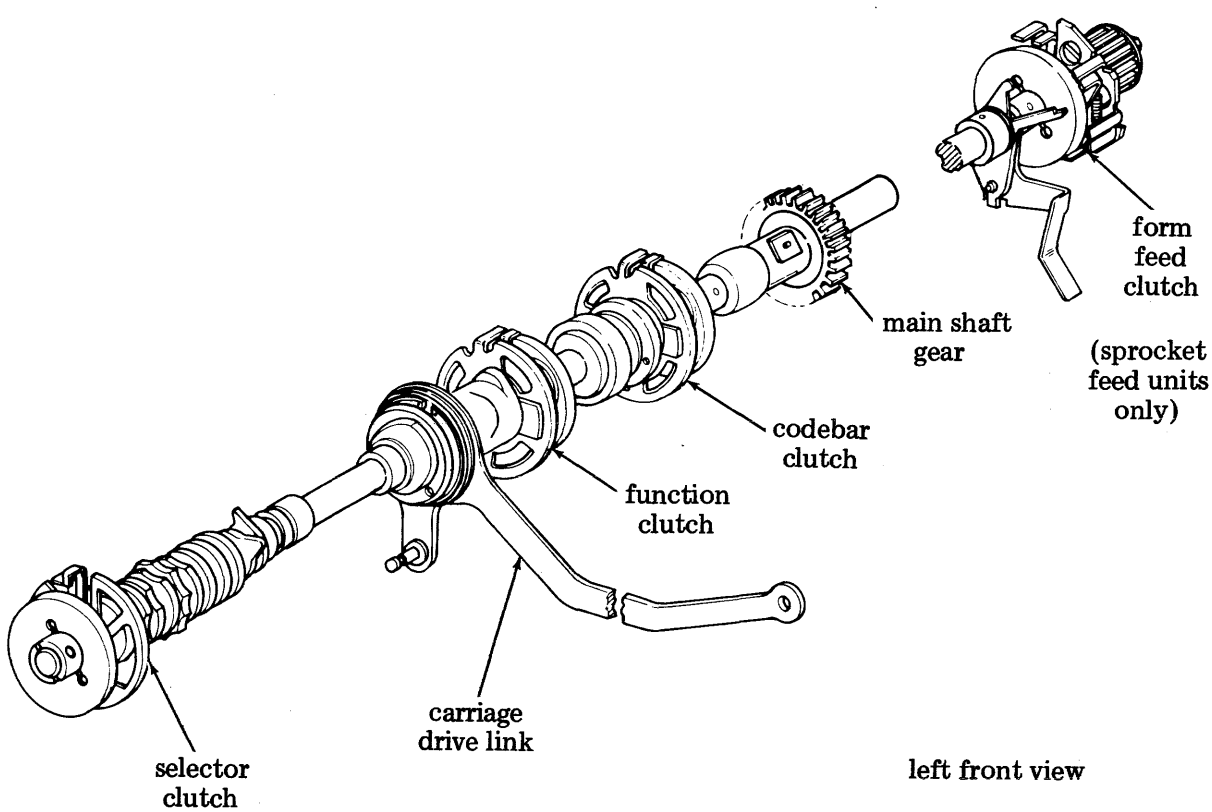


Figure 16 - Main Shaft

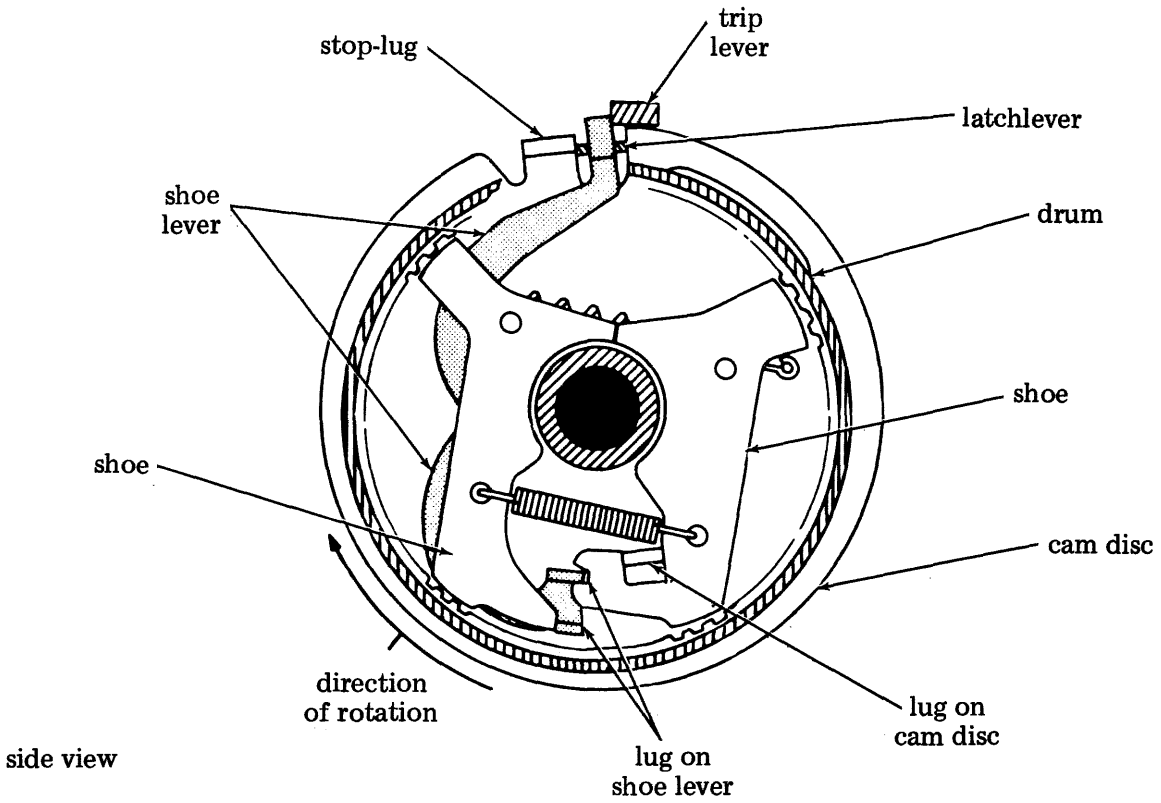


Figure 17 - Internal Expansion Clutch

shoes rotate the disc and the sleeve attached to it. The clutch is now engaged, and the cam sleeve rotates in unison with the shaft.

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

SELECTOR MECHANISM

4.30 The selector mechanism illustrated in Figures 18 and 20 receives the code combinations from the selector magnet driver and converts them to mechanical arrangements that control the codebar mechanism.

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

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

(a) The start cam follower associated with the start lever falls into the indent of the start cam.

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

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

4.34 As the selector clutch rotates, the spacing locklever, the push lever reset bail, the codebar clutch trip follower arm, and

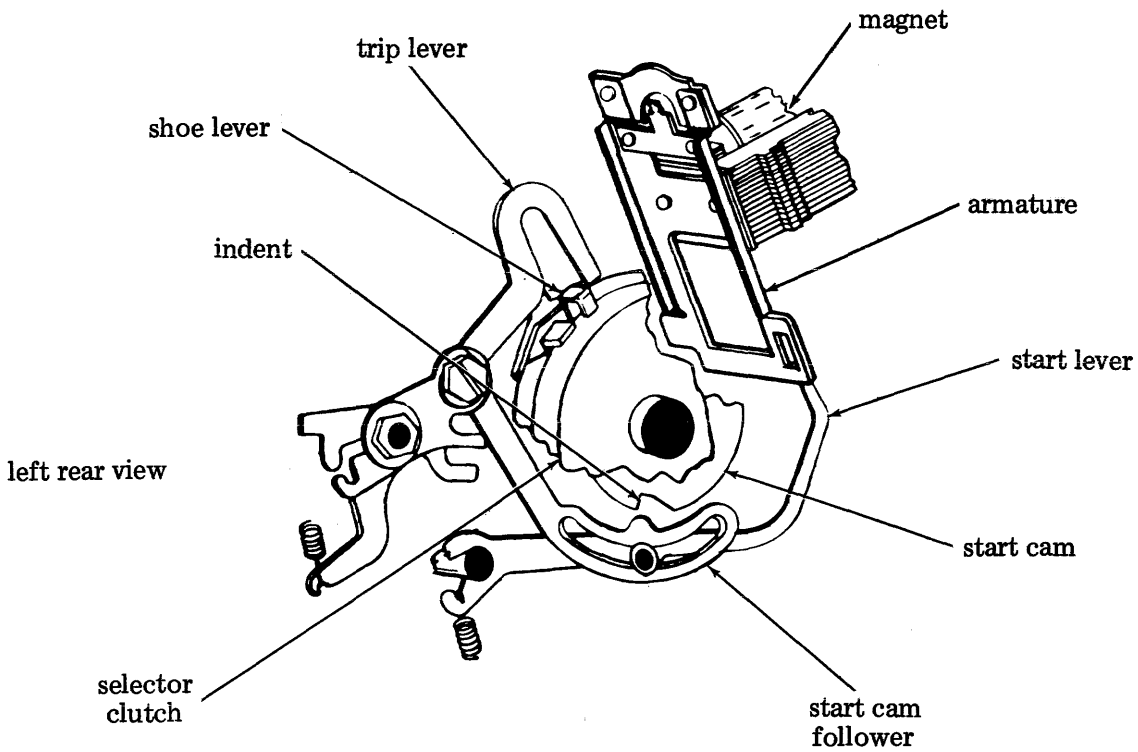


Figure 18 - Selector Trip Mechanism

eight selector levers ride individual cams under spring tension.

4.35 Early in the codebar cycle, the high part of the push lever reset cam pivots the push lever reset bail. In its motion, the bail resets all the spring biased push levers selected in the previous cycle. Once reset, the push levers can be positioned either marking or spacing as the intelligence pulses are received.

4.36 The selector cam sleeve illustrated in Figure 19 has twelve cam surfaces. The cam surfaces are positioned in a staggered fashion so that a sampling sequence can take place. As mentioned in 4.32 and 4.33, the start cam performs its function, and soon after the push lever reset cam is operated. Following these, the spacing locklever cam and the eight intelligence cams operate in sequence.

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

4.37 If the intelligence pulse is spacing it de-energizes the magnet coil and the armature is in the unattracted position. The spacing locklever moves up, holding the armature in this position during the sampling interval. The selector lever is prevented from moving up into the indent of its cam by the armature, and the push lever remains in its unselected (spacing) position in front of the selector lever (Figure 20).

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

4.39 As the code combination is received, each intelligence pulse is sampled in turn, and the corresponding selector levers and push levers are positioned accordingly. The contours of the selector cams are such that near the end of the cycle they drive the selector levers and selected push levers down to their marking position. In this position, the blocking levers with their slotted portions are up. The blocking levers associated with the unselected push levers remain in the spacing position in which their slotted portion is down (Figure 20).

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

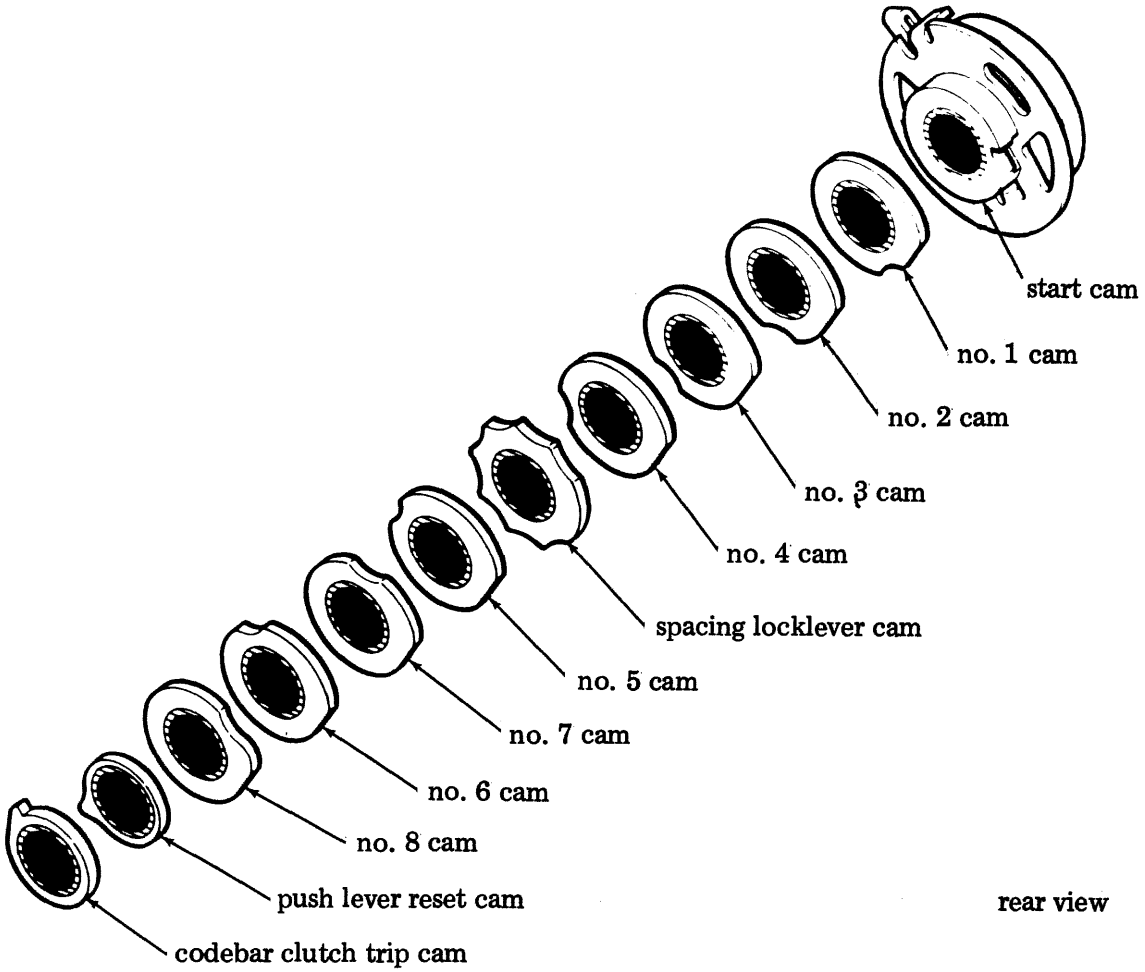


Figure 19 - Selector Cam Sleeve

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

4.42 As an example, assume that the letter D (--3--7-) code combination is received by the typing unit. The start pulse (spacing) trips the selector clutch, which begins its cycle. The stripper bail strips all previously selected push levers from the selector levers. The intelligence pulses are sampled in order, and the no. 3 and no. 7 push levers are selected. Near the end of the cycle the selector clutch cams the no. 3 and no. 7 push levers down, and they pivot the no. 3 and no. 7 blocking levers up to their marking position. The trip cam causes the trip follower arm to trip the codebar clutch. The stop pulse (marking) disengages the selector clutch, and the selector returns to its stop position.

RANGE FINDER

4.43 For optimum operation of the typing unit, the selector must sample the code elements at the most favorable time. The range finder illustrated in Figure 21 provides a means of determining this time by establishing a range of operating margins.

4.44 When the range finder knob is loosened, a pointer may be moved along a range scale by a handle. This changes the angular position of the trip levers and latchlevers with respect to the main shaft, and thus changes the position where the selector clutch begins and ends its cycle. The effect of this operation is to change the time in the cycle when the selector samples each code pulse.

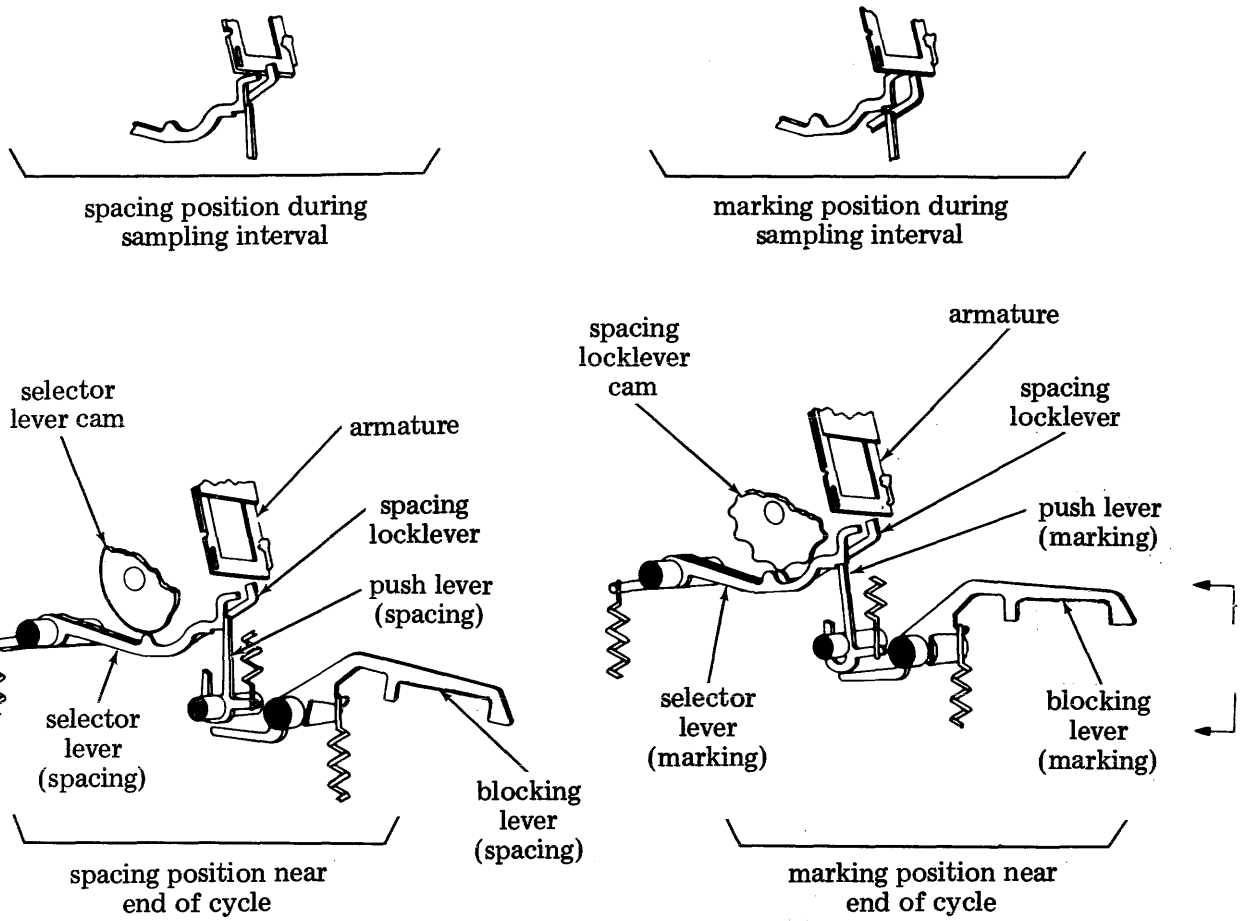


Figure 20 - Selector Mechanism

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

CODEBAR MECHANISM

4.46 A character to be printed is determined basically by the code combination set up on eight codebars (Figure 22). In order to position the codebars, the selection must first be set up in the selector blocking levers. The codebars must then be allowed to sense the blocking levers.

4.47 At the point when the selection is completed, the selector codebar clutch trip lever, in following its cam surface in the selector, rises and trips the codebar clutch. The

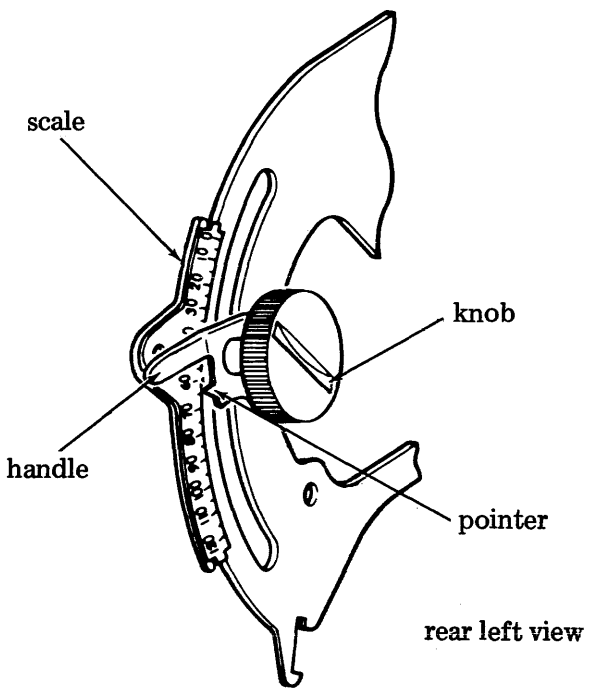


Figure 21 - Range Finder

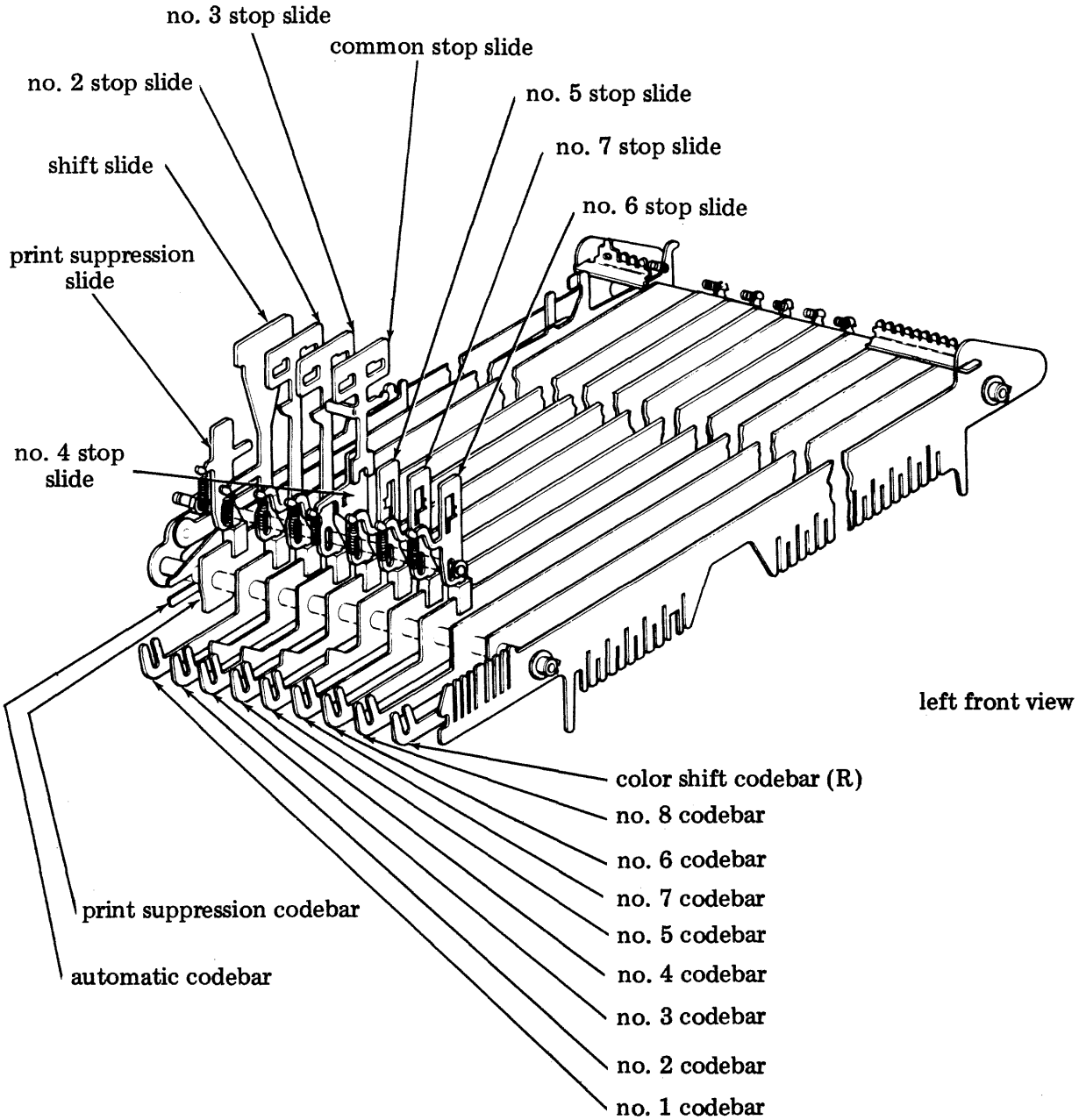


Figure 22 - Codebar Arrangement

codebar clutch controls the motion of the codebar reset bail. During the first portion of movement of the codebar reset clutch, the codebar reset bail rises. The codebars, under control of their individual springs, attempt to rise (Figure 23).

4.48 Each codebar has two projections on the left end which may engage the selector blocking lever. If a blocking lever is up (marking condition), it will engage the second projection on the codebar, and will allow the codebar to rise further. If a blocking lever is down (spacing condition), it will engage the first projection on the codebar, and will not permit the codebar to rise (Figure 23).

4.49 A code selection is therefore transferred from the selector mechanism to the codebar mechanism in such a manner that a codebar associated with a marking pulse moves up, and a codebar associated with a spacing interval stays down. At the proper point during the rotation of a codebar reset clutch, a second cam surface trips the function clutch.

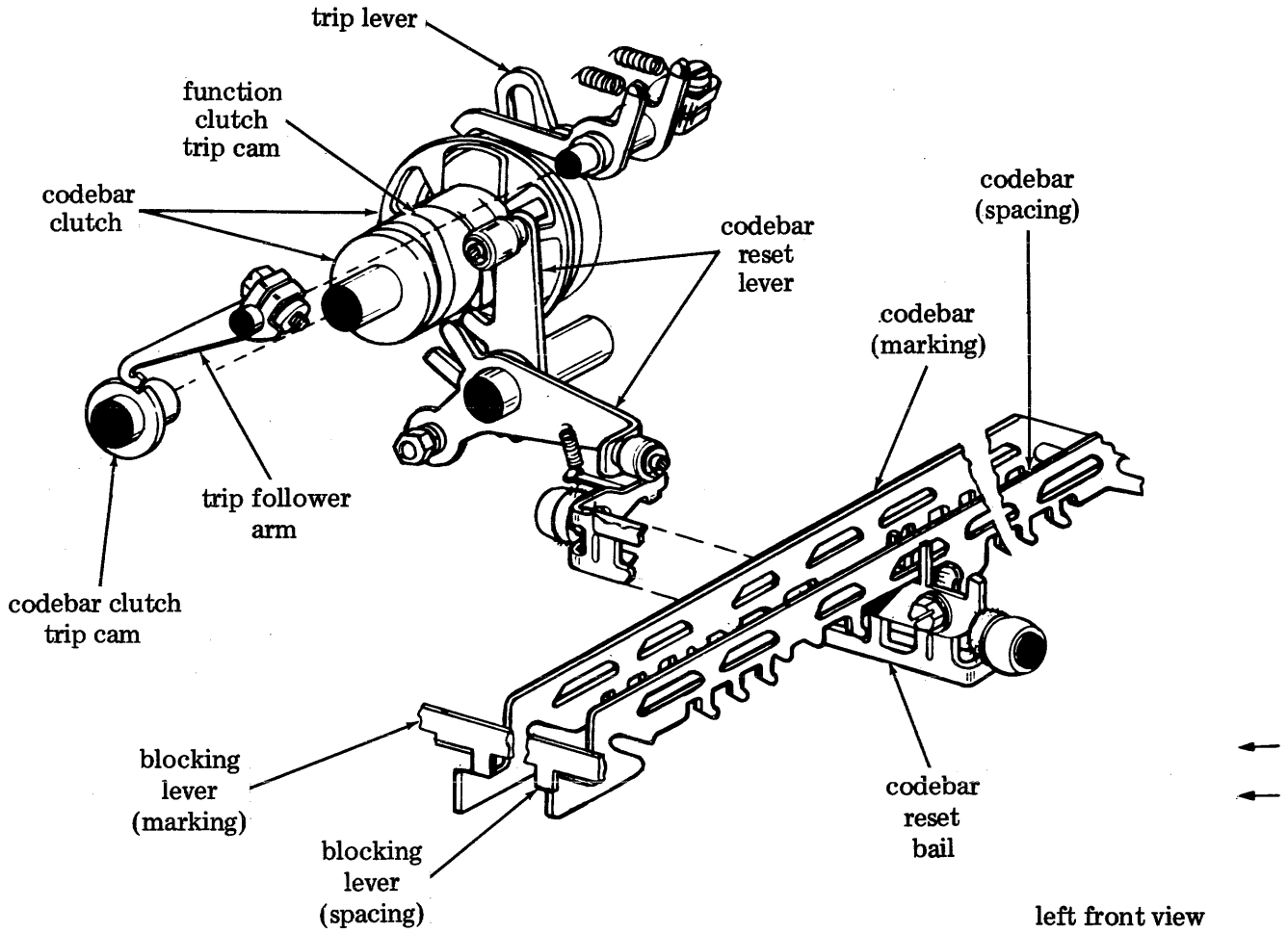


Figure 23 - Codebar Mechanism

FUNCTION MECHANISM

4.50 The function mechanism illustrated in Figure 24 enables the typing unit to perform functions at the receipt of the proper code combinations. Functions are operations supplementary to printing a message, such as carriage return and line feed.

4.51 Early in the codebar cycle, a cam pivots the function trip follower arm, which moves the function trip lever out of engagement with its shoe lever. The function clutch engages and makes one complete revolution. The function drive cam, through a follower arm and drive arm, causes the function rocker shaft to rock. The function rocker shaft, through two drive linkages, moves a function drive bail up during the first part of the cycle and down during the middle portion (Figure 24).

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

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

4.54 Near the beginning of the function cycle, a cam pivots a drive arm which moves the function stripper bail frontward. Near the end of the cycle the cam permits the drive arm, under spring tension, to move the stripper

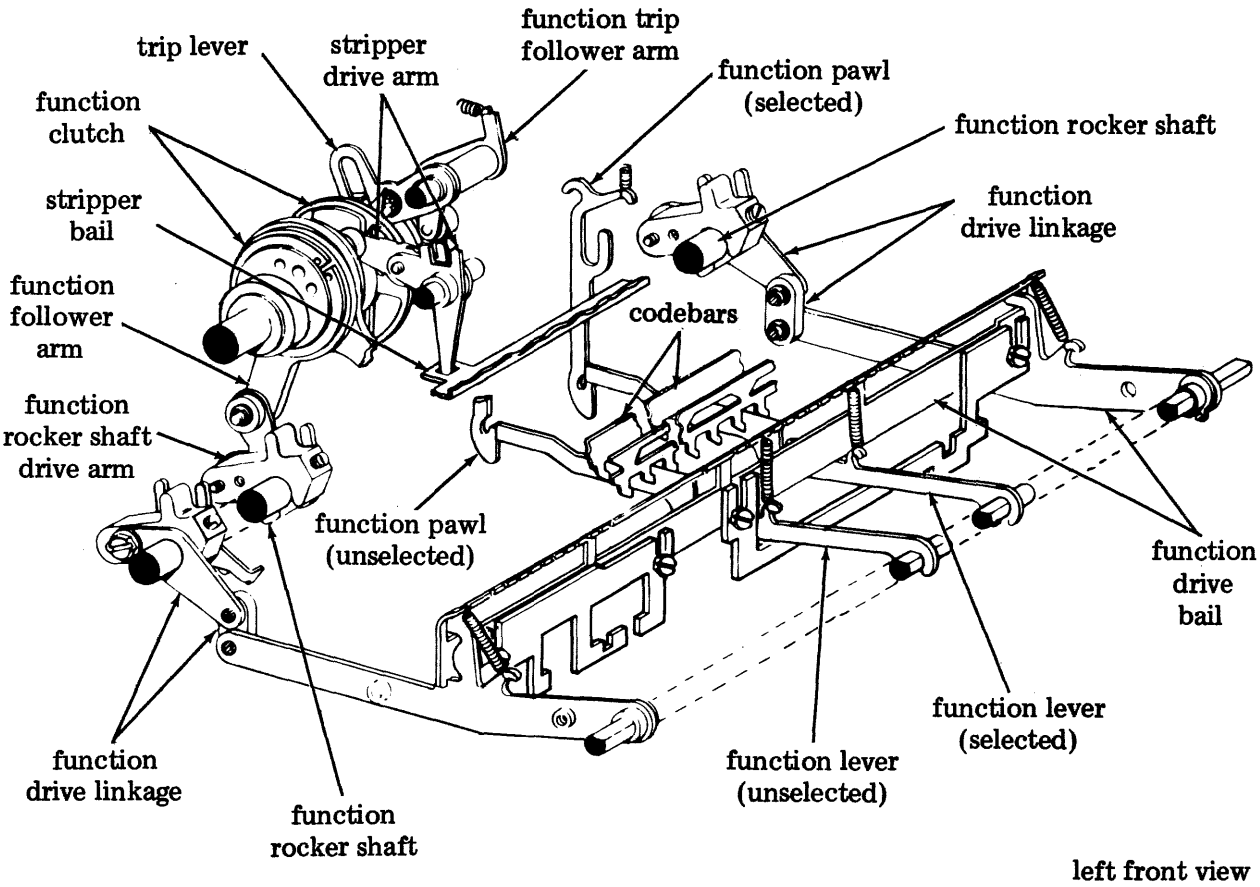


Figure 24 - Function Mechanism

bail rearward and strip any latched function pawls from their selected function levers.

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

PRINTING MECHANISM

A. Type Wheel

4.56 The characters on the type wheel are arranged in sixteen positions around, and six positions vertically (Figure 9). The printing area shown in Figure 9 is the area where the selected character must be if it is to be printed when the print hammer strikes the type wheel. As shown in Figure 9, the borderline between the fields is under the printing area when the typing unit is in the stop condition.

4.57 During the first part of each function cycle, vertical and rotary positioning mechanisms impart separate but simultaneous motions to the type wheel to select the proper character. The rotary positioning mechanism rotates the type wheel either clockwise or counterclockwise to align the proper row with the printing area. The vertical positioning mechanism raises the type wheel to the place for the proper character to print in the printing area. During the last part of the function cycle, the type wheel is returned to its stop position.

B. Motive Force

4.58 As the function clutch rotates, the associated eccentric cam starts an oscillating motion through the carriage drive link to the carriage drive bail (Figure 15). The bail pivots rearward during the first part of the cycle, and frontward to its stop position during the latter part. In doing this, it causes the power bail on the carriage to pivot first clockwise (as viewed from the left), then counterclockwise. The power bail has two rollers that move along the drive bail and permit it to receive the motion regardless of the carriage position along the printing line (Figure 25).

C. Rotary Positioning

4.59 Referring to Figure 26, the rotary positioning bail is held against the power bail by a spring. Connected to the rotary

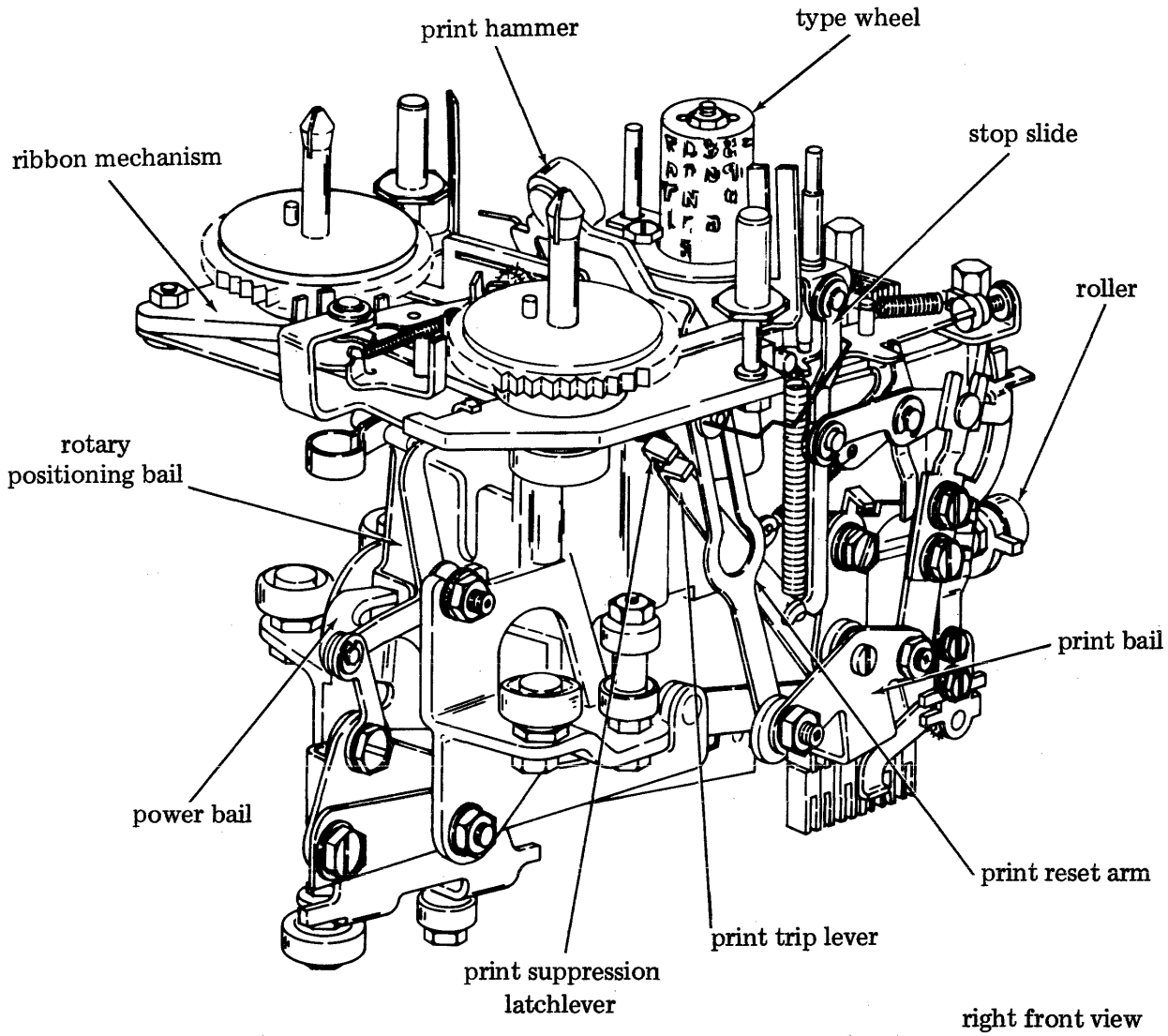


Figure 25 - Print Carriage Mechanism

positioning bail (at the top) is the rotary drive arm which pulls back on one of two racks. These racks are meshed with the pinion on the top hub of the type wheel shaft and tube.

4.60 As the power bail rotates, the rotary positioning bail rotates. The rotary drive arm is engaged with one of the racks and causes it to move, turning the pinion with which it is meshed (Figure 26). The pinion, being an integral part of the tube, turns the tube. The tube turns the cross pin fastened to the type wheel shaft and type wheel.

4.61 This motion continues until the end of one of the racks strikes a stop slide (Figure 27). At this time, the type wheel is correctly positioned in the rotational direction.

D. Degree of Rotation

4.62 How far the type wheel rotates in either direction is determined by the no. 1, no. 2, and no. 3 codebars. The no. 1 codebar controls the position of the shift slide, while the no. 2 and no. 3 codebars control the positions of the no. 2, no. 3, and common stop slides. These stop slides ride the codebars, and are up when the codebars are marking and down when the codebars are spacing (Figure 27).

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

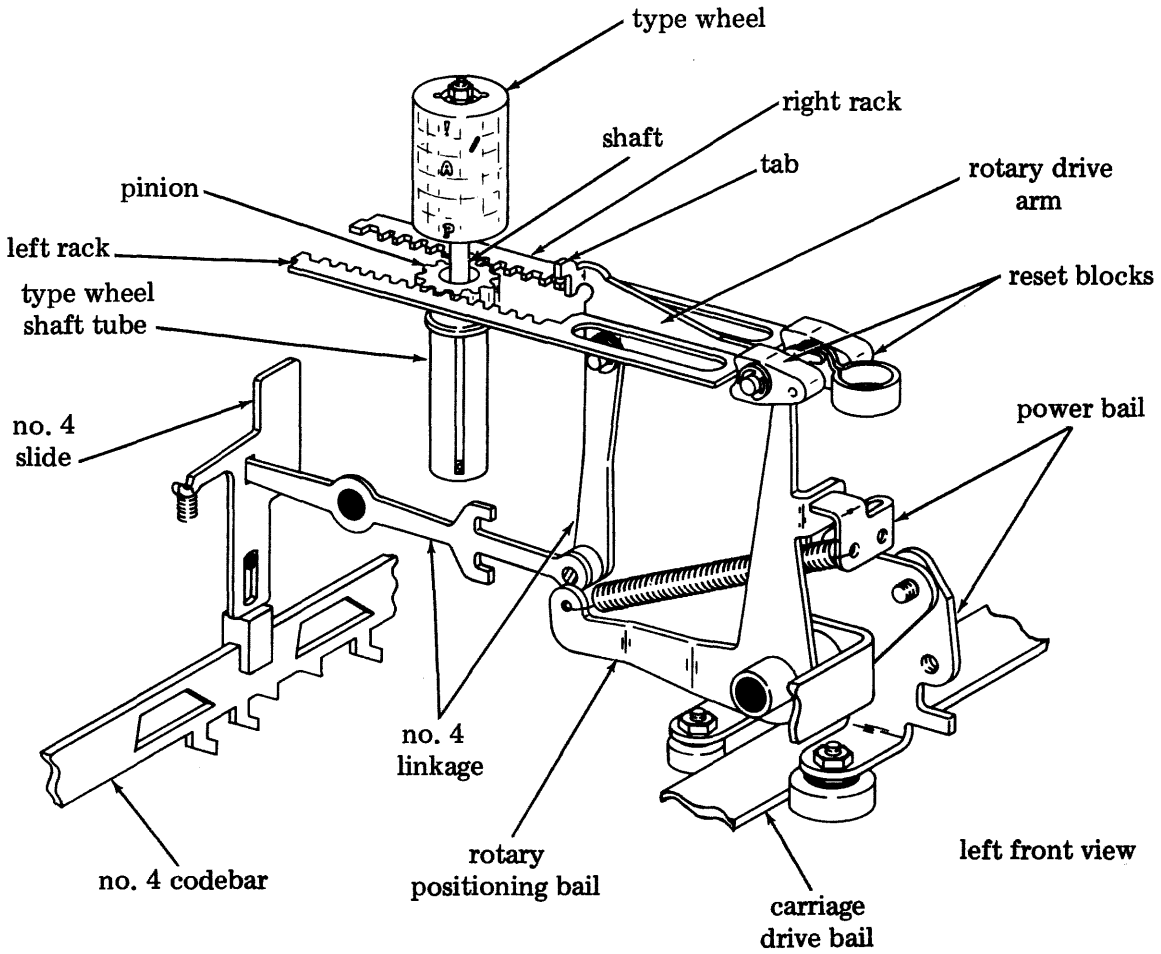


Figure 26 - Rotary Positioning Mechanism

4.64 The position of each stop slide determines how much the rack will travel before it is stopped. When a stop slide is down, it blocks the rack; when it is up, the rack will pass through a slot in the slide and continue to travel until blocked by another slide. The shift slide has no slot. It will block the rack whether it is up or down (Figure 27).

4.65 Depending on the position of the shift slide, the rack will travel to position either the odd or even rows of the type wheel. When the shift slide is up, the even rows are selected; when it is down, the odd rows are selected.

4.66 As mentioned in 4.62, the shift slide is controlled by the no. 1 codebar. When the no. 1 pulse is spacing, the no. 1 codebar and the shift slide are down. In this position, the shift slide is blocked by the front stop surface of the rotary stop plate (Figure 28). The no. 2, no. 3, and common stop slides remain locked in the slots of the slide guideplate. The corresponding positions of the shift slide, the no. 2, no. 3, and common stop slide, will effect 7, 5, 3, and 1 rows of type wheel rotation respectively.

4.67 When the no. 1 pulse is marking, the no. 1 codebar and the shift slide are up. In this position, the shift slide is up, blocked by the rear stop surface of the rotary stop plate (Figure 28). The two slide guideplates, under spring tension, move to the rear. This positions all four stop slides to the rear effecting one additional row of type wheel rotation. Thus, the shift slide, the no. 2, no. 3, and common stop slides will effect 8, 6, 4, and 2 rows of type wheel rotation respectively.

E. Vertical Positioning

4.68 The vertical positioning mechanism, illustrated in Figure 29, positions the type wheel so that the proper character in the selected row is in the printing area at the time of printing.

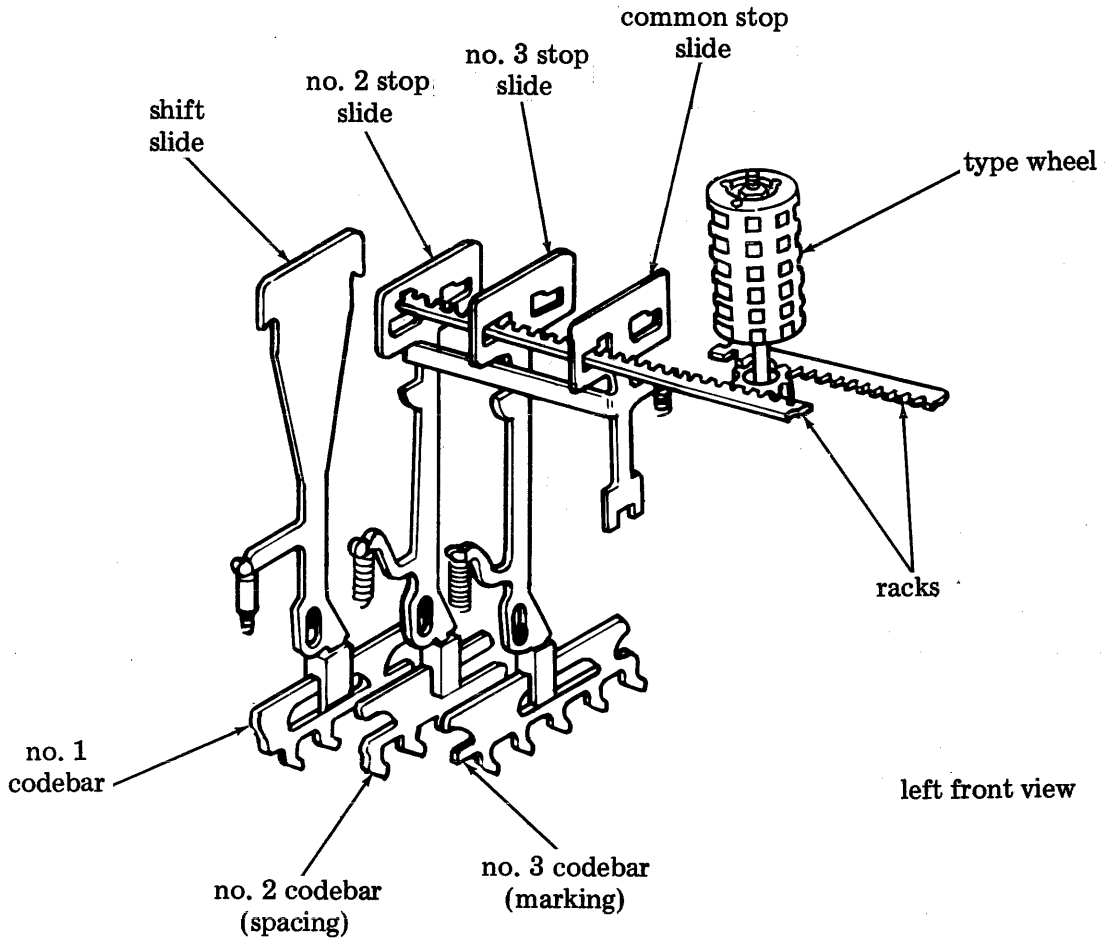


Figure 27 - Rotary Positioning Stop Slides

4.69 Vertical positioning is determined by the no. 5, no. 6, and no. 7 codebars, along with their associated stop arms. The marking codebars that effect printing in the first through sixth rows of the type wheel are as follows:

TYPE WHEEL ROW	CODEBAR (MARKING)
1	5, 6, and 7 Spacing
2	5 and 6
3	7
4	5 and 7
5	6 and 7
6	5, 6, and 7

4.70 A vertical bail is held against the power bail by a spring. When the bails rock clockwise (as viewed from the left) during the first part of the function cycle, the vertical drive bail, through a drive arm, lifts the type wheel shaft and type wheel. How far the type wheel is raised is determined by six stop arms that respond to the no. 5, no. 6, and no. 7 pulses. When the drive bail encounters an arm, it is stopped and its spring extends as the power bail continues to pivot. The type wheel shaft moves up and down the tube, and permits rotary motion to be transferred to the type wheel regardless of its vertical position.

4.71 When a code combination is received in which the no. 5, no. 6, and no. 7 pulses are spacing, the corresponding codebars and their respective slides remain down (spacing), and no motion is transferred to the stop arms. As the rear extension of the vertical drive bail rises, it strikes the C_1 stop arm, which is the longest (Figure 29). This permits the type wheel to be raised to the point where the first character in the selected row is in the printing area at the time of printing.

4.72 When the no. 5 and the no. 6 pulses are marking and the no. 7 pulse is spacing, the no. 5 and no. 6 codebars move their vertical slides up. The slides pivot the C_1, C_2, and 6 stop

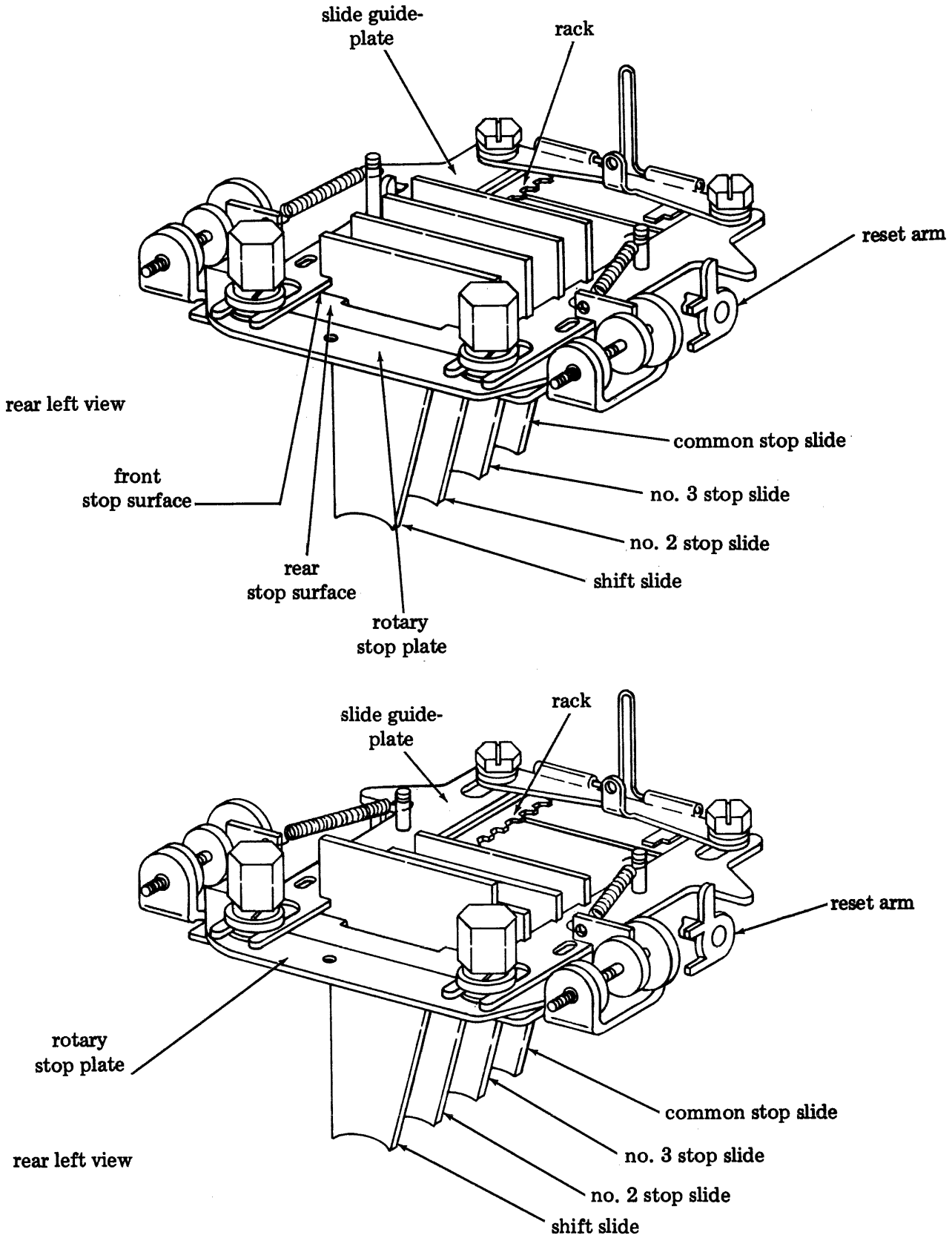


Figure 28 - Rotary Positioning Mechanism

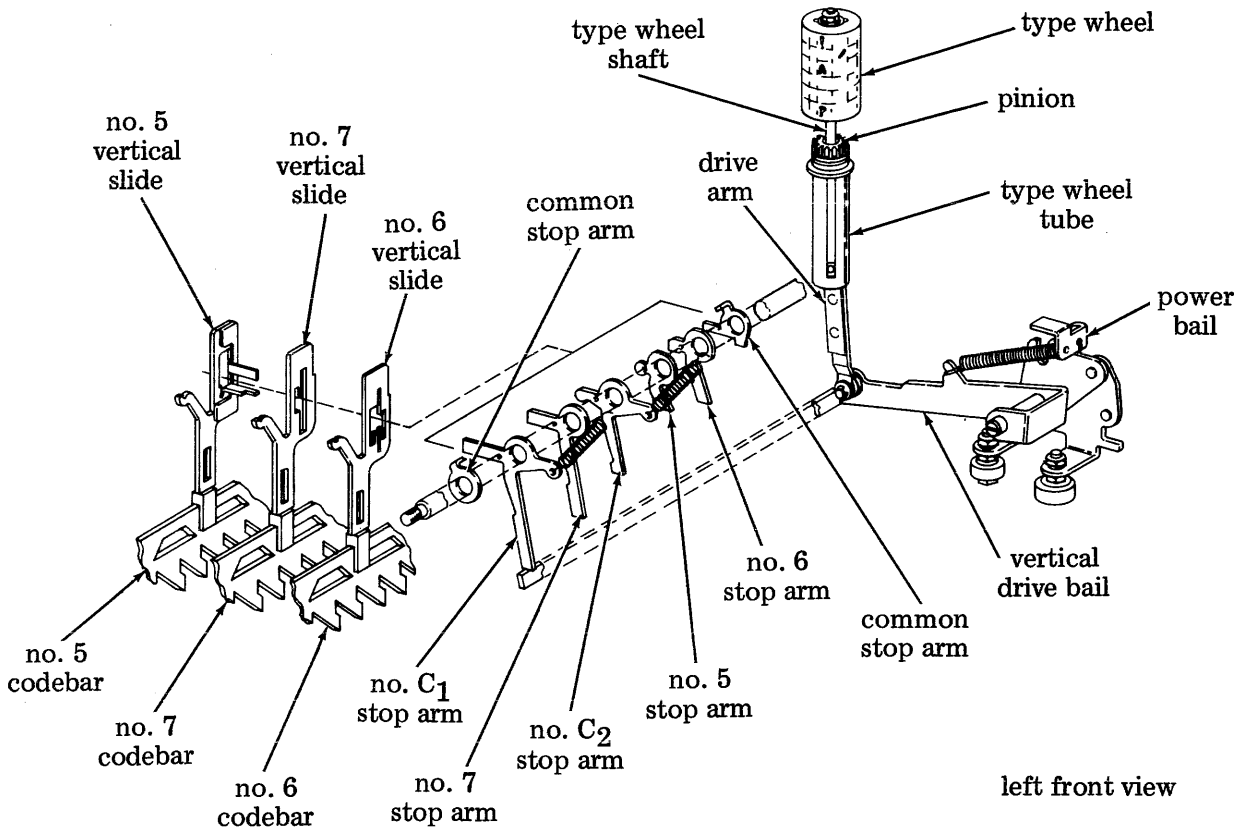


Figure 29 - Vertical Positioning Mechanism

arms rearward, out of the way of the drive bail. The bail strikes the no. 7 stop arm (the second longest), and the second character in the selected row is placed in the printing area.

4.73 When the no. 7 pulse is marking and the no. 6 and no. 5 are spacing, the no. 7 slide pivots the C_1 and no. 7 stop arms out of the way. The bail strikes the no. C_2 stop arm (the third longest), and the third character row is placed in the printing area.

4.74 When both the no. 5 and no. 7 pulses are marking and the no. 6 is spacing, three stop arms, C_1, C_2, and no. 7, are pivoted out of the way. The bail moves up until it strikes the no. 6 stop arm (the fourth longest), and the fourth character row is placed in the printing area.

4.75 When the no. 6 and no. 7 pulses are marking and the no. 5 is spacing, the C_1, 7, C_2, and 6 stop arms are pivoted out of the way. The bail moves up until it strikes the no. 5 stop arm (the second shortest), and the fifth character row is placed in the printing area.

4.76 When the no. 5, no. 6, and no. 7 pulses are marking, the C_1, 7, C_2, 6, and 5 stop arms are pivoted out of the way. The bail moves up and strikes the common stop arm (shortest), and the sixth character row is placed in the printing area.

F. Printing Mechanism

4.77 After the type wheel has been positioned, the printing mechanism illustrated in Figure 30 supplies the motion required to print the selected character. The motion is transferred through the proper levers, bails, springs, etc, to the rubber print hammer which strikes the type wheel forcing it against the ribbon and paper.

4.78 The print hammer is secured to the print hammer bail, and is located in front of the type wheel. The bail is latched by a lever extending down the right side of the carriage. When released, the print hammer flies forward under the action of the torsion spring, and hits the type wheel. Because the print hammer is made of a soft rubber, the type wheel is not damaged.

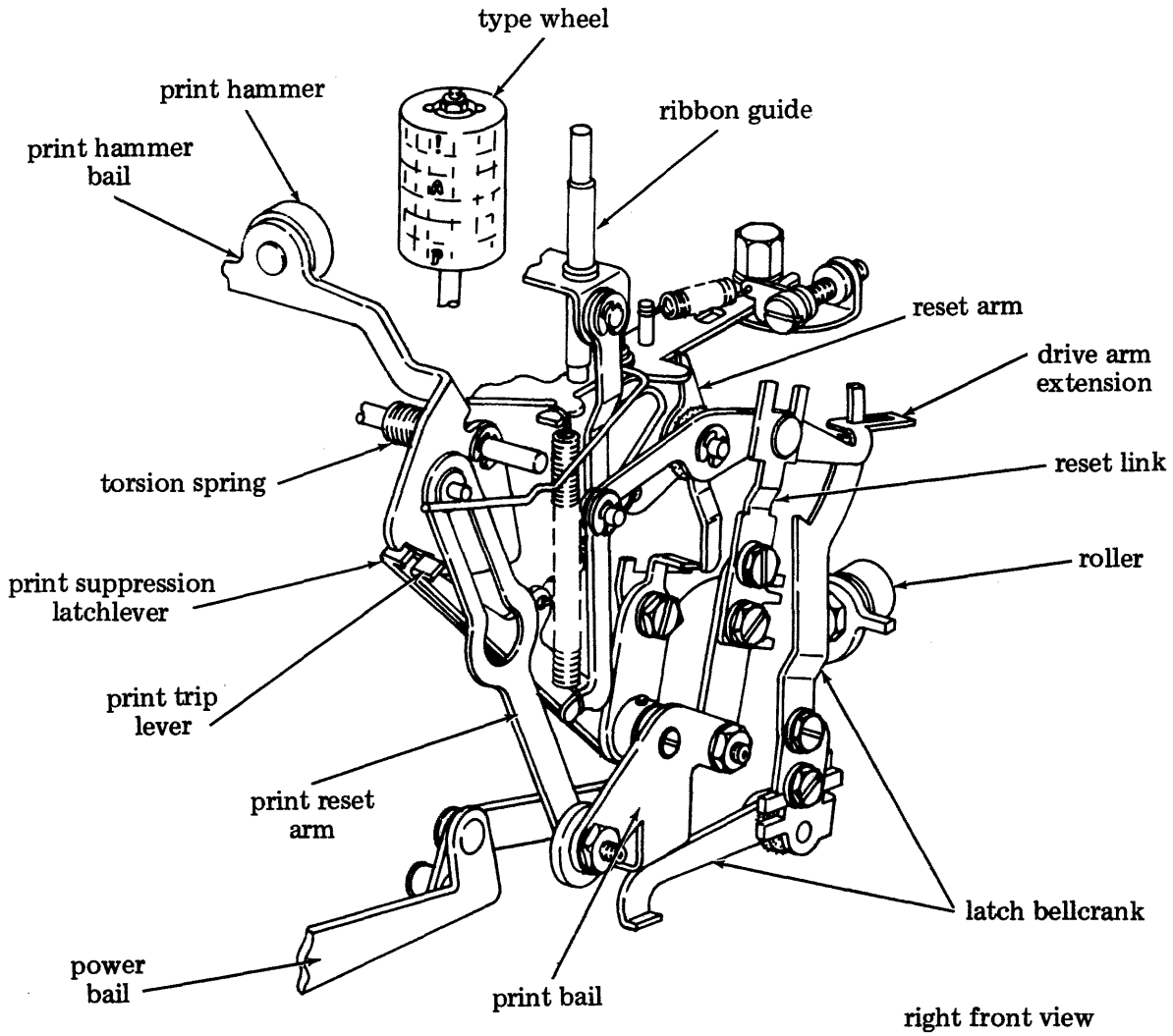


Figure 30 - Printing Mechanism

4.79 When the type wheel is struck, the type wheel and type wheel shaft rock forward and backward printing the selected character by impacting the ribbon and paper against the platen. Vertical and rotary positioning is not altered during printing.

4.80 During the last half of the cycle, the power bail returns the printing parts to their stop positions, and the print reset arm, attached to the print bail, returns the print hammer bail to its stop position. It is then latched by the print trip lever. Provisions are included to suppress printing during functions.

G. Printing Suppressed

4.81 The print suppression mechanism, illustrated in Figure 31, prevents printing whenever a function code combination is received.

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

4.83 If a function lever has not been selected, the print suppression codebar moves up and to the left, to its selected position. The print suppression slide follows the motion of this codebar and pivots the print suppression latchlever out of the way of the shoulder on the print hammer bail. Therefore, when the print trip lever releases the bail, its hammer is permitted to strike the type wheel and printing occurs.

4.84 If a function lever moves up to its selected position, it engages one of a series of notches in the print suppression codebar.

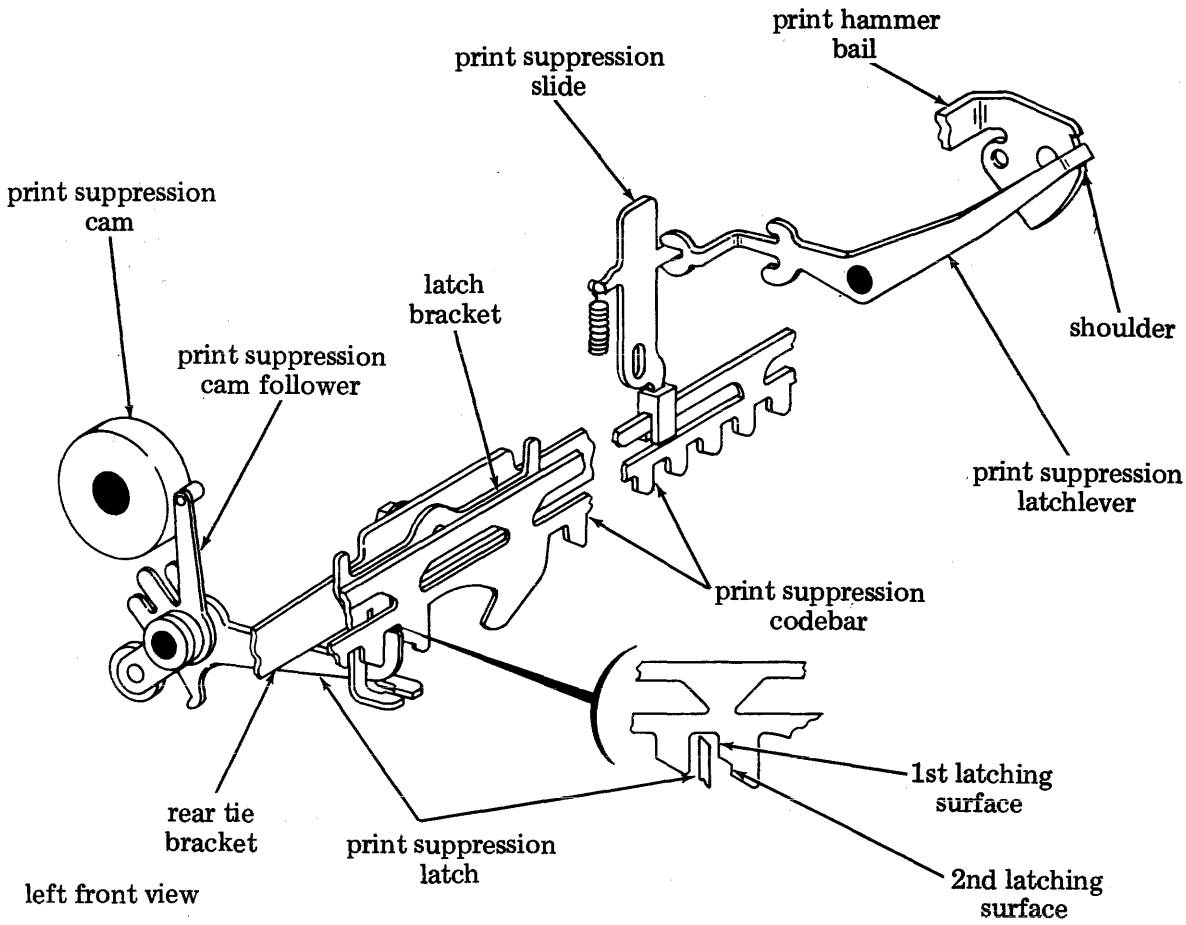


Figure 31 - Print Suppression Mechanism

When the latch releases the codebar, the selected function lever prevents it from moving all the way to its selected position. Therefore, the print suppression latchlever is not pivoted and catches the shoulder when the hammer bail is released by the trip lever. The hammer does not reach the type wheel, and printing is suppressed.

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

H. Ribbon Mechanism

4.86 The ribbon mechanism (Figure 32) supplies the ink for printing. As the typing unit operates, the mechanism feeds the ribbon from one spool to the other, and reverses the direction of feed when the spool is nearly depleted.

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

4.88 The mechanism continues to rotate one spool until the other is nearly depleted. An eyelet in the ribbon then engages the ribbon reversing arm. As the eyelet is pulled against the arm, the latter moves to a point where a detent spring shifts it to its alternate position, where one of its reversing extensions falls ahead of an extension on the feed pawl. As the pawl moves frontward during the last half of the cycle, it strikes the arm extension and is pivoted to its alternate position against the other ratchet. In doing so, it strikes an extension on the check pawl and pivots it to its alternate position against

the other ratchet. The depleted spool is now rotated to take up the ribbon until the other spool is nearly depleted, when reversal again takes place.

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

I. Two-Color Printing

4.90 The capability of two-color printing, red or black, is a mechanical function controlled by the "R" codebar shown in Figure 23. The "R" codebar is controlled by two functions for red and black printing; "ESCAPE" "3" effects red printing, and "ESCAPE" "4" effects black printing.

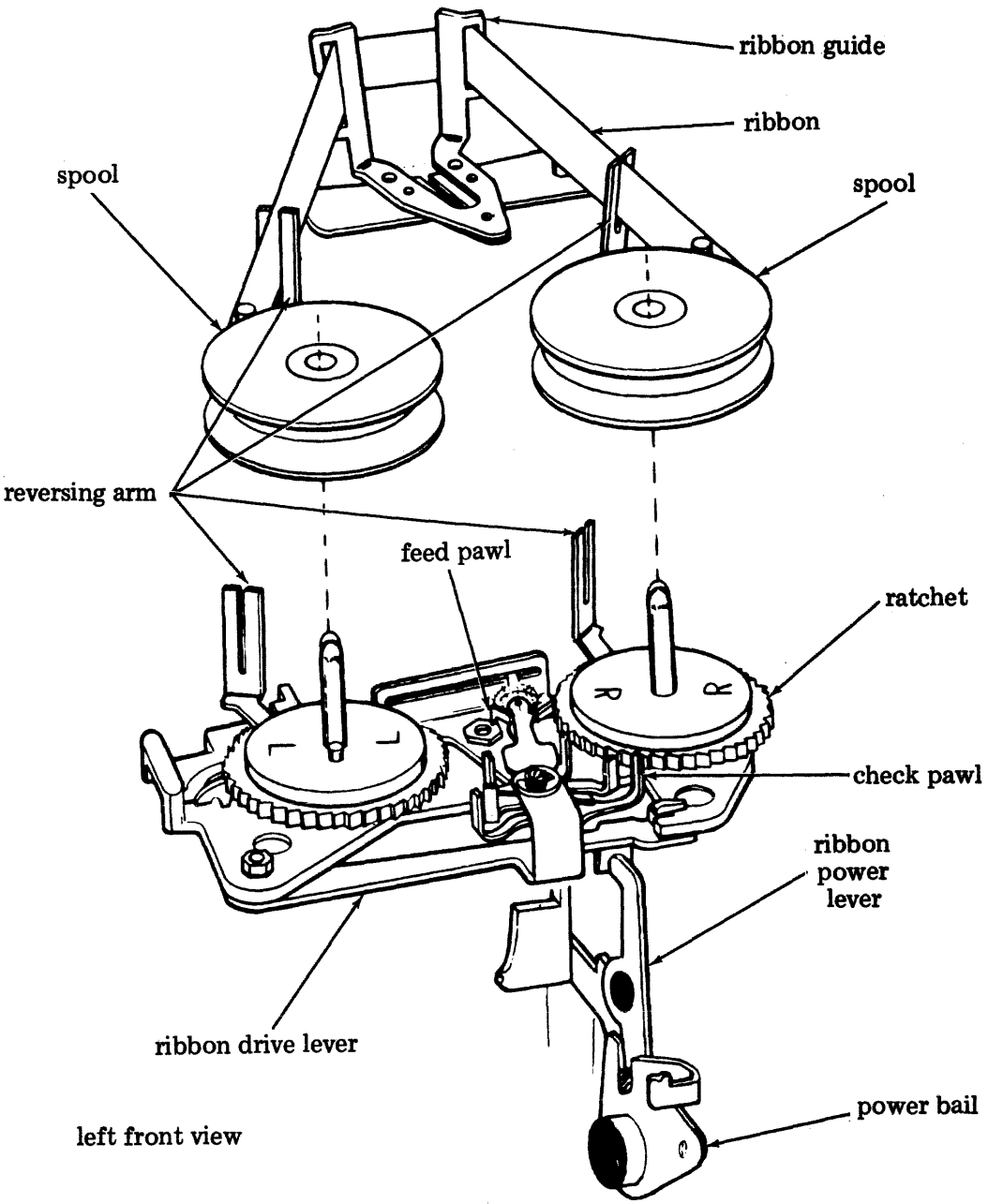


Figure 32 - Ribbon Mechanism

4.91 When the function "ESCAPE" "3" is received (local or remote), the "R" codebar moves up and engages the lower extension of the latch bellcrank (Figure 30). The latch bellcrank pivots, allowing the drive arm to move the ribbon guide up. Printing will then occur in the lower half of the ribbon, or red.

4.92 When the function "ESCAPE" "4" is received (local or remote), the "R" codebar remains down, and the latch bellcrank does not move. The latch bellcrank remains latched by the drive arm extension, preventing the ribbon guide from moving up. Printing then occurs in the upper half of the ribbon, or black.

SPACING MECHANISM

4.93 The spacing mechanism (Figure 33) positions the carriage so that the printed characters are horizontally in line on the paper. Each time a character is printed, the carriage is positioned one character to the right. Spacing is suppressed on all functions except "space" when spacing occurs and printing is suppressed. At the end of the printed line, spacing is suppressed and the typing unit overprints. When the "carriage return" function is received, the carriage is returned to the left margin.

NOTE: With the automatic carriage return-line feed feature, spacing is not suppressed at the end

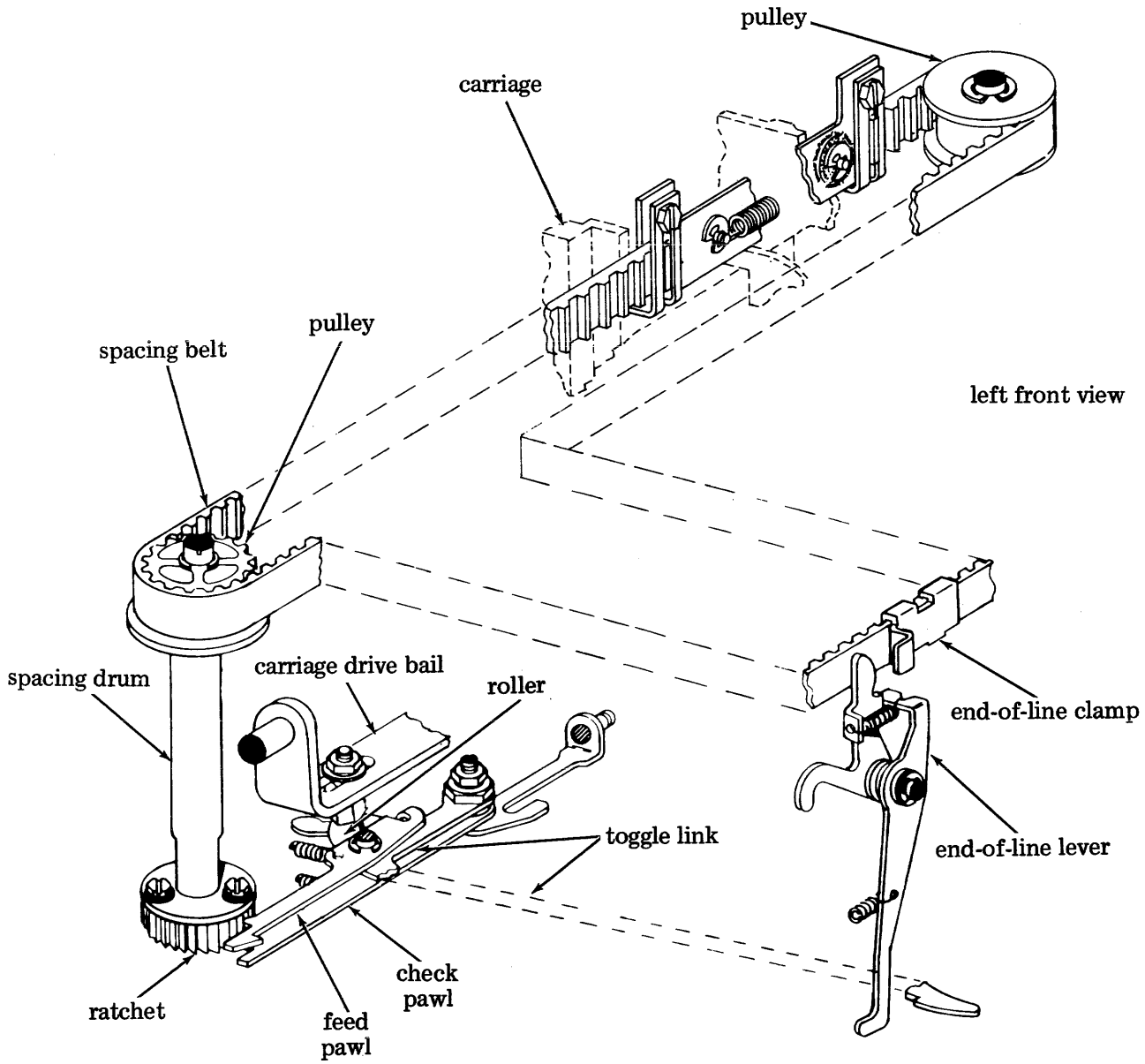


Figure 33 - Spacing Mechanism

of a line. Also, the typing unit does not overprint at the end of a line. The carriage is returned automatically to the left margin when it reaches a predetermined point.

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

4.95 When the "space" code combination is received, the codebars permit the space function lever to move up to its selected position early in the function cycle. This motion is transferred, through a space linkage, to a space lever which moves the print suppression latch out of the way of the toggle linkage. The spacing linkage buckles completely and spacing takes place as described, while printing is suppressed.

SPACE SUPPRESSION

4.96 On every function except "space," spacing as well as printing must be suppressed (Figure 34). When a character to be printed is received, the print suppression codebar moves up and to the left. In doing so it pivots a space suppression latch so that it is moved to the right, out of the way of the toggle linkage. This permits the linkage to buckle and effect spacing.

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

4.98 When the carriage reaches the right margin at the end of a line, a clamp on the spacing belt pivots an end-of-line lever counterclockwise. In this position, a latching surface on the spacing toggle link engages the end-of-line lever and prevents the linkage from buckling and effecting spacing. Thus, spacing is

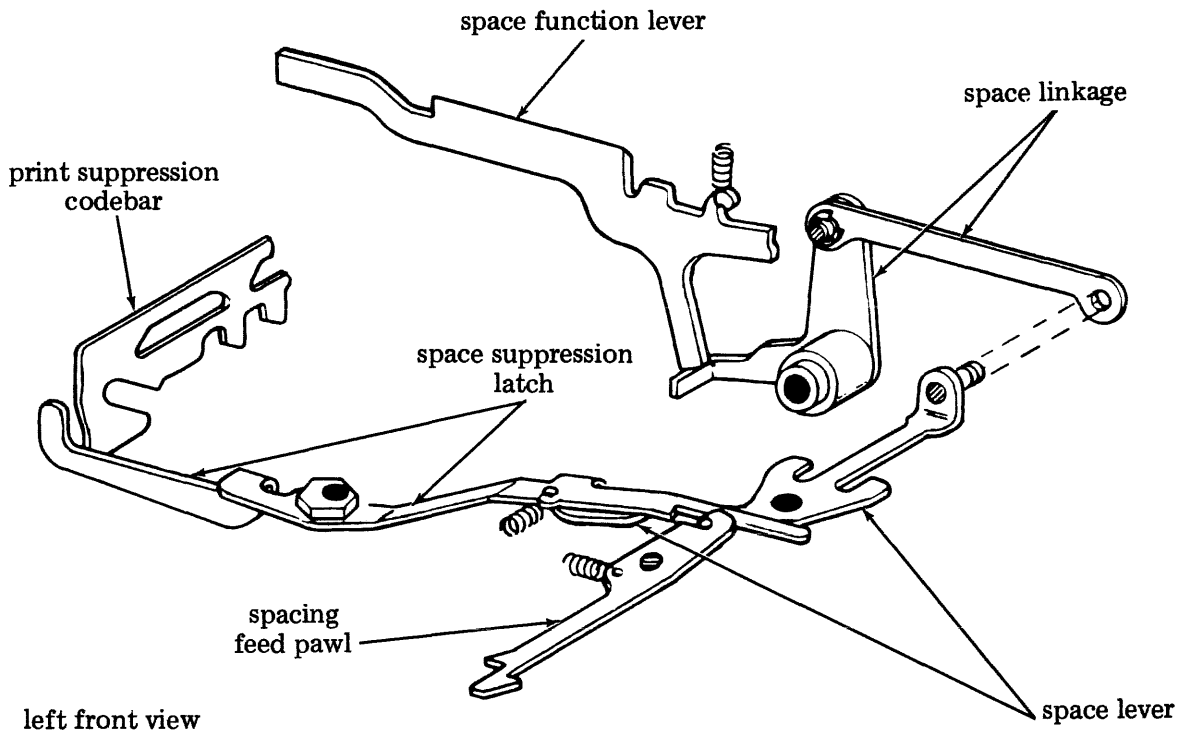


Figure 34 - Space Function and Space Suppression Mechanism

suppressed, and the typing unit overprints at the right margin until the "carriage return" code combination is received.

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

CARRIAGE RETURN

4.99 When the "carriage return" code combination is received, the carriage return function lever moves up to its selected position, and engages the carriage return function pawl (Figure 35). As the function bail moves the lever and pawl down during the middle portion of the cycle, an extension on the pawl drives the carriage return actuating lever down also. This

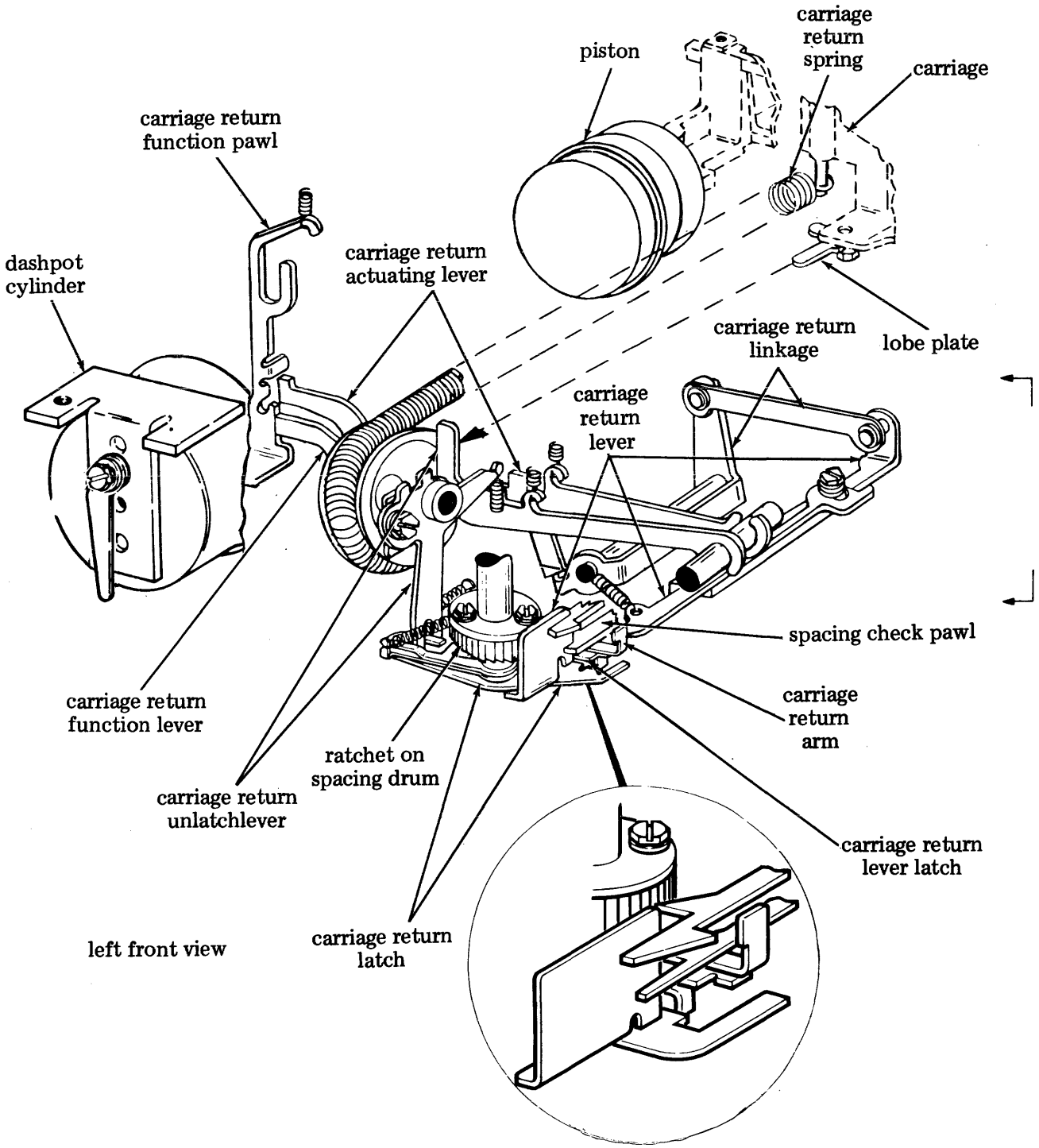


Figure 35 - Carriage Return Mechanism

motion is transferred by means of linkages to the carriage return lever. In moving frontward, the carriage return lever is latched by both the carriage return latchlever and carriage return latch.

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

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

PAPER OR FORM FEEDING

A. Friction Feed

4.102 The paper feed mechanism used on optional friction feed typing units is illustrated in Figure 36.

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

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

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

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

B. Sprocket Feed

4.107 The platen drive mechanism (Figure 37) rotates the platen for vertical positioning so that the printed characters are properly located in lines on the forms. The platen drive mechanism is activated through the form-out and form-feed mechanisms (Figures 38 and 39), and controlled by the form-feed clutch. It feeds forms upon receipt of either the "line feed" or "form-out" code combination and may be adjusted for single or double line feed.

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

NOTE: Forms can be fed manually by depressing the platen knob, on the left end of the platen, and rotating it.

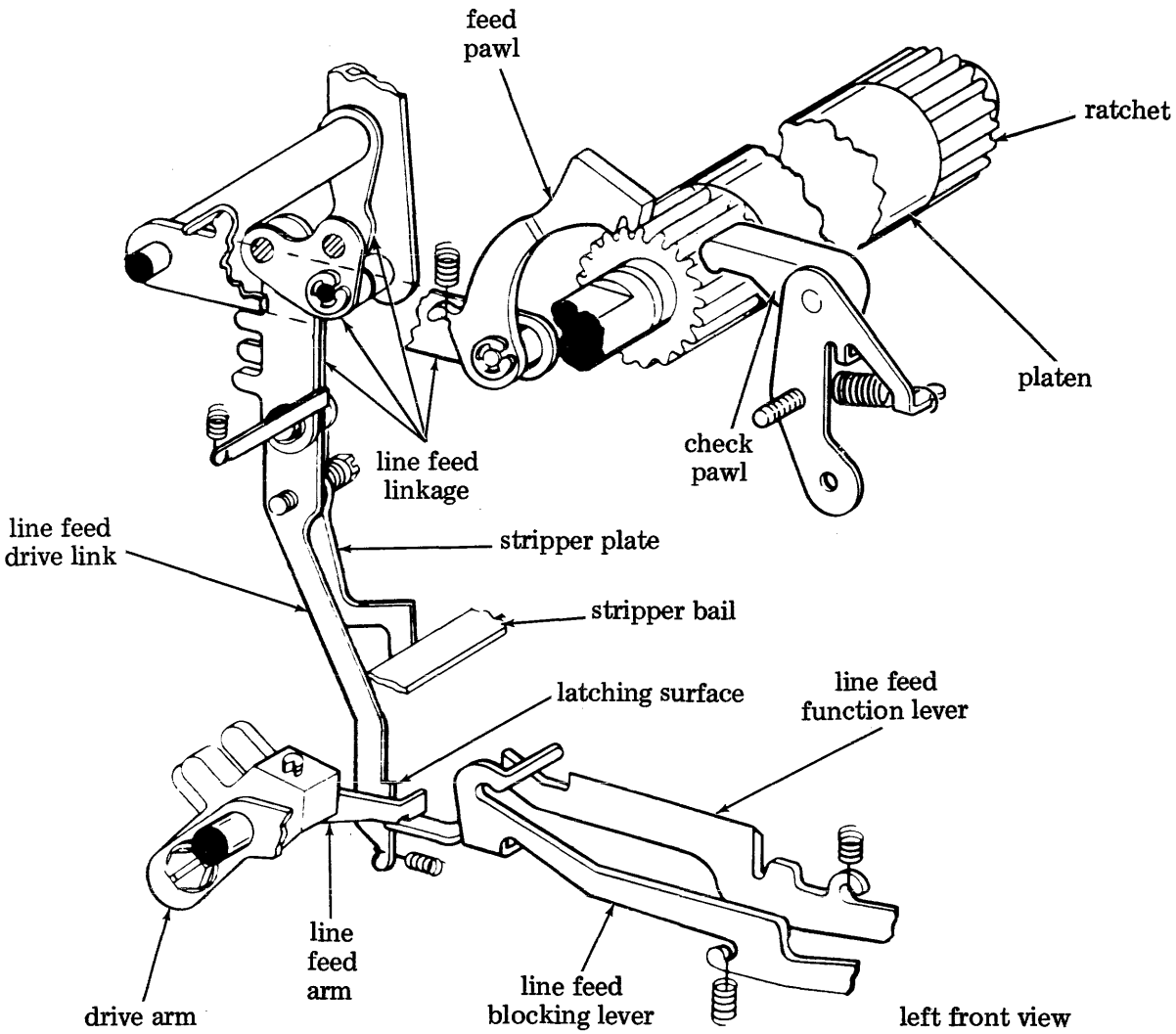


Figure 36 - Paper Feed Mechanism (Friction Feed)

4.109 Form Feed — Single Line Feed (Figure 38): With the line feed selector lever in single line feed position, the left stripper adjusting screw is positioned downward blocking the pivotal action of the stripper lever. During the function cycle the line feed pawl is pulled down, pulling the line feed extension lever down. Since the stripper lever can pivot a small amount, the line feed pawl is stripped by the strip lever extension soon after it has engaged, with the result that the line feed lever extension travels downward a small amount which is, however, sufficient to trip the form-out clutch and affect line feed. The form-out clutch will be disengaged again at the next trip point.

4.110 Form Feed — Double Line Feed (Figure 38): With the line feed selector in the double line feed position, the left stripper adjusting screw is moved up. This allows the stripper lever to pivot a greater amount (than for single line feed). During the function cycle the line feed pawl is pulled down, pulling the line feed extension lever down. Because the stripper lever can pivot, the stripper lever extension will not strip the function pawl right away, but will allow it to move downward a greater amount than before (ie, in single line feed mode). This additional travel of the line feed pawl results in the line feed lever tripping the form-out clutch for a longer time, affecting double line feed.

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

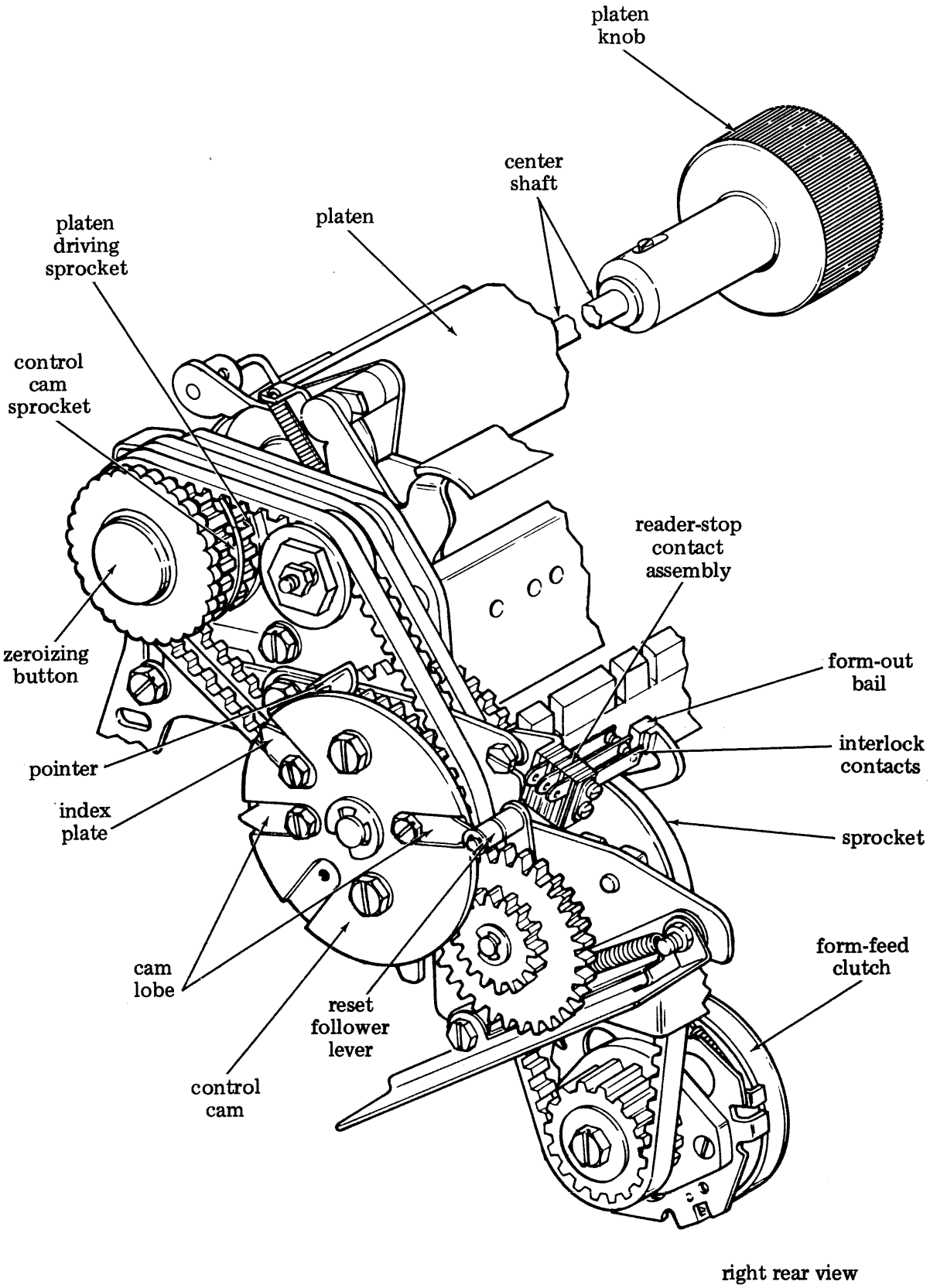


Figure 37 - Platen Drive Mechanism (Sprocket Feed)

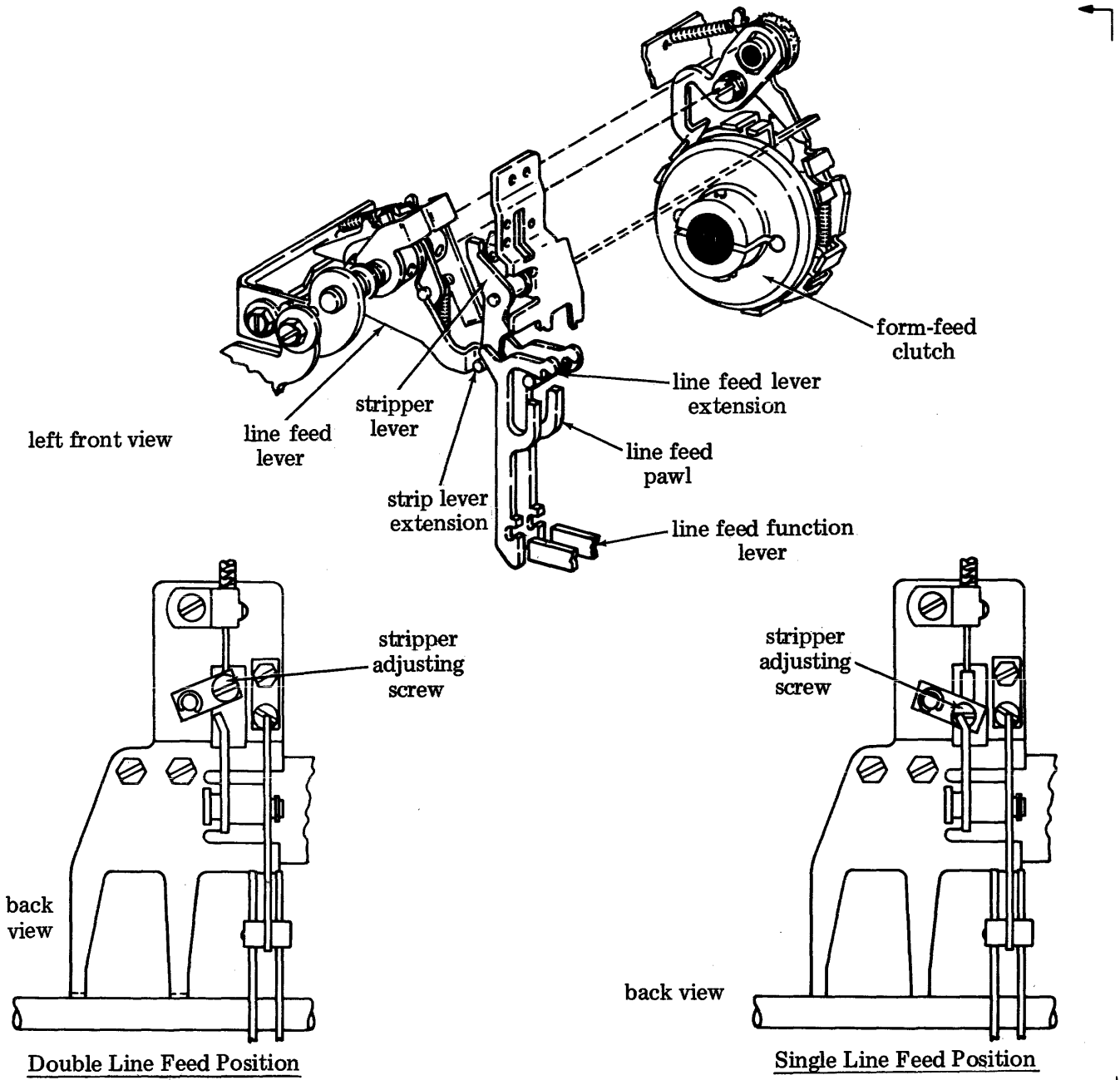


Figure 38 - Form-Feed Mechanism (Sprocket Feed)

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

4.112 Form Out: When the typing unit receives the "form-out" code combination, the form-out function lever (Figure 39) moves up to engage the form-out function pawl. During the function cycle the pawl is pulled down. This action pivots the latchlever assembly which becomes disengaged from the form-out lever. Due to spring tension the form-out lever pivots to the rear. An extension on the form-out lever pivots the trip lever extension which in turn moves the clutch trip lever away from the clutch shoe lever. The form-feed lever engages and remains engaged throughout the form-out cycle.

4.113 When engaged, the clutch drives the platen drive mechanism which consists of belts, gears, and sprockets. The platen drive mechanism is illustrated in Figure 37.

4.114 As long as the form-out lever stays pulled to the rear by spring tension, the form will advance except as regulated by the control cam of the platen drive mechanism.

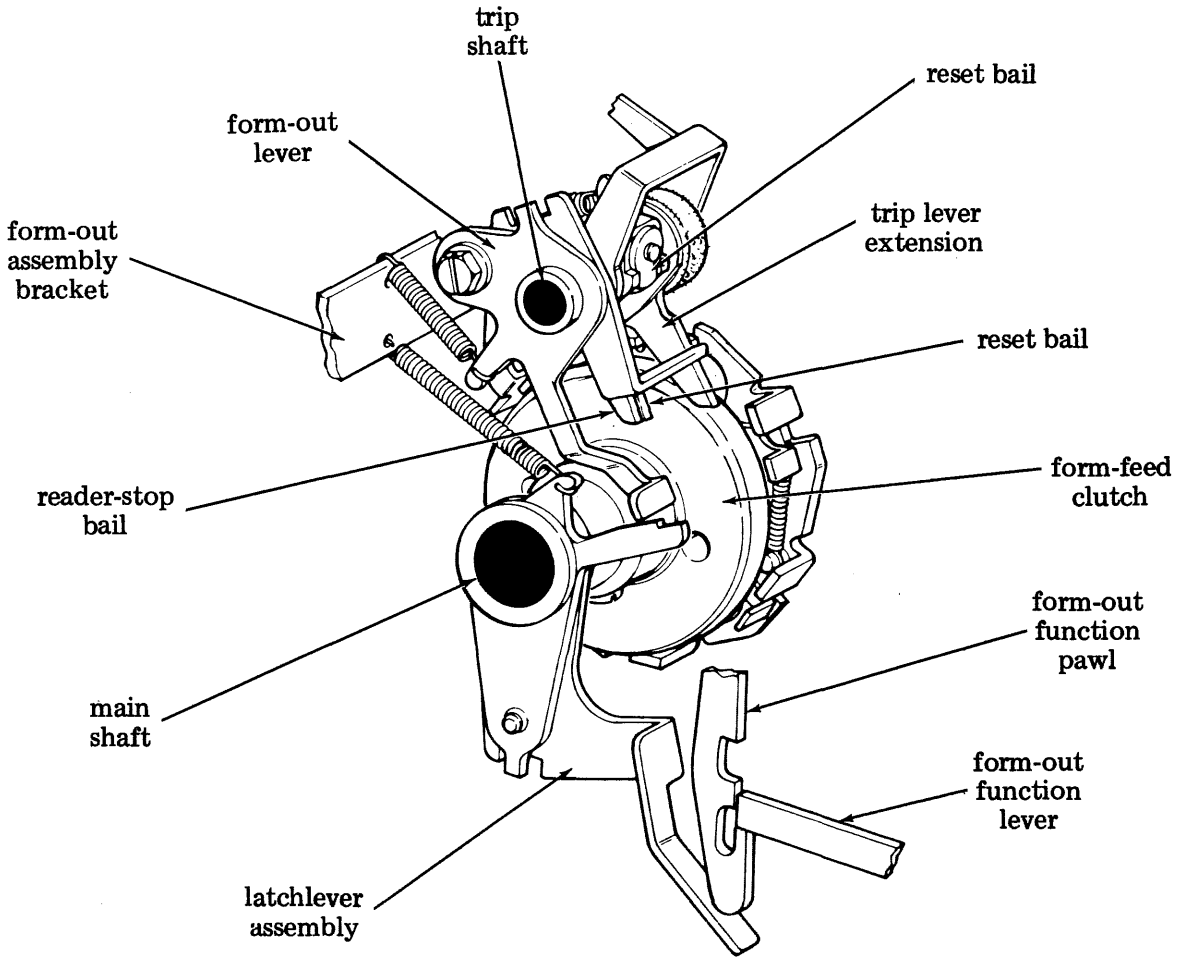


Figure 39 - Form-Out Mechanism (Sprocket Feed)

Whenever the platen rotates, the control cam, being related to the platen by belts and gears, also rotates. The rotating cam, through cam lobes, a reset follower lever, and a reset bail, initiates the action to terminate the advance of the platen and thus the form-out cycle.

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

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

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

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

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

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

4.120 When an Automatic Send-Receive Teletypewriter Set receives a "form-out" code combination, the form-out bail (Figure 37) is rotated toward the front by the form-out lever extension. This action causes the interlock contacts of the reader stop contact assembly to be operated with the following results:

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

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

4.121 The form can be manually advanced any length by pressing the platen knob inward and rotating the knob (Figure 37).

MARGIN BELL AND END-OF-LINE BELL

A. Margin Bell

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

B. End-of-Line Bell

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

BACKSPACE MECHANISM

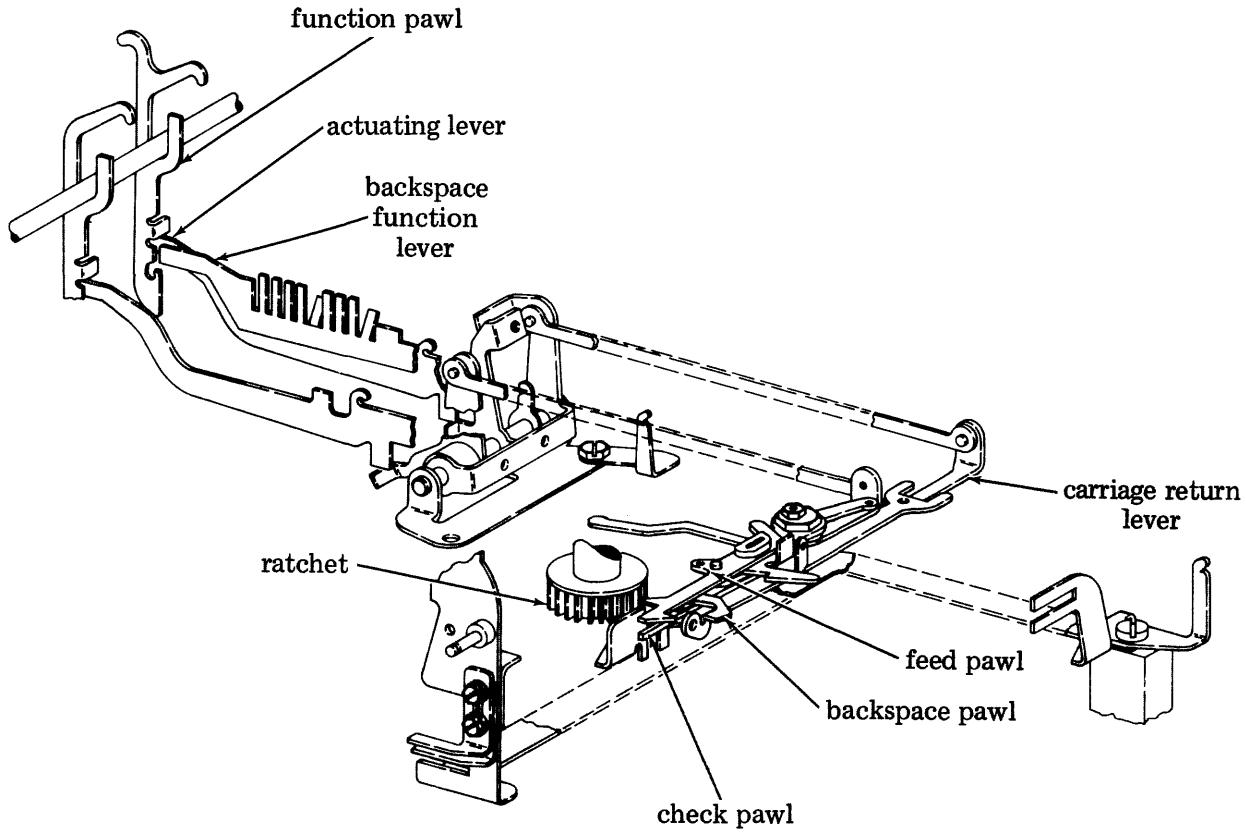
4.124 The backspace mechanism is part of the APL (A Programming Language) sets. It is also available as a separate option. The function of the backspace mechanism is to backspace the printing carriage one character so that overstrike characters can be generated.

4.125 The backspace mechanism (Figure 40) achieves backspace by moving the feed pawl and check pawl away from the ratchet. The entire backspace function is accomplished in two parts; half a character backspaced during the first part of the printer cycle, and half in the second part of the printer cycle.

4.126 When the backspace function is received, the feed pawl and check pawl are completely disengaged from the ratchet allowing the carriage to move to the left half a character, after which the backspace pawl engages the ratchet. As the printer completes its cycle, the backspace pawl is moved away from the ratchet and the carriage moves to the left the other half character.

4.127 When the backspace code combination is received, the backspace function lever rises and picks up its pawl which is then driven downward. This action of the function pawl is transferred to an actuating lever by means of an extension on the backspace function pawl. As this actuating lever moves downward, it rotates the carriage return lever through the backspace and carriage return bails and the carriage return link. This movement of the carriage return lever is sufficient to free the feed pawl and check pawl from the spacing ratchet, but not enough movement is impacted to latch up the carriage return function.

4.128 As the backspace function pawl approaches its lowest point of travel, the pawl is stripped off by the stripper bail. This stripping action causes the feed pawl and check pawl to return to the spacing ratchet.



left front view

Figure 40 - Backspace Mechanism

4.129 During a carriage return function, the backspace pawl is held away from the spacing ratchet so that should a carriage return-backspace sequence be sent, the printer does not malfunction.

5. OPTIONS

AUTOMATIC CARRIAGE RETURN/LINE FEED

5.01 With this customer-activated option, carriage return and line feed will automatically occur after the 132nd character on wide platen units, and after the 72nd character on standard platen units. To enable the automatic carriage return/line feed feature, the disabling clips on the function lever guide must be removed (Figure 41) as follows:

Narrow platen friction:	slot A
Narrow platen sprocket:	slots A and L
Wide platen:	slots A and AD

NOTE: The function box casting should be used as a guide for locating the proper slots in the function lever guide.

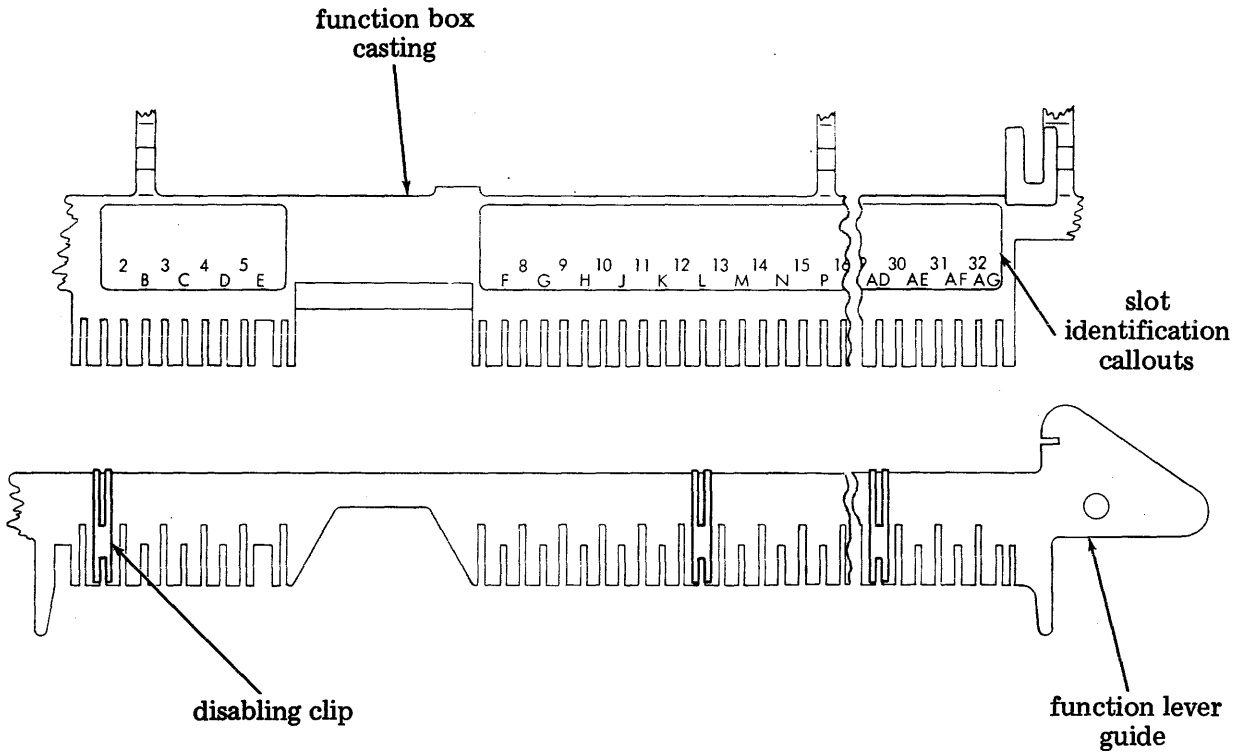


Figure 41 - Disabling Clip Location