37 TYPING REPERFORATOR

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

1. GENERAL

1.01 This section provides the description and principles of operation for the 37 Typing Reperforator (Figure 1). For information concerning adjustments refer to Section 574-330-700 and for lubrication refer to Section 574-330-701.

1.02 The typing reperforator is an electromechanical unit that records information as combinations of perforations in the tape and characters printed between the perforated feed holes. Information is represented by the presence or absence of a signal pulse for each of the eight levels of intelligence. The information is received in a form that corresponds to ASCII (American National Standard Code for Information Interchange), and is translated into the necessary mechanical motions to perforate the code holes, print the character, and feed the tape. Mechanical motion is supplied through an external motor unit and drive mechanism. The reperforator operates at 150 wpm.

1.03 Character or graphic representations are the coded equivalent of the alphabet, numerals, or symbols. Function representations are the coded equivalent of operations auxiliary to transmission or reception of the graphics, such as carriage return, line feed, or signal bell. Both character and function representations are perforated into the tape, so they can be used in conjunction with typing equipment.

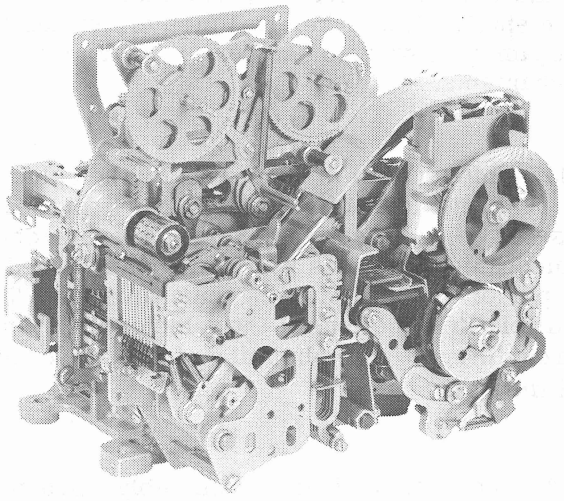


Figure 1 - Typing Reperforator

Prepared for American Telephone and Telegraph Company by Teletype Corporation

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

1.05 References in the text to left or right, front or rear, top or bottom, etc, are referenced facing the punch block.

2. DESCRIPTION

BASIC UNIT

2.01 The basic typing reperforator (Figures 2 and 3) consists of the selector, transfer, function, typing, perforator, and ribbon feed mechanisms. The selector mechanism includes a 2-coil magnet, selecting cam sleeve, and range finder. The range finder permits adjusting the selector mechanism in relation to the signal code. Backspace and tape feed-out mechanisms are optional features.

2.02 Rotary motion from an external source is received by a main shaft (Figure 5), and distributed by the two-cycle cam and clutch assembly. The unit operates at 150 wpm and can be geared (optionally) to 100 wpm. These speeds are determined by the gearset on the main shaft. The rocker bail further extends the mechanical power to the perforator and typing mechanisms.

2.03 Information is presented to the selector in the form of sequential mark and space pulses. These electrical pulses are converted to mechanical motions which are transferred to the perforator and printing mechanisms. The parallel output motions of the selector are transferred through a combination of cams, levers, and linkages.

2.04 The cast frame assembly provides mounting facilities for the various mechanisms which comprise the typing reperforator. The frame is mounted on the related equipment that provides motive power for the typing reperforator. One connector (Figure 5) is provided on the side of the unit for all electrical input requirements.

Selector Mechanism

2.05 The selector mechanism receives electrical code input and converts it, through a trip assembly, to mechanical code output. The selector mechanism consists of magnet coils and armature; selector cam and clutch; and associated levers, arms, and bails.

Transfer Mechanism

2.06 The transfer mechanism transfers signal intelligence from the selector to the associated pushbar for positioning the type wheel in the typing mechanism. On two-color printing and print suppression equipped units, the transfer mechanism provides a means for setting up the function contacts to initiate these features.

Function Mechanism

2.07 The function mechanism conveys the motion of the main shaft to the typing and perforator mechanisms. It is comprised of a cam-clutch (Figure 6), a clutch trip assembly, and a rocker bail (Figures 13 and 14).

Typing Mechanism

2.08 The typing mechanism consists of a type wheel, type wheel positioning mechanisms, and printing mechanism. It is controlled by the selecting and transfer mechanisms. The type wheel (Figure 2) is a metal clad wheel embossed with alpha and numeric characters, and it may be replaced easily to obtain different type faces and character arrangements. The type wheel positioning mechanisms consist of axial and rotary positioning mechanisms and their respective correcting mechanisms. After the type wheel has been positioned and corrected, the printing mechanism utilizes a hammer to drive the ribbon and paper tape into the type wheel and imprint the selected character. Printing and perforating occur simultaneously at the punch block, but the characters are printed six and one-half positions behind the corresponding code perforations.

Perforator Mechanism

2.09 The perforator mechanism (Figure 3) contains a punch block, punch pins and drive parts. The punch pins, contained within the punch block, punch fully perforated code holes in the tape in response to the selector mechanism, via punch slides and punch slide latches. A feed hole is perforated on each cycle of operation.

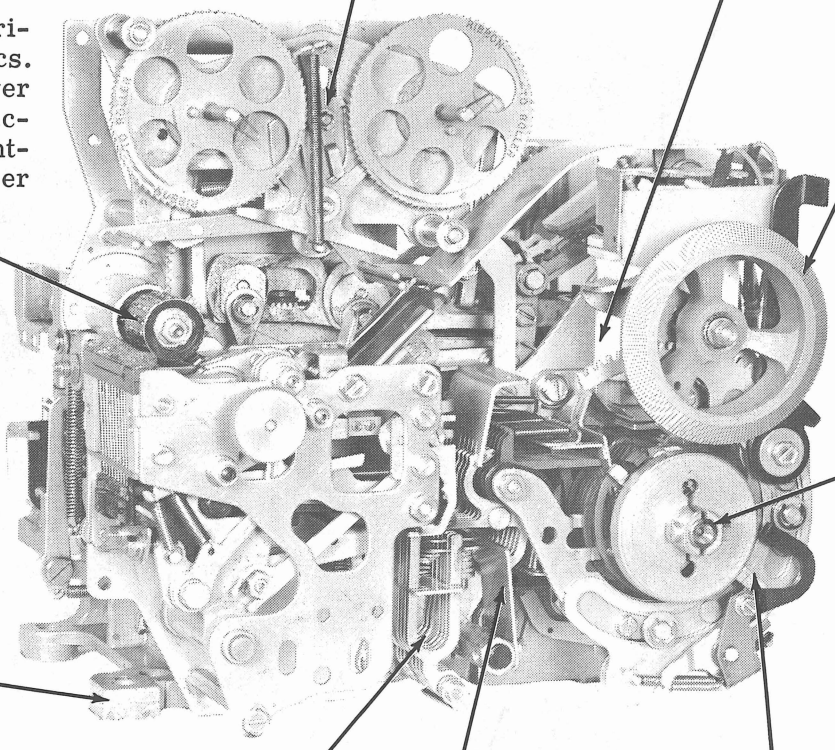
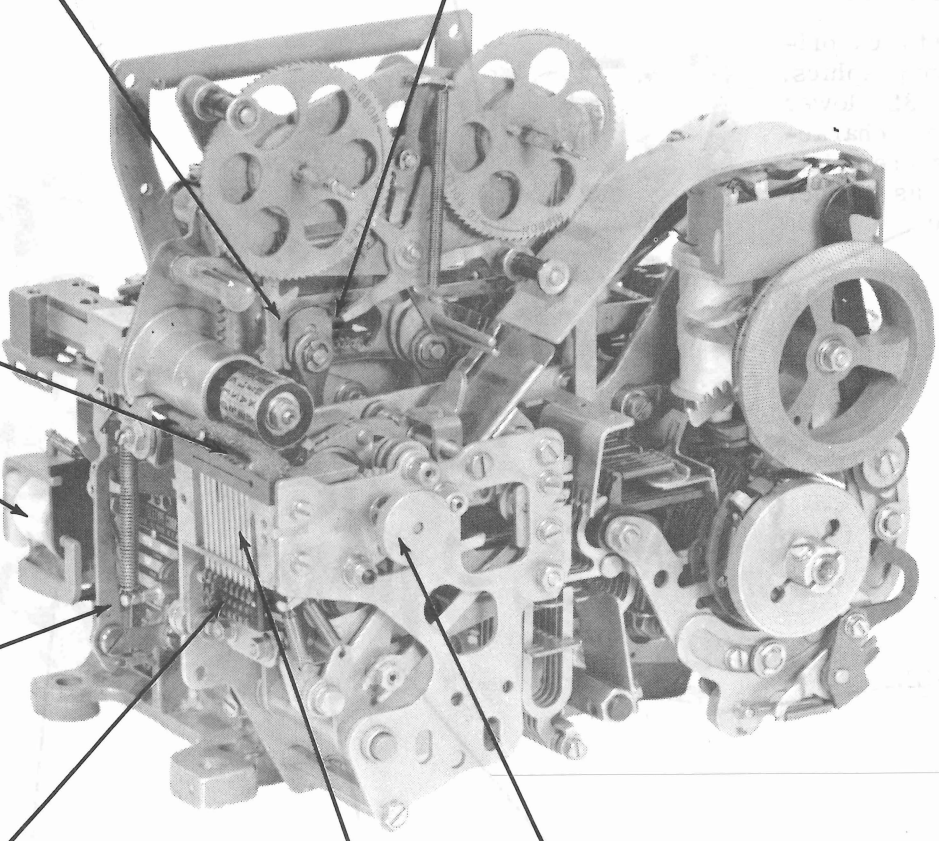


Figure 2 - 37 Typing Reperforator



ROTARY CORRECTING MECHANISM

ROTARY POSITIONING MECHANISM

PUNCH BLOCK

PRINT SUPPRESSION MAGNET

PRINTING MECHANISM

- Operates the print hammer.

PERFORATOR

- Feed holes are in line with code holes.
- Perforated code holes correspond to marking bits in the signal input. Nonperforated portions of the tape correspond to spacing bits.

HANDWHEEL

- Permits manual tape feeding.

PUNCH PINS

- Pins and corresponding holes in the punch block are numbered from left to right: 1, 2, 3, feed hole, 4, 5, 6, 7, and 8.

Figure 3 - 37 Typing Reperforator

Ribbon Feed Mechanism

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

VARIABLE FEATURES

2.11 A number of variable features are available with the typing reperforator. These features enable the unit to perform special operations and may be installed either at the factory or in the field. The following is a list of these variable features:

- Manual operated tape feed-out (delete)
- Solenoid operated tape feed-out (delete)
- Backspace
- Print suppression
- Two-color printing
- Last character visibility
- Code reading contacts
- Function contacts
- Auxiliary timing contacts

Tape Feed-Out

2.12 The tape feed-out feature enables the operator to insert a fill character (delete) that is used for leaders, tape splicing, timing, and spacing. Tape feed-out can be either manual or magnet operated. Manual tape feed-out is provided by operating a tape feed-out lever that trips the selector mechanism to perforate "delete" tape (Figure 4). The magnet operated tape feed-out mechanism (Figure 5) feeds out a nonmetered amount of tape perforated with the delete code. This feature is operated by depressing the REPEAT and DELETE keys on the keyboard or the FEED OUT key on the ROTR or RT set.

Backspace

2.13 The backspace mechanism for units containing Model 37 perforators is capable of reversing the normal motion of the fully perforated tape. This mechanism can backspace up to twelve characters with any fully perforated tape and does not print characters.

2.14 The purpose of backspacing tape is to delete errors by obliterating the individual character perforations by means of the delete code. The power drive assembly provides for remote control of the backspace mechanism.

Print Suppression

2.15 This mechanism is used to prevent printing on certain characters, such as functions and/or lower case characters. Print suppression is operated on control function code combinations and is mechanically operated by a magnet located on the front of the unit (Figure 3).

Two-Color Printing

2.16 The two-color printing mechanism is used to print desired characters in red (3.58). Examples, where the two-color printing feature is used, it could be printing functions or special characters in red. Lower case characters are printed in upper case on the typing reperforator; sometimes it is desirable to have these characters printed in red. The two-color printing mechanism consists of a solenoid, mounting bracket, retraction lever, special ribbon carrier, two-color ribbon, function contacts, and auxiliary timing contacts.

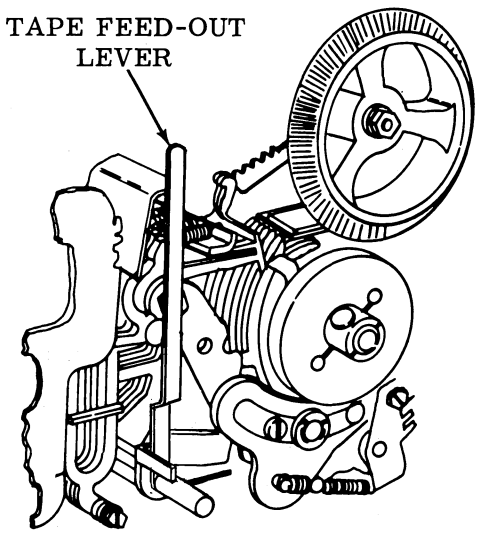
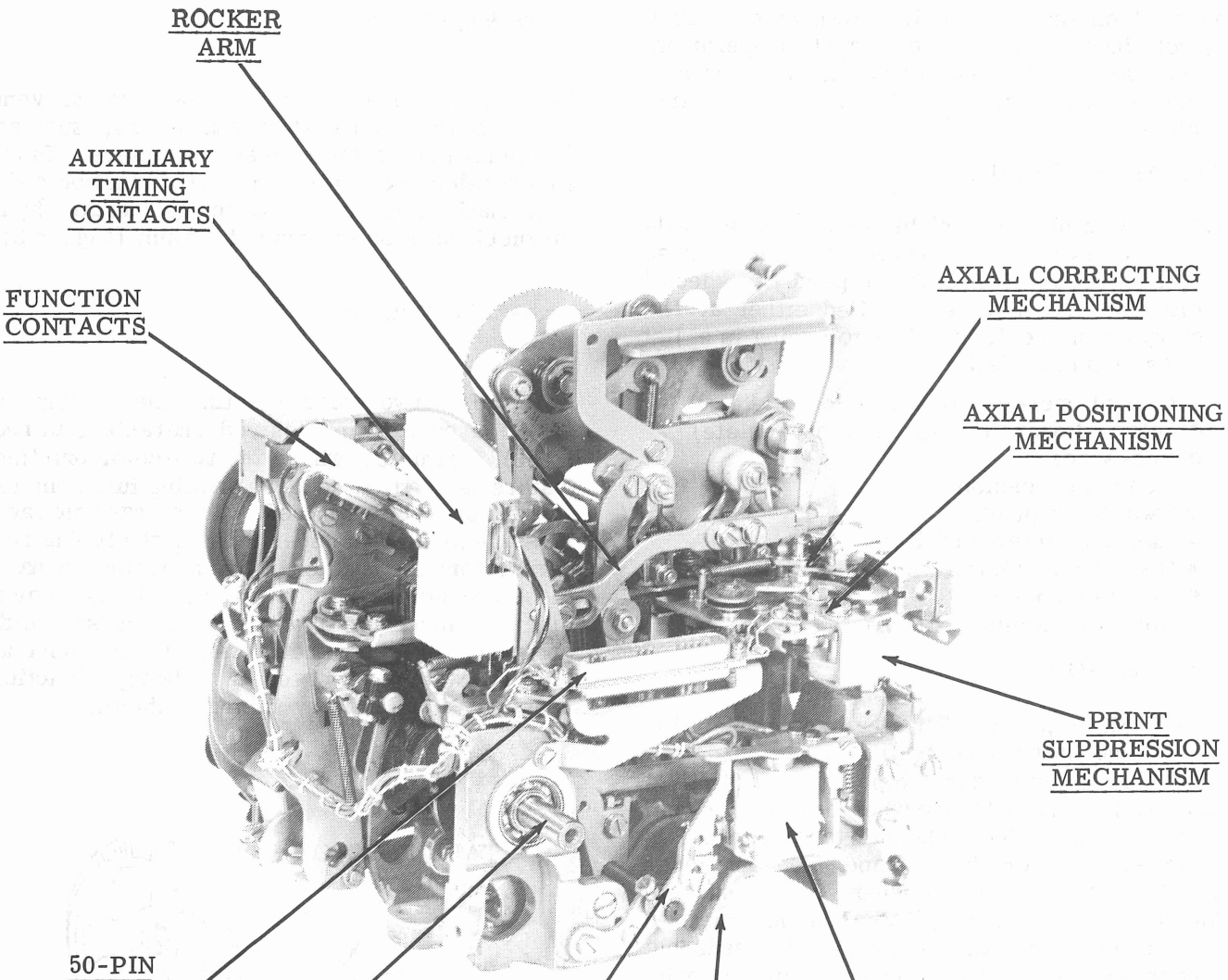


Figure 4 - Manual Tape Feed-Out



- Provides mechanical motion to the selector and printing mechanisms.

(Left Side View)

Figure 5 - 37 Typing Reperforator

Last Character Visibility

2.17 This mechanism (3.50) allows the operator to view the last character printed on the tape. The mechanism is operated by a solenoid and linkage to pull the type wheel and ribbon away from the printed area of the tape.

Function Contacts

2.18 The function contacts (Figure 5) enable the typing reperforator to perform various auxiliary functions that are activated by the sixth and seventh code levels, and are primarily used in the circuitry for print suppression and two-color printing.

Timing Contacts

2.19 Code reading timing contacts and the auxiliary timing contacts are mounted over the main shaft in the rear of the unit. The contacts are the transfer-type and are activated by a cam on the main shaft. These contacts are synchronous with the mark and space signals. The code reading timing contacts are for protection of the code reading contacts. The auxiliary timing contacts are used with print suppression and two-color mechanisms.

Code Reading Contacts

2.20 Code reading contacts are located in front of the selector push levers and they read parallel signals from the serial signals received by the selector. The purpose of these contacts is to read the code combination being perforated. It has a bank of eight transfer-type contacts (break-before-make) associated with a punch slide. These code reading contacts condition the circuit and work in conjunction with other switches to perform a function. The code reading contacts are wired to a 50-pin connector and is mounted to an adjustable mounting bracket which in turn is mounted to the main frame.

Character Received Contacts

2.21 Character received contacts are connected to external circuits as defined by the customer's system requirements. These contacts are available in normally open or normally closed arrangements located on the selector.

Inhibit Contacts

2.22 The inhibit contacts are used with the last character visibility feature. These contacts prevent interference with the incoming message by releasing the last character visibility solenoid when the function clutch is tripped.

TECHNICAL DATA

2.23 The typing reperforator is driven by a main shaft rotating at 500 rpm. It operates at 150 wpm with a 10-unit code (150 baud). For motor unit information, refer to the appropriate sections on motor units.

Physical Characteristics

2.24 Temperature ranges of this equipment are intended to be operated in a room environment within the temperature range of 40 degrees F to 110 degrees F. Serious damage to the equipment could result if this range is exceeded. Particular caution should be exercised in using acoustical or other enclosures.

(a) Dimensions

Width	6-1/2 inches
Length	7-1/2 inches
Height	8 inches
Weight	10 pounds

(b) Tape

Type	Standard communications and ASCII
Width	1 inch
Perforations	8-level, fully perforated
Holes/inch	10
Perforations	6 characters ahead of printing
Feed holes	In line with code holes

3. PRINCIPLES OF OPERATION

3.01 Rotary motion from an external source is applied to the main shaft through a gear or pulley (Figure 6). The main shaft rotates constantly as long as the unit is under power. An externally supplied 24 v dc circuit is used to pulse the tape feed-out magnet and operate the ribbon shift solenoid. The ribbon shift sole-

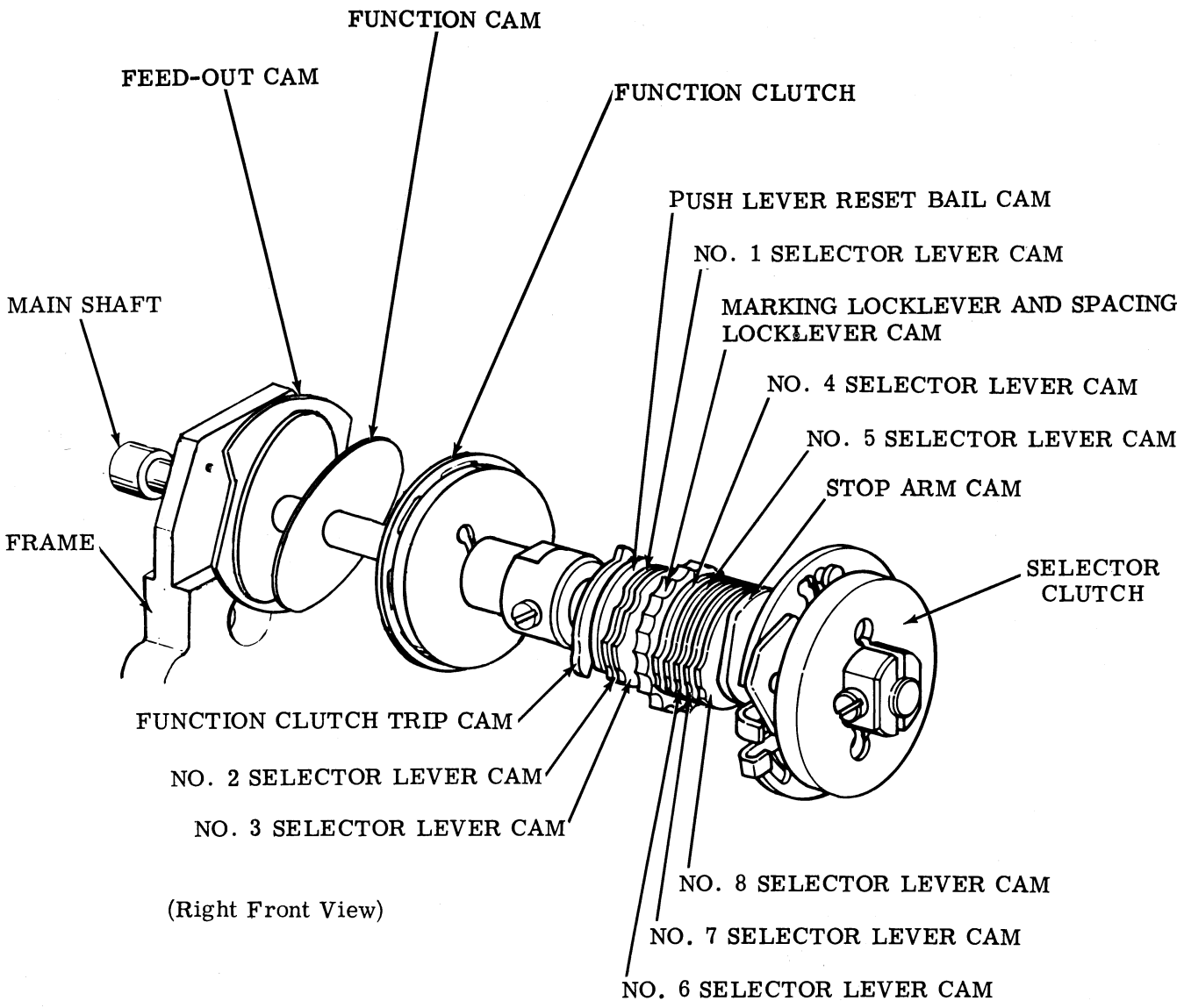


Figure 6 - Main Shaft

noid is controlled by the function contacts to permit printing in black or red. For one-color ribbon units, the print suppression mechanism prevents printing on functions. The selector magnet coils operate on a 0.500 ampere circuit through a selector magnet driver.

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

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

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

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

SELECTOR MECHANISM

3.06 The selector mechanism (Figure 2) consists of the magnet coils and armature, a selector cam and clutch, and associated levers, arms and bails necessary to convert the electrical intervals of the start-stop code to the mechanical motions which are transferred to the perforator mechanism and code contacts.

3.07 The selector clutch and cam sleeve assembly is comprised of the two-stop clutch, the start bail and lift lever cam, the eighth, seventh, sixth, fifth and fourth selector lever cams, the cam for the spacing and marking locklevers, the third, second, and the first selector lever cams, the push lever reset bail cam, and the function clutch trip cam.

3.08 During the time in which a closed line circuit (marking) condition exists, the selector magnet coils are energized and hold the selector armature against the selector magnet pole pieces. In this stop position, the selector armature blocks the start lever.

3.09 At the start of a signal for any character or function, the start (spacing) interval releases the selector armature which under tension of its spring, moves away from the magnet pole piece and, thus, unlatches the start lever. The start lever turns clockwise under the tension of its spring to move the start bail into the indent of its cam.

3.10 As the start bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selector cam clutch engages and begins to rotate. By this time, the start lever tip has moved into the selector armature extension cut-out and the armature starts moving in correspondence with the signal bits. Between the second and third signal bit, the lift lever is pivoted clockwise by the start bail cam and lifts the start lever above the armature extension. At this same time, the start bail rides to the high point of its cam where it remains to hold the start lever away from the selector armature until late in the character cycle. In approximately the middle of the cycle the lift lever

rides down its cam, thus, lowering the start lever. When the stop impulse at the end of the signal is received, the selector armature is pulled up to block the start lever. Thus, the start bail is prevented from dropping into the low part of its cam (stop position of cam sleeve, and the attached stop arm is held so as to stop the clutch shoe lever).

3.11 The selector cam clutch disc upon which the latchlever rides has an indent at each of its two stop positions. When the clutch shoe lever strikes the stop arm, the inertia of the cam disc assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latchlever drops into the indent in the cam disc, and the clutch is held disengaged until the next start interval is received.

3.12 The series of up to eight selecting levers and the marking and spacing locklevers ride their respective cams on the selector clutch and cam sleeve assembly. As the marking and spacing signal intervals are applied to the selector magnet, the selector cam sleeve rotates and actuates the selector levers. When a spacing interval is received, the marking locklever is blocked by the end of the armature and the spacing locklever swings toward the back above the armature and locks it in the spacing position until the next signal transition is due. Extensions on the marking locklever prevent the selector levers from following their cams. When a marking impulse of the signal is received, the spacing locklever is blocked by the end of the armature and the marking locklever swings to the back below the armature to lock it in the marking position until the next signal transition is due. During this marking condition the selector levers are not blocked by the marking locklever extensions, but are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam, while the armature maintains a marking condition, swings to the back or selected position momentarily. Each selecting lever has an associated push lever which drops off a shelf on the top of the selecting lever when it rides into its cam indent. As the cam sleeve turns, each selecting lever together with its latched push lever is moved toward the front and held there until all eight code intervals have been received. After all the selected push levers have been positioned to the front and all unselected push levers have been positioned to the rear, they are held until the next start interval is received. When the subsequent start interval again causes the cam sleeve to rotate, the push lever reset bail, in following its cam, unlatches the selected push levers. The push levers then return to the unselected (rear) position under their spring tension.

3.13 The no. 1 push lever differs in that it uses an auxiliary no. 1 push lever and auxiliary strip bail. When the no. 1 selector lever is permitted to follow its cam (marking condition) the auxiliary no. 1 push lever is selected in the same manner as other push levers. At this time the strip bail is on the high part of its cam, resetting all the selected push levers above the shelves on their associated selector levers. When the no. 1 selector lever returns counterclockwise to the intermediate position on the cam, a tab on the auxiliary no. 1 push lever engages the no. 1 push lever and drives it to the front in a marking condition. At approximately midcycle the auxiliary push lever is stripped by its auxiliary strip bail, thus, the auxiliary no. 1 push lever is prepared for the next incoming marking pulse. The auxiliary lever action permits normal strip operation to occur between no. 1 and no. 2 pulse selection.

3.14 The selector cam sleeve clutch has two stop positions and likewise the individual cams have two complete identical contours in 360 degrees, providing for two complete cycles of operation for each revolution of the cam sleeve.

Note: When rotating the main shaft by hand, the clutches will not fully disengage upon reaching the stop position. In order to relieve the drag on the clutch and permit the main shaft to rotate freely, apply pressure on the lug of the clutch disc to cause it to engage its latchlever. This procedure should be followed prior to applying power to the unit.

Manual Operation of the Unit

3.15 While adjustments are being made, apply current to the selector coils, holding the selector magnet armature in the marking position. To manually select an all marking combination, momentarily raise the start lever from under the selector cam to permit the selector clutch to engage. Rotate the main shaft slowly through a half revolution. Fully disengage the clutch as prescribed in the preceding note and repeat if desired.

Start-Stop Operation (Figure 7)

3.16 Engage-disengage selector cam sleeve with main shaft; responds to start and stop bits of a character.

Operation

Engage selector cam sleeve with main shaft.

(1) Start (spacing) bit of new character de-energizes selector magnets and releases armature.

(2) Armature, under tension of armature spring, falls against downstop bracket.

(3) Absence of armature extension unlatches start lever which, under tension of start lever spring, pivots inward moving the stop arm bail into the indent of its cam. As the stop arm bail pivots inward, the attached stop arm pivots out of path of clutch shoe lever.

(4) Clutch shoe levers expand to engage disc and cam sleeve assembly with rotating clutch drum.

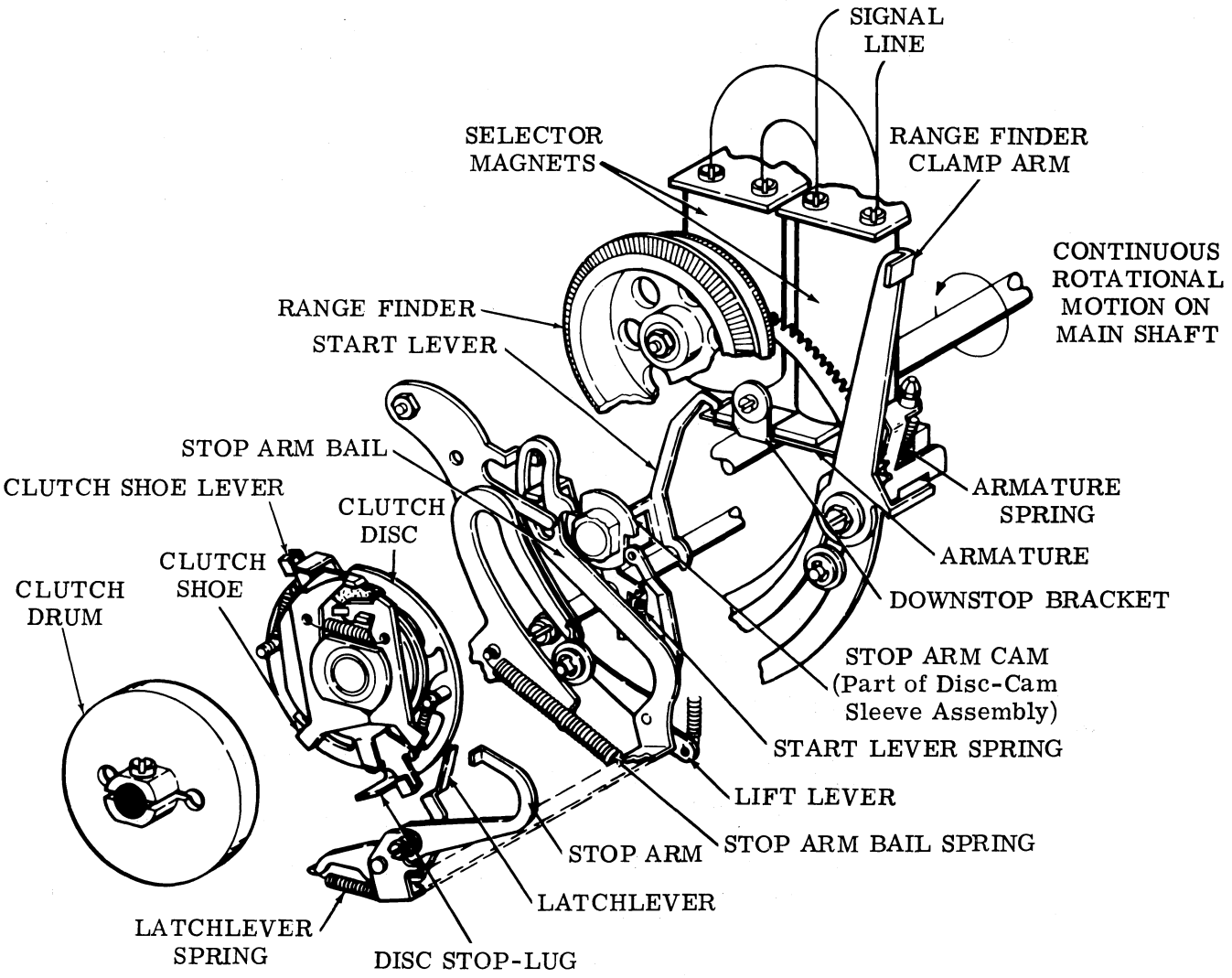


Figure 7 - Selector Start-Stop Operation

Raise, reset, and lower start lever. Block clutch shoe lever.

(1) Cam sleeve starts rotating. Selector cam sleeve mechanically operates its cam followers in a prearranged sequence as code level signals (marking or spacing) operate the armature (3.18).

(2) Between the second and third character bit, lift lever elevates start lever above opening in armature extension. Stop arm bail rides to high part of stop arm cam forcing start lever away from armature, restoring stop arm to blocking position.

Disengage selector cam sleeve from main shaft.

(1) Lift lever falls into indent of stop arm cam and lowers start lever.

(2) Stop (marking) bit at end of character energizes selector magnets and attracts armature.

(3) Stop arm cam presents indent to stop arm bail.

(4) Stop arm bail begins to enter indent but is prevented from entering fully by start lever whose inward movement is blocked by armature extension. Stop arm engages shoe lever to disengage cam sleeve from rotating clutch drum.

(5) Clutch disc latched by latchlever.

(6) Selector mechanism prepared to receive start (spacing) bit of subsequent character.

Push Lever Reset (Figure 8)

3.17 Strip the previous character from push levers after a start bit causes the selector cam sleeve to engage the main shaft.

Operation

As cam sleeve begins rotating, high part of push lever reset bail cam lifts push lever reset bail against tension of spring. Bail pivots, lifting and unlatching the marking push levers from in front of their selector

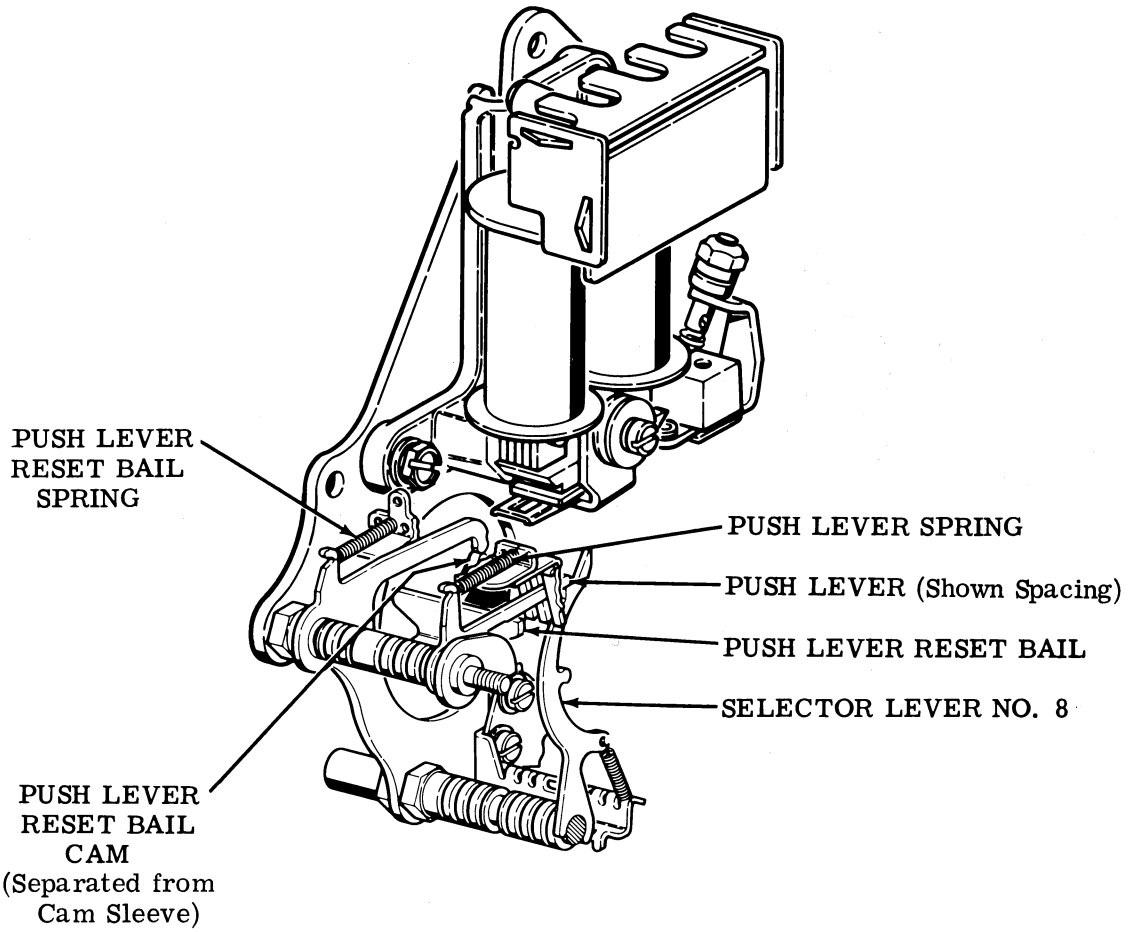


Figure 8 - Selector Push Lever Reset

levers. The bail returns to the unoperated position when the lobe drops from the high part of the cam. All of the push levers, except the auxiliary push lever (3.19) will then be in the spacing condition.

Note: Mechanically adjust position of stop arm, stop arm bail, lift lever, and cam sleeve in order to select most favorable period for sampling character bits as received by selector magnets. Range finder clamp arm, when pivoted clockwise, permits range finder scale adjustment.

Selection (Figure 9)

3.18 Code selections are performed by sequentially positioning push levers as marking and spacing intervals are applied to selector magnets.

Operation

View (A) - Idle Condition

(1) Selector cam sleeve shown before starting selection cycle. Marking locklever, spacing locklever, and eight selector levers held against cam sleeve by their individual springs; the lobes of each lever are riding on high part of selector cam sleeve.

(2) As marking and spacing signal intervals are applied to selector magnets, selector cam sleeve rotates and actuates selector levers.

View (B) - Marking Condition

(1) When marking impulse is received, the spacing locklever is blocked by end of armature. Top of marking locklever moves under armature, supporting armature in marking position until next signal transition is due.

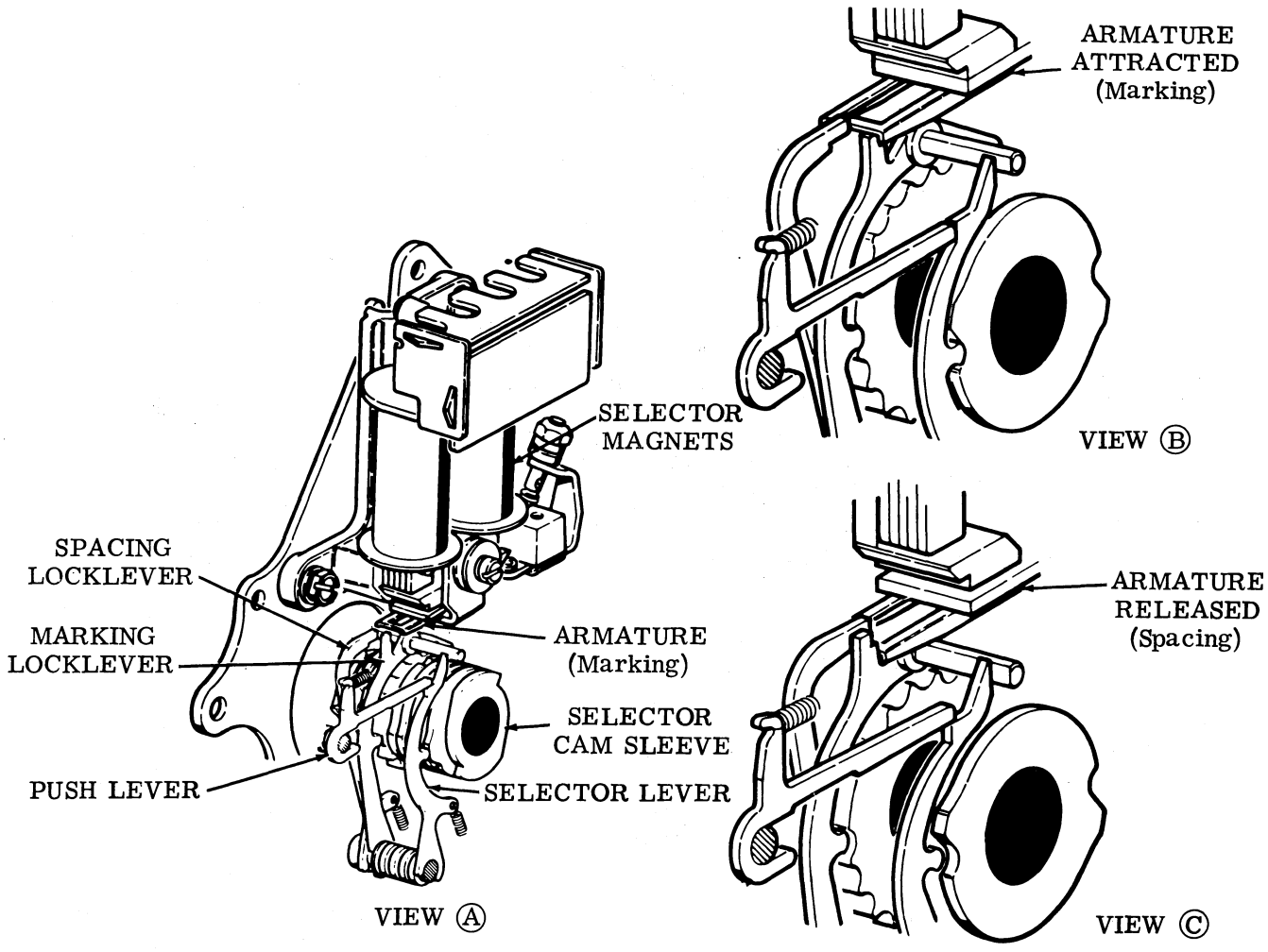


Figure 9 - Selector Operation

(2) During marking condition, selector levers are not blocked by armature extensions but are permitted to ride against their respective cams. Only that selector lever which is opposite the indent in its cam, can affect its push lever.
(3) As the lobe of the selector lever is drawn into its cam indent, the push lever drops off the shelf of its selector lever. When the selector lever is forced out of its indent, the selected push lever slides to the marking position.

View Ⓒ - Spacing Condition
(1) When spacing interval is received, the marking locklever is blocked by end of armature. Spacing locklever swings above armature and locks it in the spacing position until next signal transition is due.
(2) During spacing condition, selector levers are prevented from riding their respective cams by extensions on marking lock lever.
(3) Lobe of selector lever opposite its cam indent cannot enter indent fully. Push lever will not latch in front of selector lever but will remain on shelf.

Auxiliary Push Lever (Figure 10)

3.19 Auxiliary push levers sense marking or spacing position of selector lever no. 1. Normal strip operation (push lever reset) occurs during reception of code bit no. 1 and does not permit push lever no. 1 to sense position of its selector lever.

Operation

Auxiliary push lever responds to marking impulse for push lever no. 1. When bit no. 1

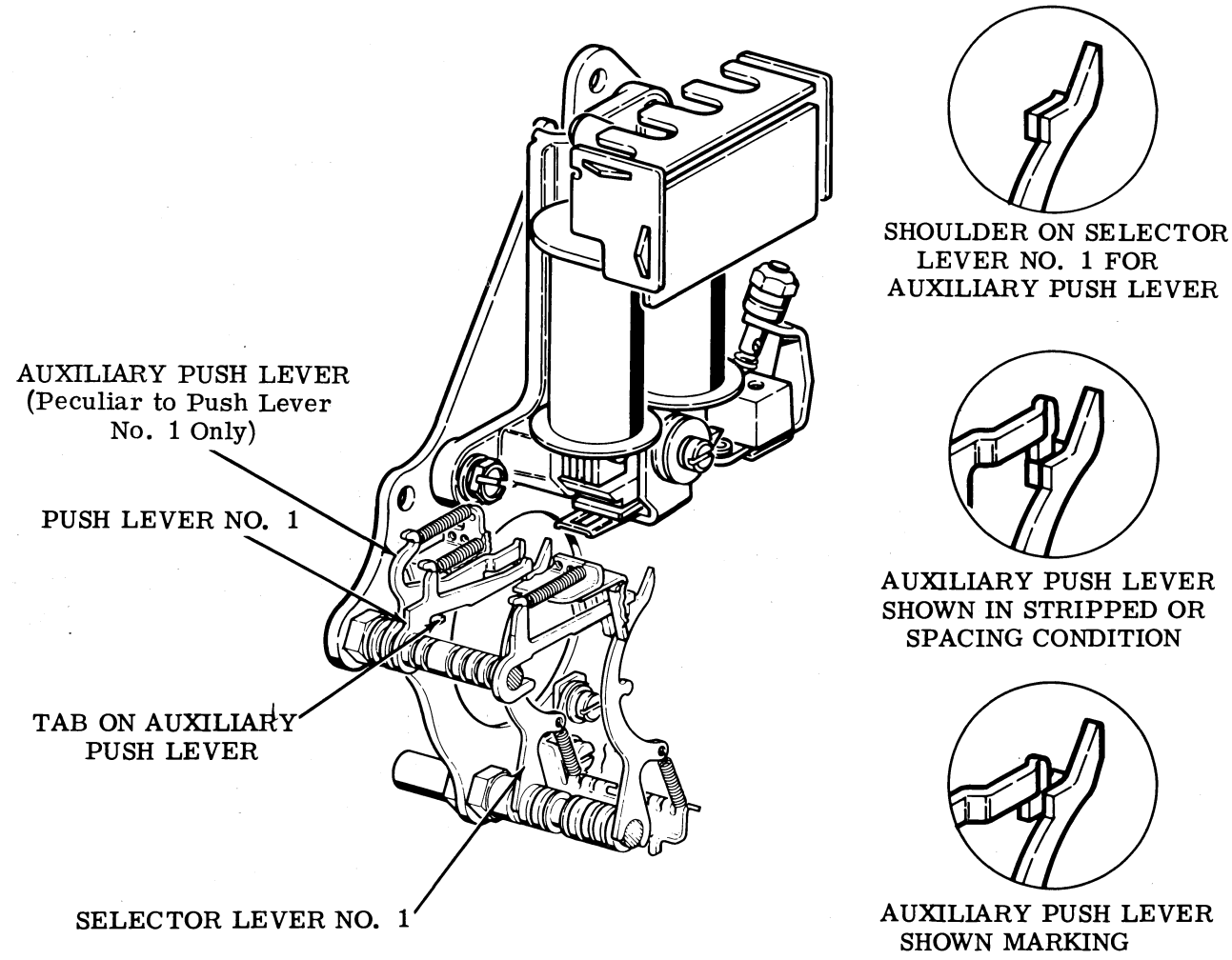


Figure 10 - Selector Auxiliary Push Lever

is marking, auxiliary push lever drops in front of shoulder of selector lever as push lever no. 1 is stripped. Tab on auxiliary push lever carries push lever no. 1 to marking position. When push lever reset bail (3.17) returns to unoperated position, push lever no. 1 is in front of, but not touching, its selector lever. Approximately half way through selection cycle, auxiliary push lever is stripped by auxiliary reset lever. Push lever no. 1 is then latched by selector lever no. 1.

TRANSFER MECHANISM (Figure 11)

3.20 The function of the transfer mechanism is to provide a path for the signal intelligence from the selector to the associated push-bar in the type wheel positioning mechanism. It also provides a means for setting up the function contacts to condition ribbon for red or black printing or to initiate print suppression, determined by the unit.

3.21 The transfer levers engage the punch slides at one end, as illustrated by the no. 4 transfer lever in Figure 12. The transfer levers all pivot about a common point and, at various distances from this pivot, engage their corresponding transfer beams. The opposite end of the transfer beam is coupled to one arm of a bellcrank lever. The opposite arm of the no. 1, 2, 3, 4, 5, and 7 bellcrank levers engage

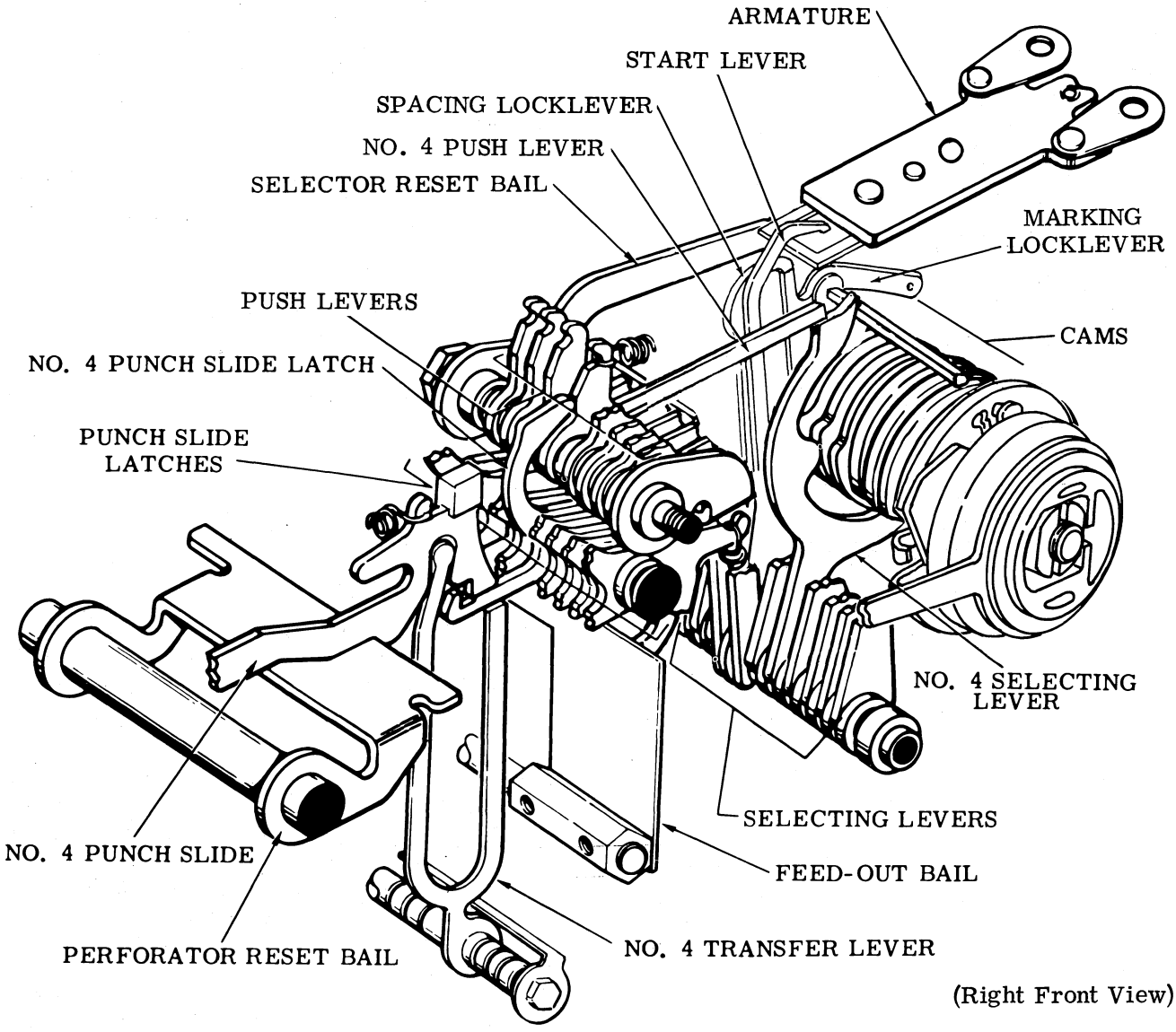


Figure 11 - Selector and Transfer Operation

their associated pushbars. Since the no. 6 and 8 bits do not control the position of the type wheel, they do not have an associated pushbar. When a selected punch slide falls forward, the corresponding pushbar is raised upwards and into engagement with the operating blade attached to the rocker bail. An additional extension on the lower end of the latchlever is arranged to engage a bail on the tape feed-out mechanism.

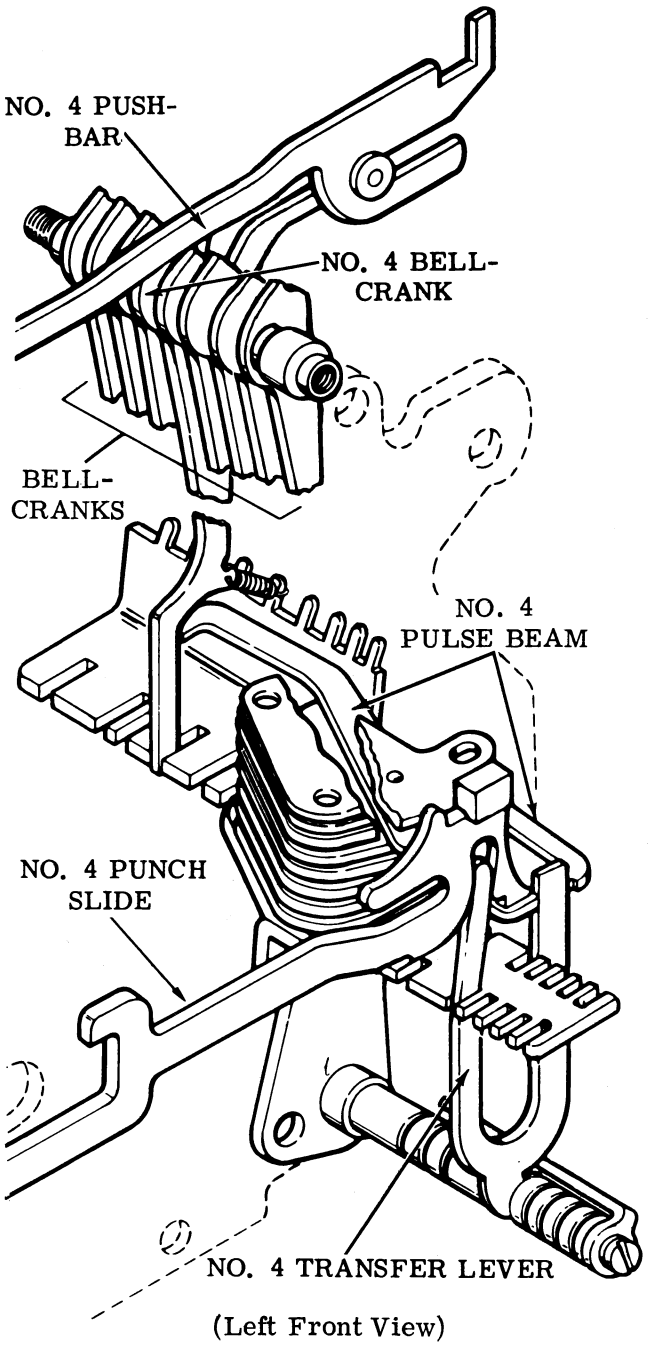


Figure 12 - Transfer Mechanism

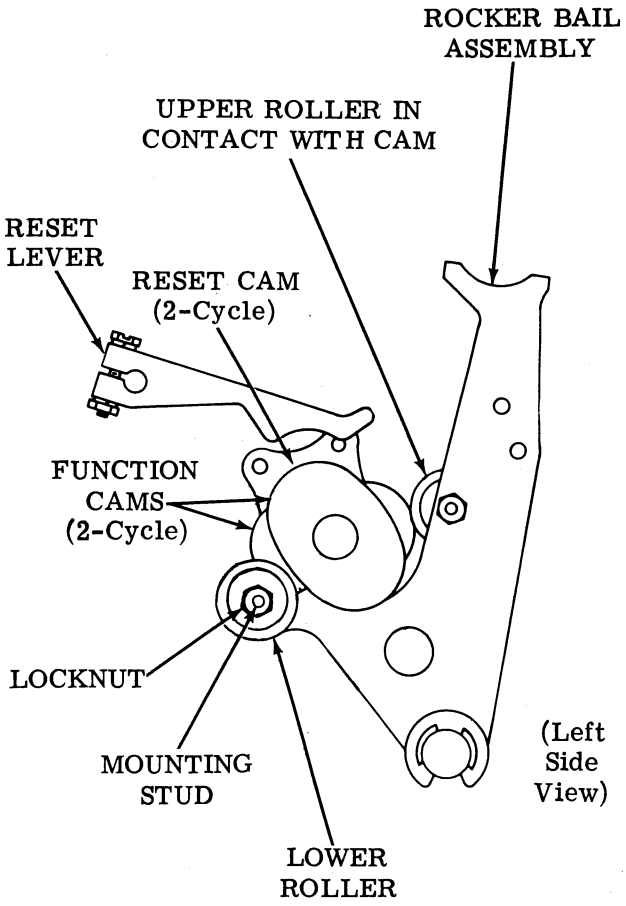


Figure 13 - Function Cams and Follower Rollers

FUNCTION MECHANISM

3.22 The function mechanism conveys the motion of the main shaft to the typing and reperforator mechanisms. It is comprised of a cam-clutch (Figure 6), a clutch trip assembly, and a rocker bail (Figures 13 and 14).

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

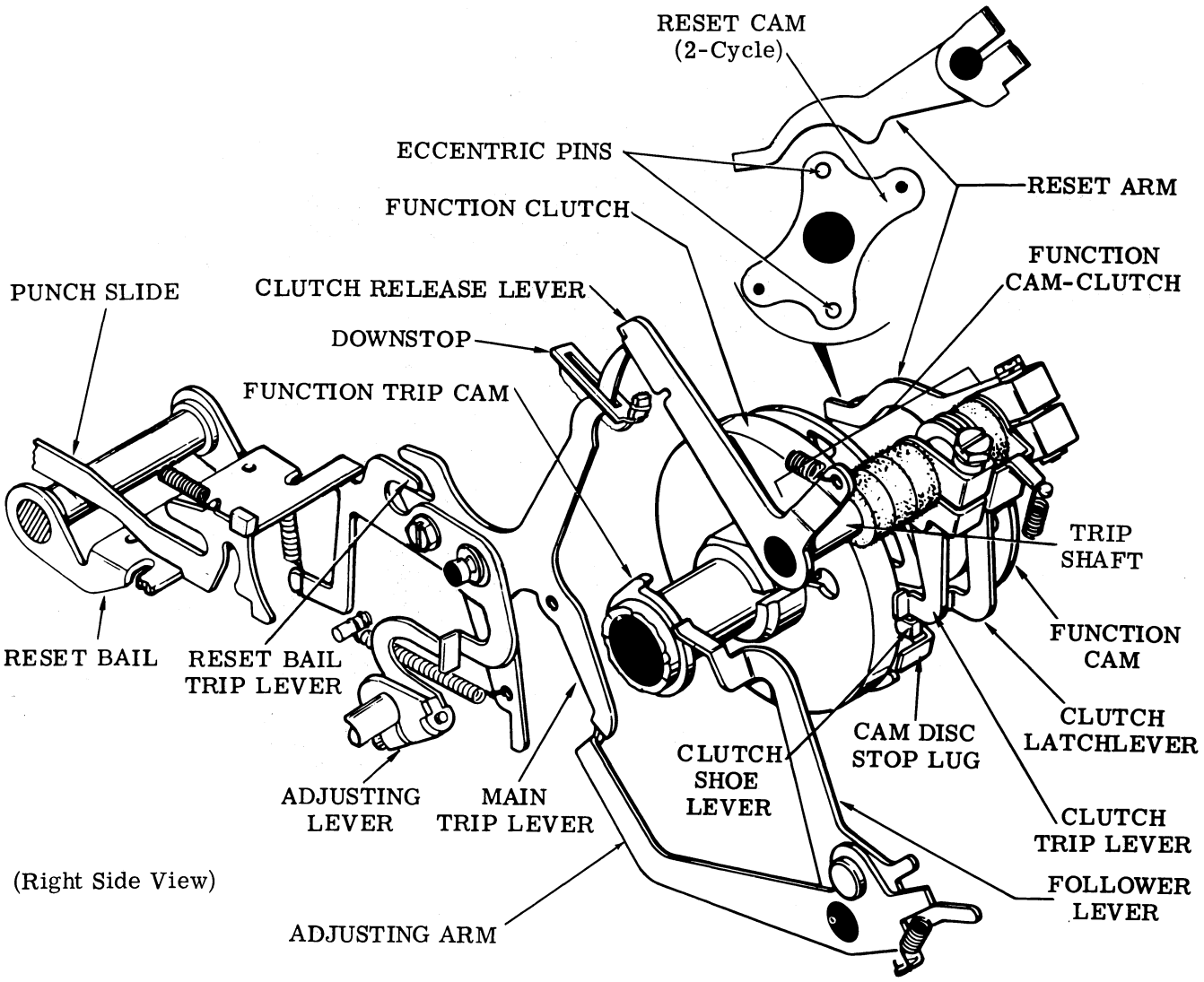
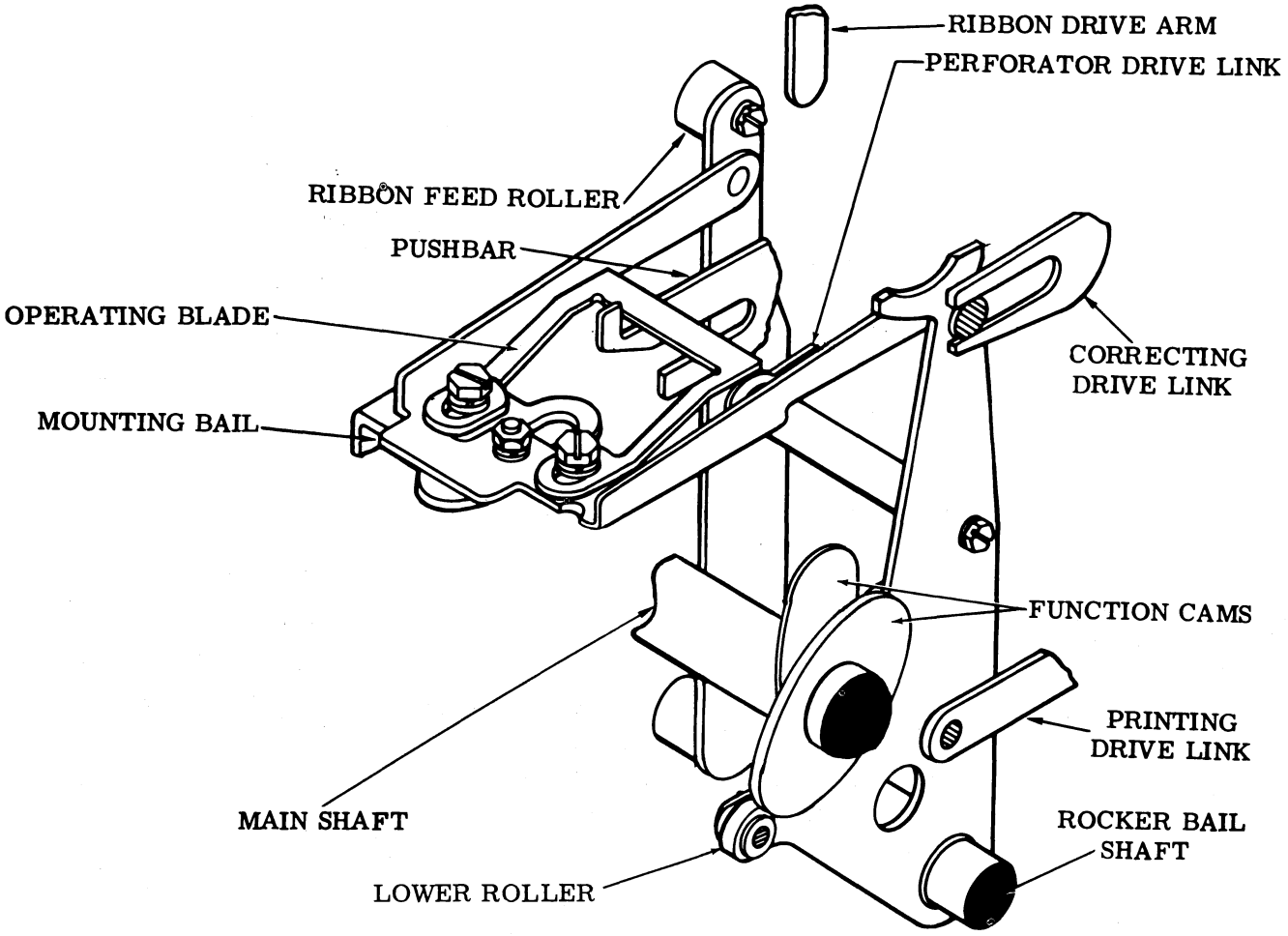


Figure 14 - Function Cam-Clutch and Clutch Trip Assembly

of the way of a clutch release lever, which falls against a downstop and rotates a trip shaft counterclockwise. Immediately, the low part of the trip cam allows the follower lever to return to its unoperated position, and the upper arm of the main trip lever moves down against the clutch release lever. When the trip shaft is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam-clutch begins its cycle. The internal operation of the clutch is the same as that of the selector clutch.

3.24 About midway through the function cycle, an eccentric pin on the reset cam lifts a reset arm, which rotates the trip shaft clockwise. The clutch release lever 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 clutch release lever 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.



(Left Rear View)

Figure 15 - Rocker Bail Assembly

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

(a) Ribbon feed mechanism

(b) Perforator

(c) Correcting mechanism

(d) Function contacts

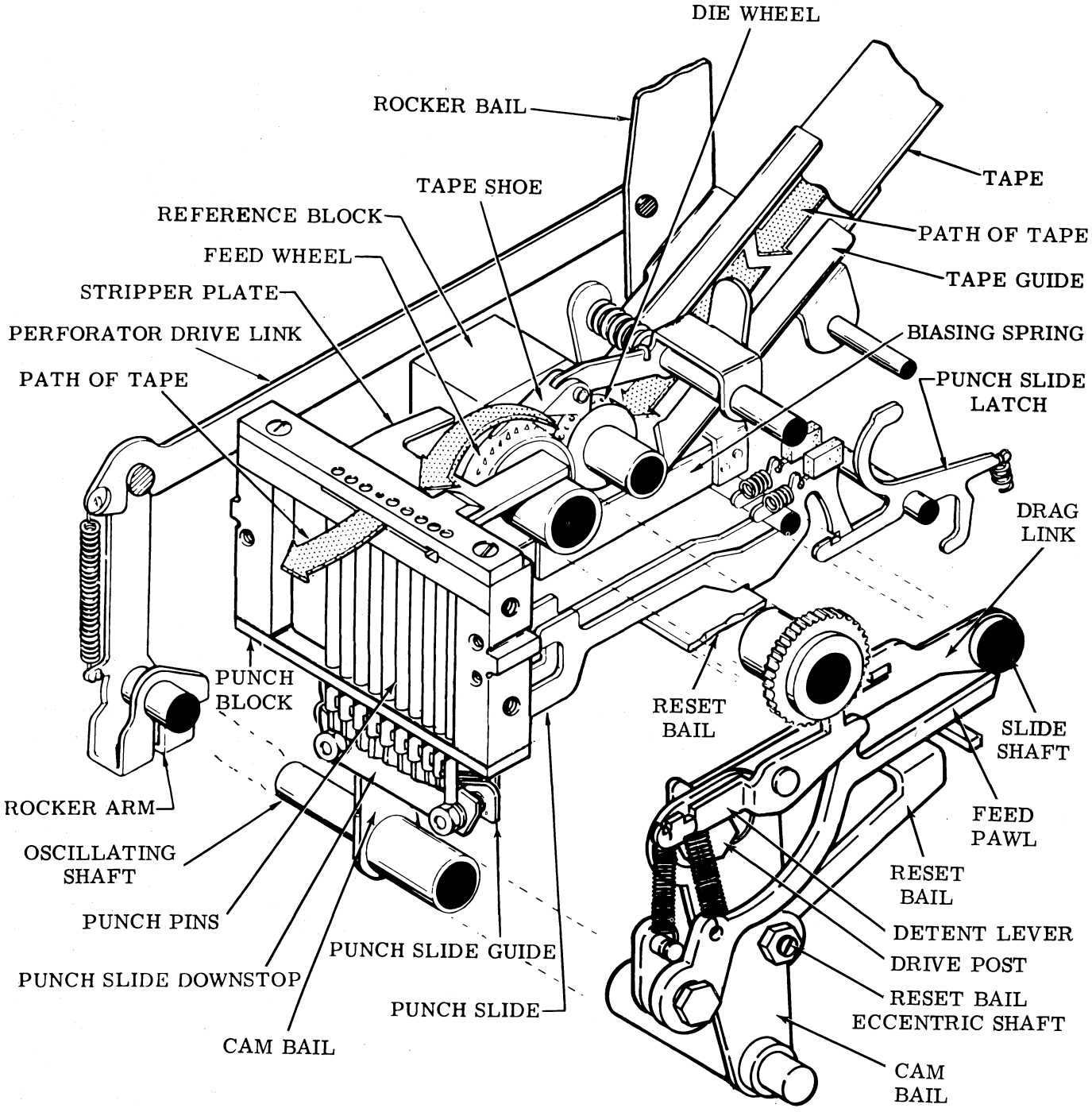
(e) Printing mechanism

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

The bail is shown in its home position in Figure 15. Each function cycle, the function cams bear against the rollers and cause the bail to rock forward (as viewed from the left in Figure 14) during the first part of the cycle, then rock back to the home position during the latter part of the cycle.

PERFORATOR AND FEED MECHANISM

3.26 The perforator mechanism (Figure 16) rolls the tape between a feed wheel and a die wheel, which does not perforate the feed



(Right Front Exploded View)

Figure 16 - Perforator Mechanism

hole but merely regulates the amount of tape feed. The punch perforates round holes corresponding to the code combination received from the signal line and perforates a smaller feed hole positioned between the third and fourth intelligence levels. Intelligence is received from the selecting mechanism by the punch slides, which select the proper punch pins in a punch block assembly. Motion from the rocker bail is distributed to the pins and the tape feed parts by a main bail assembly, which includes a cam bail, oscillating shaft, drive post, drag links, slide shaft, punch slide reset bail, and eccentric shaft.

Perforating

3.27 As described in 3.23, near the end of the selecting cycle, the reset bail is lowered and releases the eight punch slides (Figure 16). 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 oscillating shaft and cam bail counterclockwise. The cam bail attached to the right side of the oscillating shaft, lifts the slide post and moves the reset bail to the front. The selected slides are carried upward by the post and force the associated pins through the tape. The slides, thus, become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

3.28 During the last half of the cycle, the cam bail is rotated clockwise, pulling the slide post down and lowering the selected punch slides. The punch slides, which engage notches in their respective punch pins, pull the punch pins down below the tape. The main bail assembly and the selected punch slides and their associated punch pins move as a unit during the perforating stroke, both up and down. The punch pins are positively driven and retracted, to produce the fully perforated tape.

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

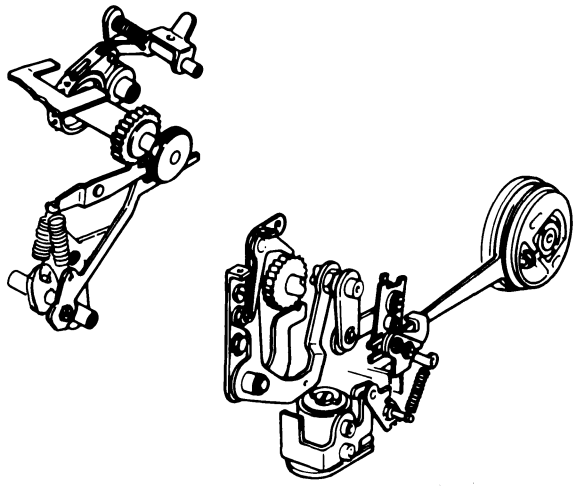


Figure 17 - Tape Feeding and Power Backspace Mechanisms

Feeding

3.31 Tape feeding (Figure 17) is accomplished after perforation during the last half of each function cycle. The tape is threaded down through a tape guide and then up between a feed wheel and die wheel (Figure 16). A feed pawl, driven by the cam bail, acts upon a ratchet and rotates the feed wheel which, by means of sharp pins and a slot in the die wheel, advances the tape one character at a time. A detent with a roller that rides on the ratchet holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high during the first half of the perforation, but is low during idling and the last half of the cycle to facilitate tape threading and feeding. A tape shoe retains the tape on the feed wheel, and a biasing spring holds it back against a reference block, so that the feed holes are punched a constant distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block, where it is perforated, and finally emerges at the front.

Tape Feed-Out

3.31 The manual tape feed-out (Figure 4) consists of a hand operated trip lever and plate. A projection on the hand trip lever

engages the lower projection of the selector start lever and trips the selector clutch. The typing reperforator runs open perforating(delete) code in the tape as long as the hand lever is held towards the front of the unit.

3.32 The magnet operated tape feed-out mechanism is of the interfering-type and consists of a magnet, mounting bracket, armature, armature extension, drive cam (mounted on the main shaft), and drive bail assembly. The drive bail assembly consists of a latch, a bail that engages the clutch trip lever, and a plate which trips the punch slide latches.

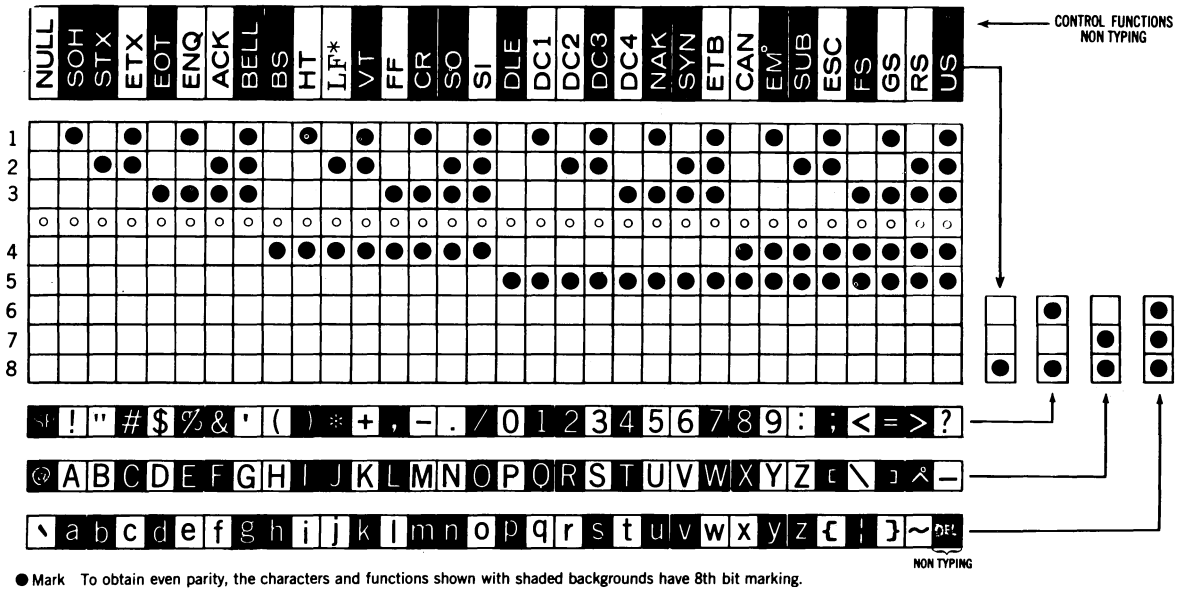
3.33 When the magnet is energized, the armature extension moves out of engagement with the latch on the drive bail assembly. The drive bail which is spring loaded is now free to fall into the indent of its cam. As the drive bail reaches the indent of its cam, it trips the punch slide latches, the reset bail and the function clutch, thereby, initiating a delete cycle of the punch. One cycle is initiated each time the perforator main shaft rotates 180 degrees. Feed-out of delete tape is continuous until the magnet is de-energized and the drive arm reaches the high part of the cam, thus, allowing the armature extension to engage the drive bail assembly.

Slide Storage Mechanism

3.34 The slide storage mechanism consists of a mounting plate, a latch, and a drive link. During normal reception of incoming messages, the punch rocker bail assembly drives the link which pushes the latch out of the way of the reset bail prior to its being stripped by the clutch trip lever. However, should a message be received during the operation of the feed-out cycle, selector cam and function cam relationship could occur whereby the reset bail could be tripped by the selector cam prior to the time when punch slides are fully reset. In this case the first character of the incoming message would be lost. The purpose of the slide storage mechanism is to hold the reset bail in engagement with the slides until the slides are fully reset so that the slides may recognize the first character set up in the punch slide latches by the selector.

TYPING MECHANISM

3.35 The characters used to type the received intelligence (Figure 18) graphics are embossed on the cylindrical surface of the metal type wheel (Figure 19). During the function cycle, the axial and rotary positioning mechanisms (Figures 20 and 21), having received the intelligence from the transfer mechanism, posi-



● Mark To obtain even parity, the characters and functions shown with shaded backgrounds have 8th bit marking.

*This character may have the meaning "NEW LINE" (NL).

Figure 18 - 8-Level Code Chart

tion the wheel so that the character represented by the received code combination is selected. Following type wheel positioning, the correcting mechanism (Figures 20 and 21) accurately aligns the selected character. Then the printing mechanism (3.52), by means of a hammer, drives the tape and inked ribbon against the wheel and imprints the character. A ribbon feed mechanism (3.54) advances the ribbon and reverses its direction of feed when one of two ribbon spools is depleted. Near the end of the function cycle the axial positioning mechanism retracts the type wheel and a ribbon guide to its home position, so that the first row of the type wheel is in line with the feed hole.

Type Wheel Positioning

3.36 A typical type wheel character arrangement is shown in Figure 19. The cylindrical surface of the wheel is shown printed out on a plane. There are 16 vertical rows, each of which is made up of four characters. These vertical rows are divided into two sections. The left section has 8 vertical rows (7 marking) and the right section has 8 vertical rows (7 spacing). The horizontal rows are numbered 0 through 3, starting with the spacing symbol (the home position). It should be noted that the clockwise and counterclockwise modifiers refer to the rotation of the type wheel to select the vertical column.

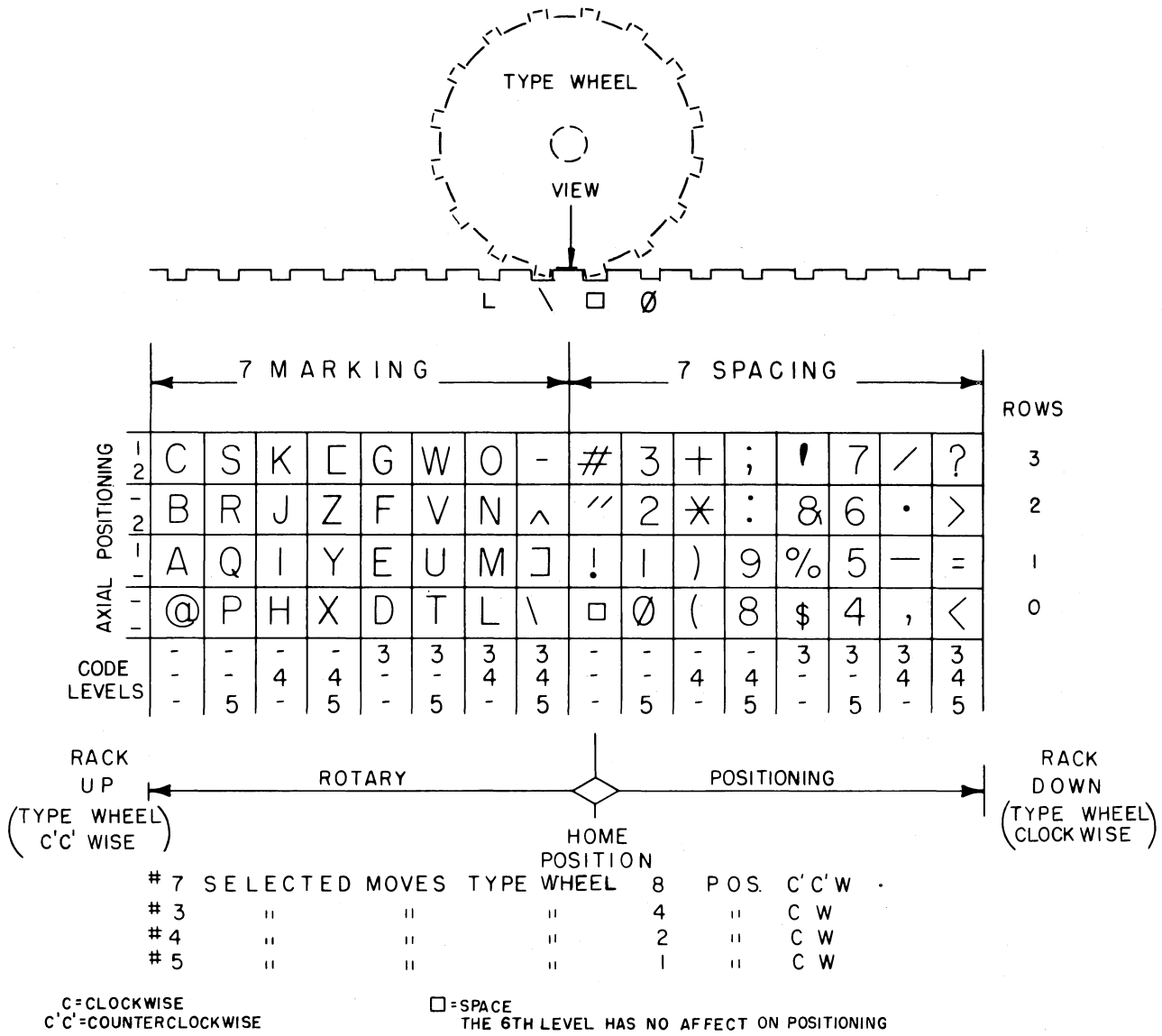
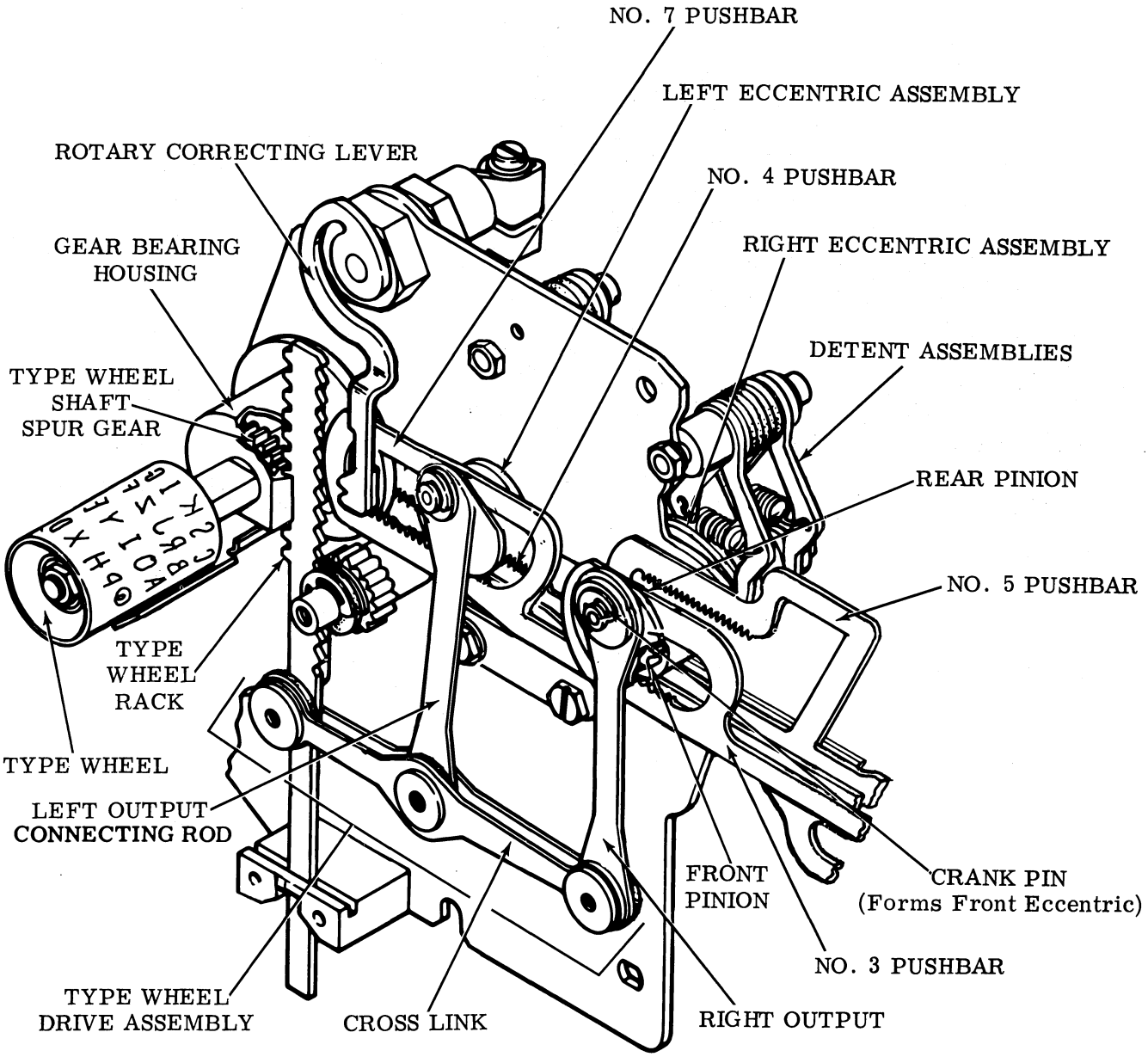


Figure 19 - Type Wheel Character Arrangement

3.37 Each printing operation begins and ends with the type wheel in the home position (horizontal row 0 at the spacing symbol). During one cycle of the printing operation the axial and rotary positioning mechanisms position the push-bars, transferring separate but simultaneous motions to the type wheel, so that the character represented by the received code combination is at the point of contact of the print hammer at the time of printing.

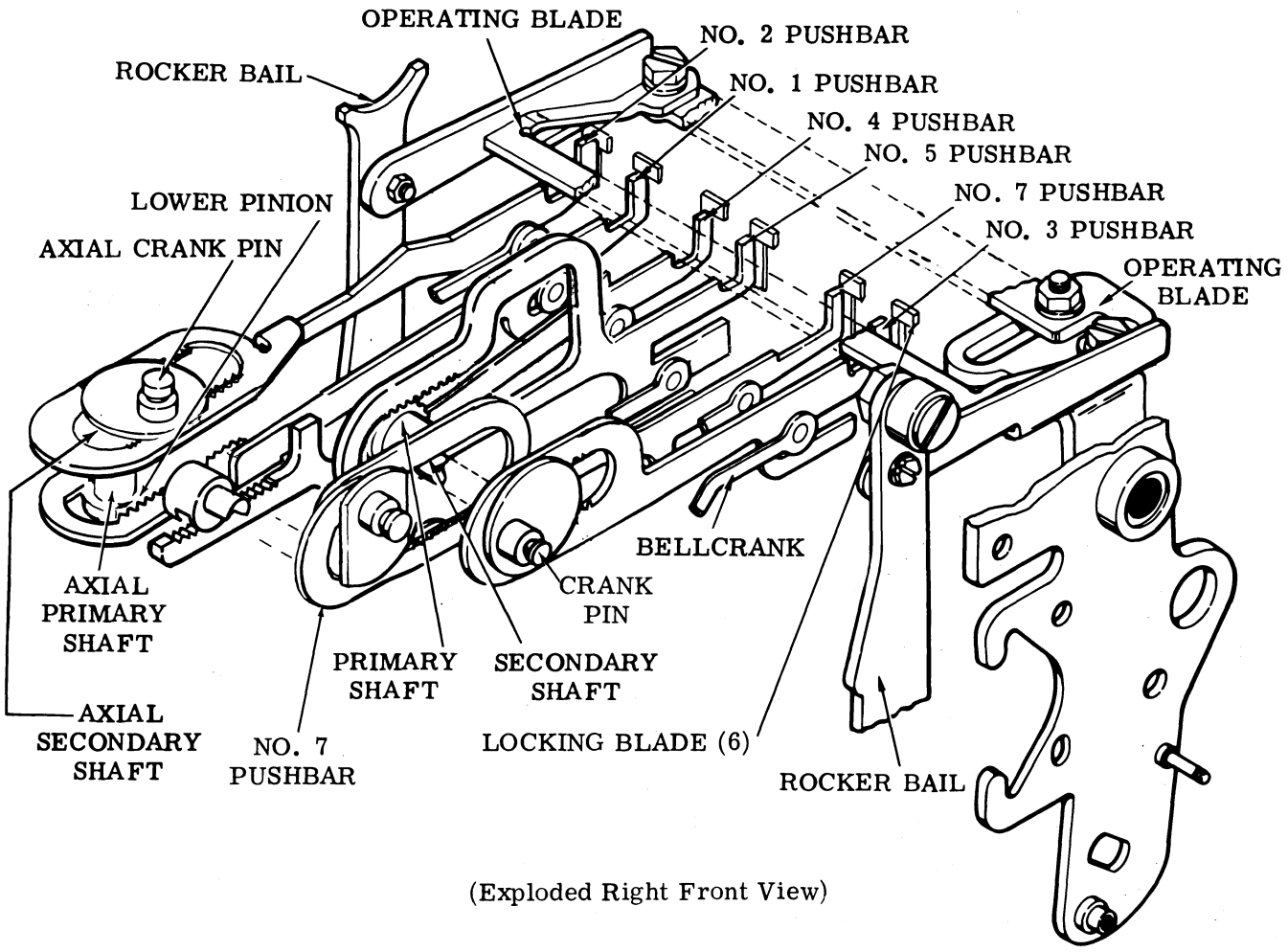
Rotary Positioning

3.38 The rotary positioning mechanism revolves the type wheel so that the vertical row containing the character to be printed is aligned with the print hammer. Mounted on the right side, the mechanism includes two eccentric assemblies as shown in Figures 20 and 21. Each assembly includes a primary shaft, a section of which is formed into a pinion. A



(Right Rear View)

Figure 20 - Rotary Positioning Mechanism



(Exploded Right Front View)

Figure 21 - Pushbars and Eccentric Assemblies

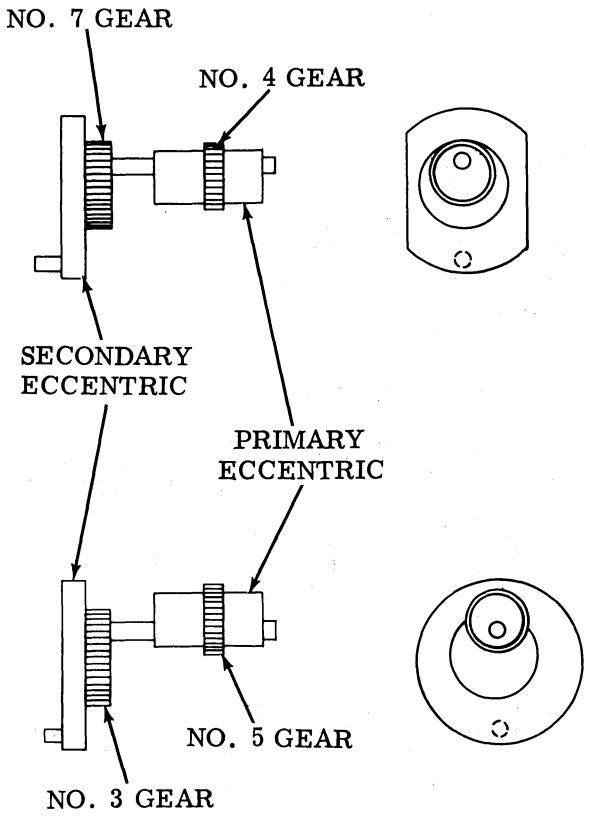


Figure 22 - Vertical Positioning Gears and Eccentrics

secondary shaft, mounted in the primary and offset from its center, forms an eccentric, or referred to as the rear eccentric (Figure 22).

3.39 The rotary positioning mechanism is controlled by the no. 3, 4, 5, and 7 pushbars. These pushbars operate their associated eccentrics (Figure 21) and through the right and left connecting rods, cross link and type wheel rack revolves the type wheel to select the proper vertical column (Figure 20).

3.40 Rotation clockwise from home position is controlled by the no. 3, 4, and 5 pushbars (Figures 19 and 23). These pushbars have assigned units of motion that always add clockwise to move the type wheel. For example, if the comma symbol is coded, the no. 3 and 4 pushbars are selected moving the type wheel clockwise 6 units (4 + 2 = 6). If the symbol < (less than) is coded, the type wheel moves to the furthest position clockwise, 4 + 2 + 1 = 7 units.

Note 1: After each character is selected and printed the type wheel returns to the home position.

Note 2: The sixth and eighth code levels have no effect on positioning.

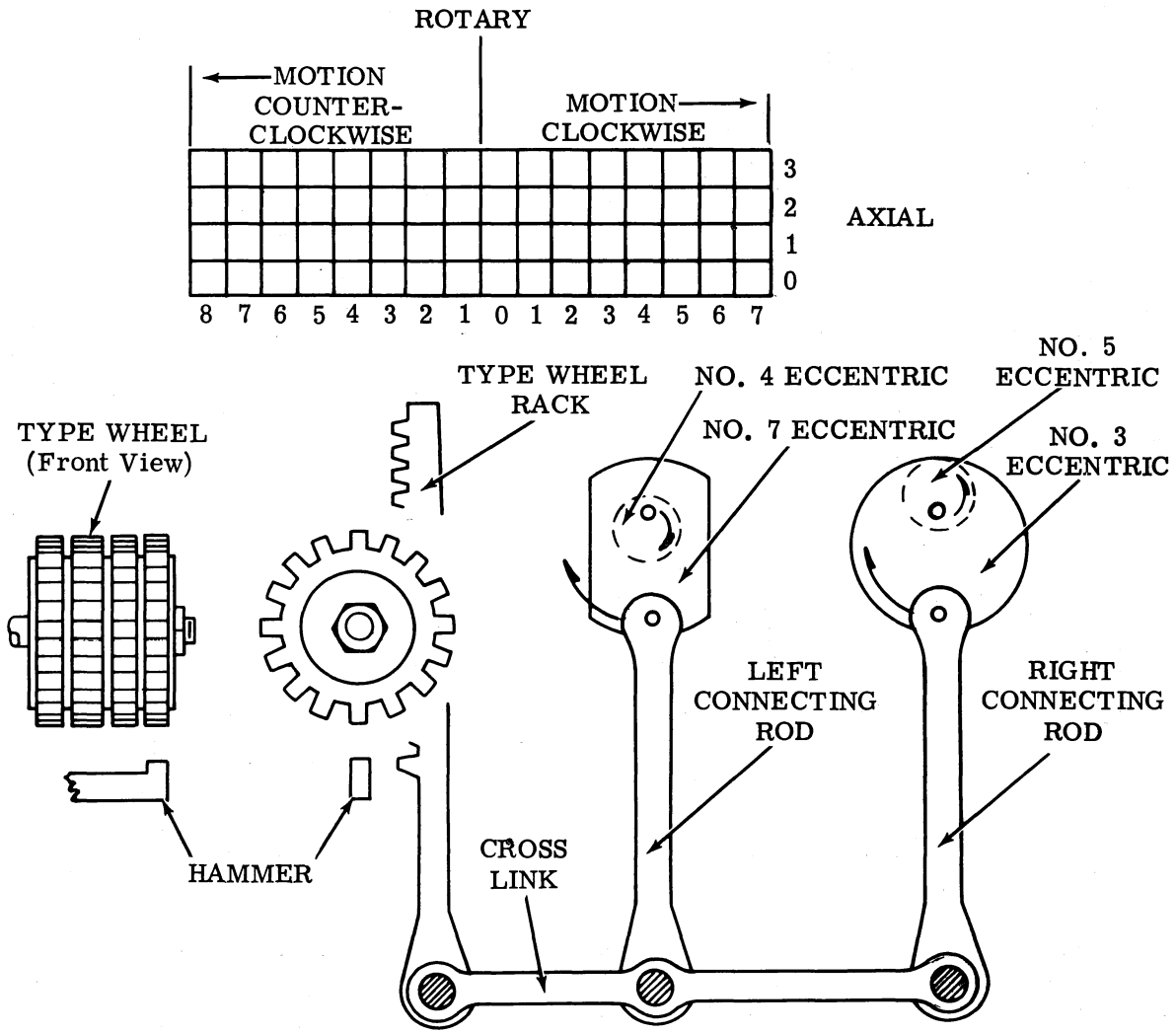
TABLE A

ROTARY POSITIONING BINARY CODE

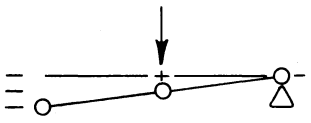
0 = SPACE 1 = MARK		UNITS OF TRAVEL
PUSHBAR 7	PUSHBARS 3 4 5	
	ADDITION	CLOCKWISE
0	0 0 0	0
0	0 0 1	1
0	0 1 0	2
0	0 1 1	3
0	1 0 0	4
0	1 0 1	5
0	1 1 0	6
0	1 1 1	7
	SUBTRACTION	COUNTER-CLOCKWISE
1	0 0 0	8
1	0 0 1	7
1	0 1 0	6
1	0 1 1	5
1	1 0 0	4
1	1 0 1	3
1	1 1 0	2
1	1 1 1	1

3.41 The no. 7 pushbar only rotates the type wheel in the counterclockwise direction: the left side of home position on Figure 19. The rotation counterclockwise is always 8 units.

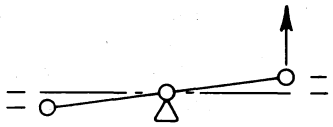
3.42 To illustrate counterclockwise motion, if the type wheel is in the home position as shown in Figure 19, and the space character (code levels 6 and 8 marking) is selected, the type wheel will not move because the space symbol is in the printing position. However, if the letter "D" is to be printed the no. 3 and no. 7 pushbars are selected. When both the no. 3 and no. 7 eccentric assemblies are displaced the combined displacement of the eccentrics and associated connecting rods, cross link, and type wheel rack simultaneously moves the type wheel 4 units counterclockwise (Figure 20).



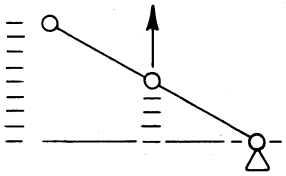
Type Wheel Positioning Rule for Connecting Rods and Pushbars



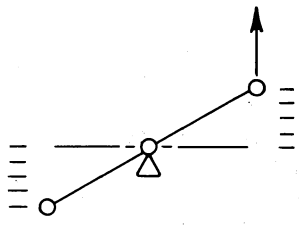
No. 4 = 2 Units Clockwise (Marking)



No. 5 = 1 Unit Clockwise (Marking)



No. 7 = 8 Units Counterclockwise (Spacing)



No. 3 = 4 Units Clockwise (Marking)

Figure 23 Rotary Positioning Mechanism

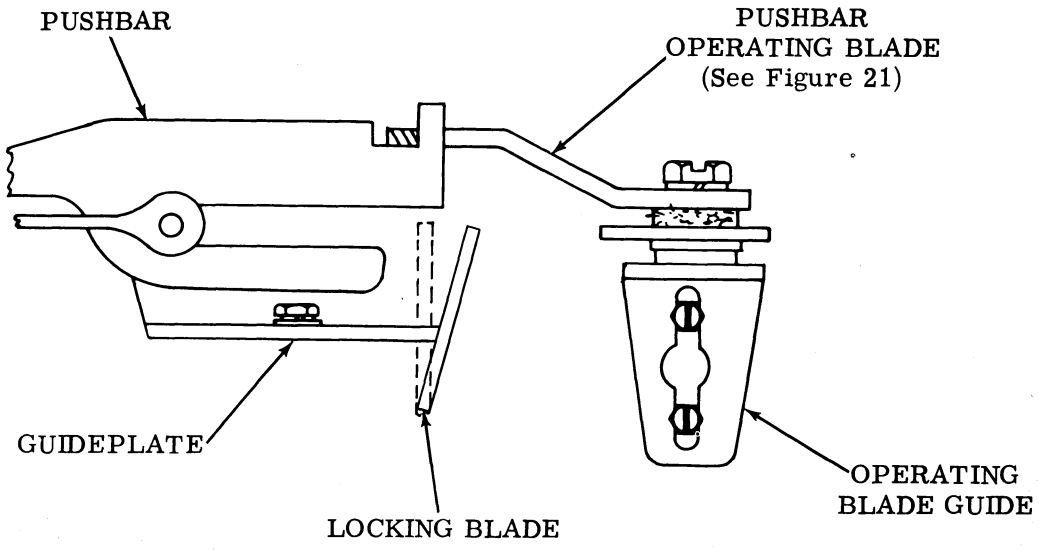


Figure 24 - Locking Blade and Pushbars

3.43 The rule for determining the units in rotary positioning is to add the units clockwise or if the no. 7 pushbar is selected, subtract the total units of clockwise motion from the 8 units of counterclockwise motion to determine the number of units to the left of home position, refer to Figure 23 and Table A.

Operating Blade and Pushbars

3.44 When in response to marking bits the associated pushbars are lifted by their bellcranks as described in 3.21, and the operating blade moves the selected pushbars forward. During the latter part of the function cycle the operating blade is moved back, returning the selected pushbars and associated eccentrics to their home position.

Locking Blades and Pushbars

3.45 When a pushbar is selected, the locking blade is free to move under the pushbar to prevent the pushbar from being lost during the initial engagement with the operating blade. During the latter part of the function cycle, the pushbar is lowered and the locking blade is pushed to its home position (Figure 24).

Axial Positioning

3.46 The axial positioning mechanism is controlled by the no. 1 and no. 2 pushbars. These pushbars and associated cams (Figures 25 and 26) moves the type wheel horizontally along its axis, so that the proper character in the selected row is aligned with the hammer at the time of printing. At the end of each function cycle the type wheel and ribbon guide are retracted to the 0 row and column 0 (Figure 19).

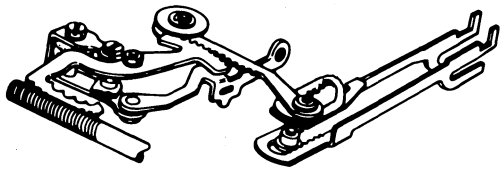


Figure 25 - Axial Positioning Mechanism

3.47 The axial positioning mechanism mounts on an axial bracket supported by the frame and side plate, and includes an eccentric assembly similar to those of the rotary positioning mechanism (Figures 20 and 21). Two eccentrics, a lower whose pinion is driven by the no. 1 pushbar and the upper whose pinion is driven by the no. 2 pushbar, rotate in bearing housings attached to the bracket. The eccentric assembly is linked to the type wheel shaft by an axial output rack and sector as shown in Figure 26.

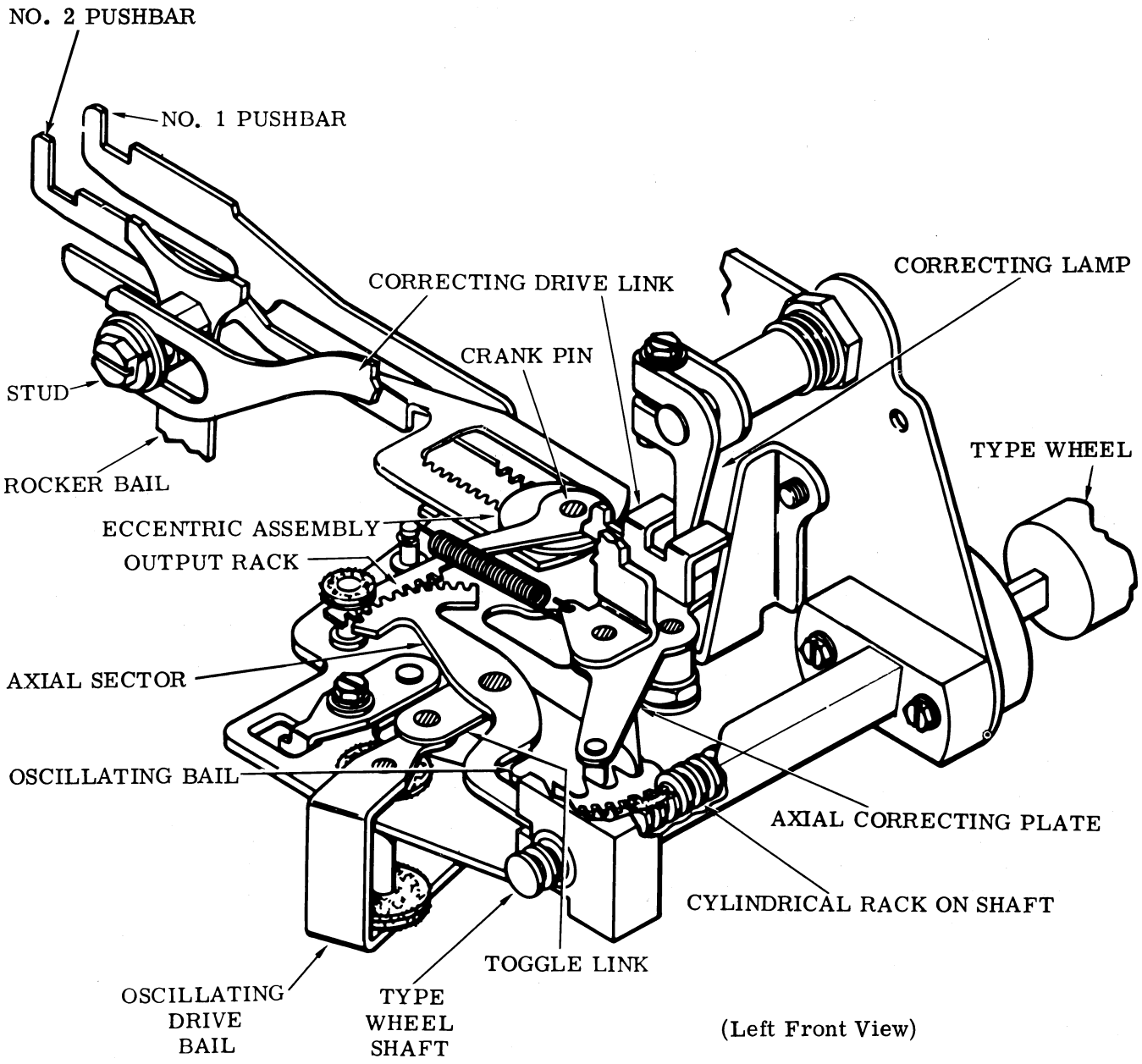


Figure 26 - Axial Positioning Mechanism

3.48 With the no. 1 and no. 2 pushbars, four positions are possible in the horizontal plane and these combinations are outlined in Table B. For example, if during a function cycle neither pushbar is selected, no motion occurs in the axial positioning mechanism. The maximum displacement exists when the no. 1 and no. 2 codebars are selected (marking).

TABLE B

AXIAL POSITION BINARY CODE

0 = SPACE 1 = MARK PUSHBARS 1 2	UNITS OF TRAVEL
0 0	0
1 0	1
0 1	2
1 1	3

Last Character Visibility

3.49 The last character visibility mechanism consists of a solenoid, mounting bracket, and a retraction link, located on the lower left side of the typing reperforator (Figure 27). When current is applied to the solenoid, by an external pushbutton, the retraction link pulls the type wheel and ribbon guide back through the toggle link on the axial plate so that the last character is visible. This mechanism will operate as long as current is applied to the solenoid. To prevent interference with an incoming message, an inhibit contact is placed in the circuit so that only when the unit is in the stop position can the circuit be closed.

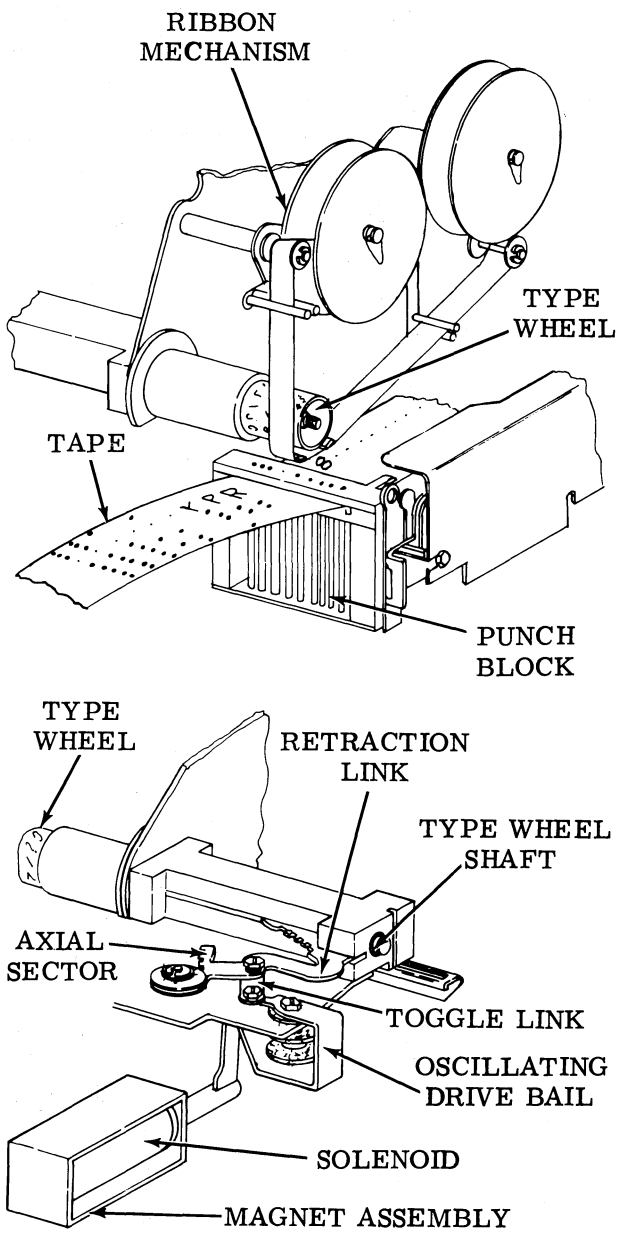


Figure 27 - Last Character Visibility Feature, Linkage and Magnet Assemblies

Position Correction

3.50 After the type wheel has been positioned by the axial and rotary positioning mechanisms (Figure 28), the selected character is more accurately aligned for printing by the correcting mechanism which compensates for any play and backlash in the positioning linkages. Each function cycle, the rocker bail transfers motion through a correcting drive link to a correcting clamp and shaft (Figure 26). The shaft pivots a rotary correcting lever (Figure 28) which is equipped with an indentation that engages a tooth in a type wheel rack. There is a tooth in the rack for each row of characters (16 in all), and they are so correlated with the type wheel that when a tooth is engaged by the corrector its row is accurately aligned with the print hammer. Axial correction, which is accomplished simultaneously, is similar to rotary correction: the drive link rotates an axial correcting plate counterclockwise (as viewed from above), and a roller mounted on the plate engages a notch in the axial sector (Figure 26).

Thus, the type wheel is accurately aligned in both fields of motion just before printing takes place. During the latter part of the function cycle, a correcting drive link spring returns the correcting mechanism to its home position.

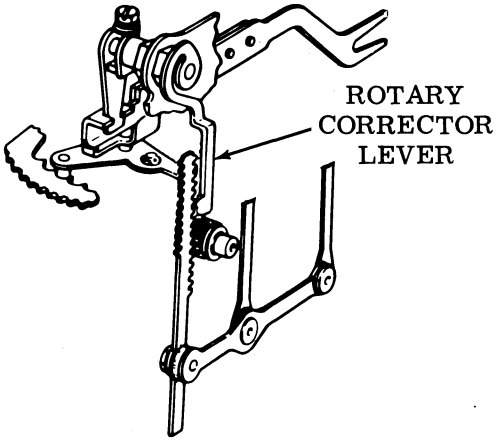


Figure 28 - Correcting Mechanism

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

Printing

3.52 After the type wheel has been positioned and corrected, the printing mechanism supplies the impact which drives the paper and ribbon against the selected character (Figure 29). It effects this operation by means of a print hammer which is mounted on a shaft supported by a bracket attached to the type wheel bearing housing. In its unoperated condition, as illustrated in Figure 30, 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.

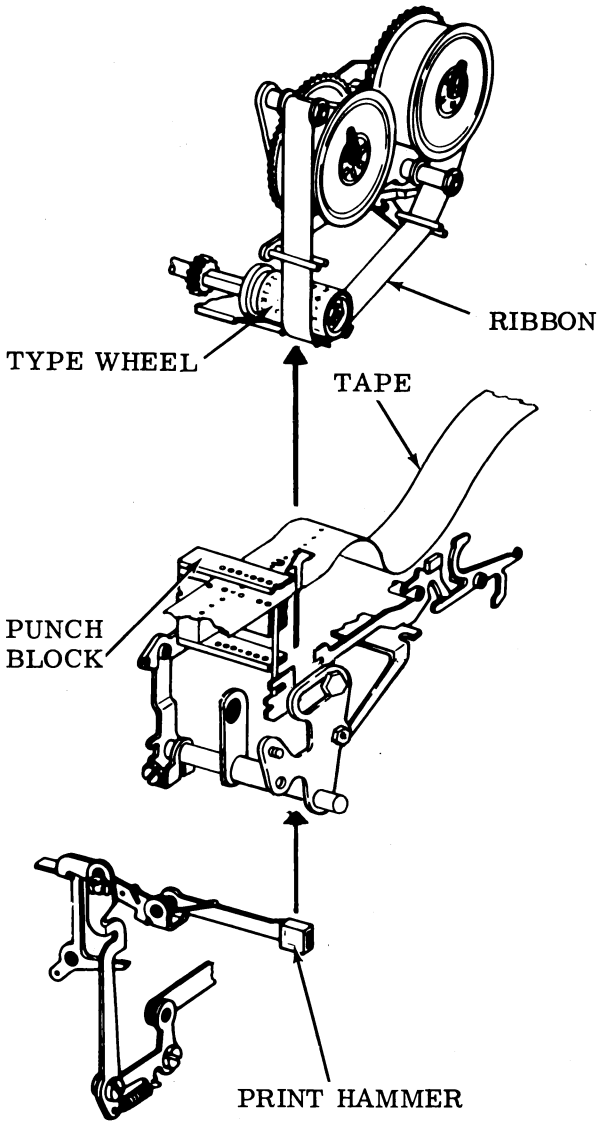


Figure 29 - Printing Operation

3.53 The rocker bail, during the forepart of the function cycle, moves a printing drive link to the right (as viewed from the left in Figure 30) and causes a pivot arm to rotate clockwise. The arm lowers a trip link which slides in an elongated slot. Near the end of the rocker bail's travel, the trip link pivots the latch which releases the accelerator. Under the spring tension, the accelerator snaps down and impels the hammer upward. The face of the hammer drives the tape and inked ribbon up against the type wheel and imprints the selected character on the tape. Near the end of its travel, the accelerator encounters a projection on a latch bracket, and inertia carries the hammer the rest of the way.

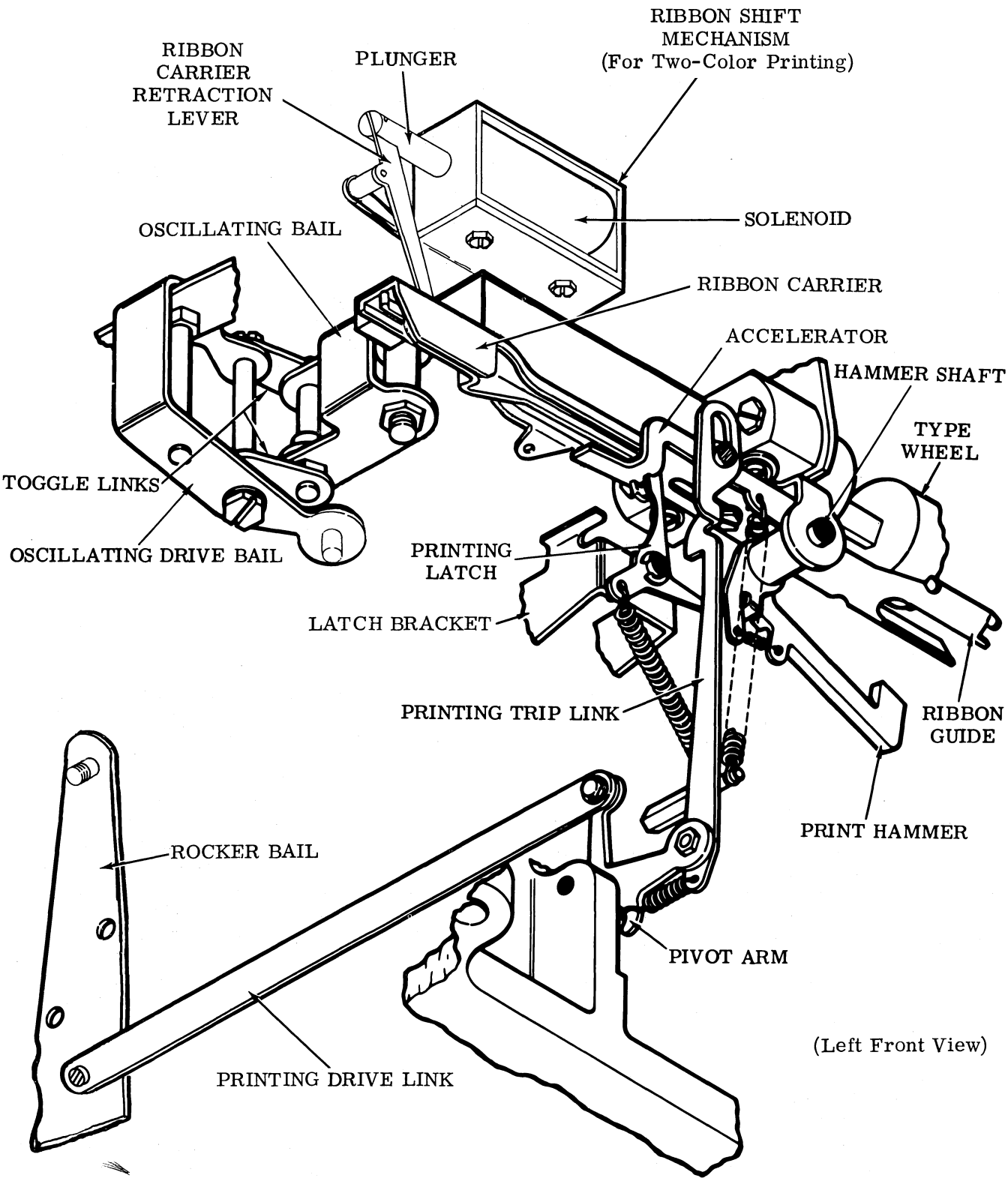


Figure 30 - Printing Mechanism

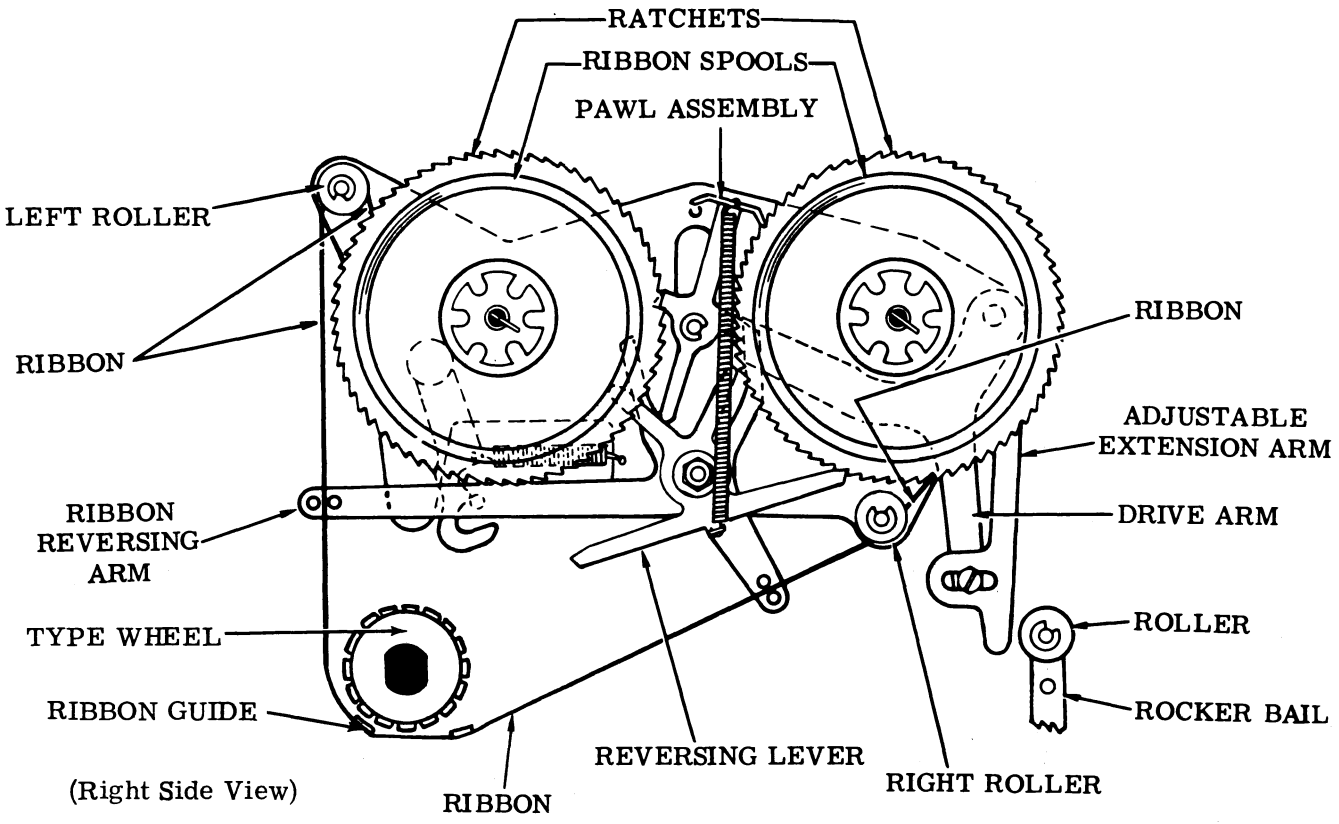


Figure 31 - Ribbon Feed Mechanism

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 FEED AND SHIFT MECHANISMS

3.54 The characters are typed in ink supplied by the inked ribbon which is held between the tape and the type wheel by a guide and advanced by the ribbon feed mechanism (Figure 31). The path of the ribbon is down to the right off the top of a right spool, under a right roller, through the guide, up through left pins on the reversing arm, over a left roller, and to the right over the top of a left spool.

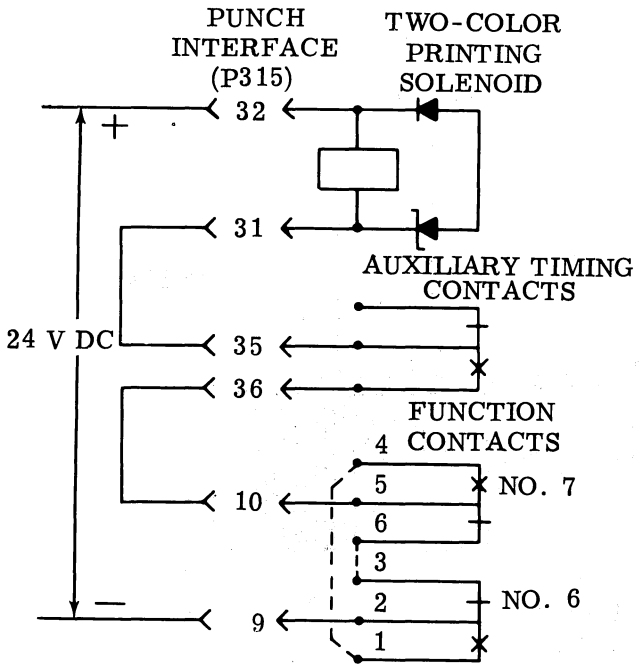
3.55 Each function cycle, as the rocker bail nears the end of its left travel, a roller mounted on its forward arm pivots a drive arm clockwise. The drive arm lifts a feed pawl which advances the ribbon, by rotating a ratchet on one of the ribbon spools, one tooth. A retaining pawl, under spring tension, 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.

3.56 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.

Two-Color Printing

3.57 On units equipped with two-color printing (Figure 30) the ribbon carrier is retracted when the ribbon shift magnet is energized. This causes the red portion of the red black ribbon to be over the print hammer. In the normal operating position the black portion of

the ribbon is over the print hammer causing characters to be printed in black. Refer to Figures 32 and 33 for information concerning the variations available in the contact assemblies.



Note 1: Strap 1 and 4 to print lower case in red.

Note 2: Strap 3 and 6 to print functions in red

Figure 32 - Schematic for Two-Color Printing Using Function Contacts

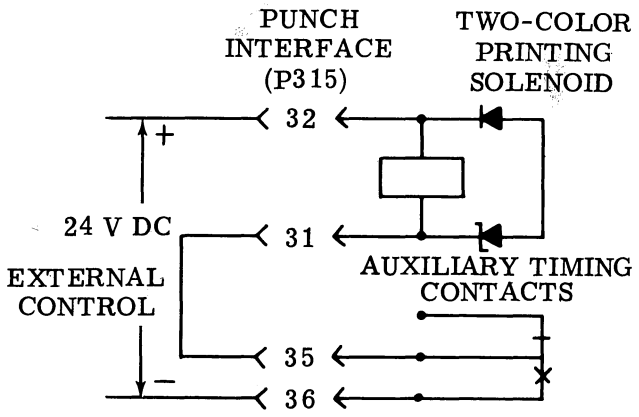


Figure 33 - Schematic for Two-Color Printing Using External Control

Print Suppression

3.58 The print suppression mechanism (Figure 34) consists of a magnet, mounting bracket, armature extension, function contact and auxiliary timing contacts. When the magnet is energized, it pulls the armature extension into the path of the print hammer accelerator lever, which prevents printing.

3.59 The print suppression mechanism can be actuated when current is supplied to the magnet by the closure of the auxiliary timing contacts, and by the closure of a set of function contacts when the no. 6 and no. 7 bellcranks are both spacing and/or both marking. Another method of actuating the print suppression mechanism is with the use of an external circuitry in place of the function contacts. Refer to Figures 35, 36, 37, and 38 for information on the electrical combinations that are available with the optional features.

BACKSPACE MECHANISM

3.60 The backspace mechanism steps the tape back through the punch block in order to delete perforated errors. The erroneously perforated code combination in the retracted tape is then obliterated by perforating the delete code combination in its place. The backspace mechanism may be operated manually or it may include power drive (Figure 39).

3.61 In manual backspace mechanism, depressing the handle of the backspacing bellcrank, disengages the perforator feed pawl from the feed wheel ratchet. The backspacing feed pawl then engages the feed wheel clockwise, backspacing the tape to the next row of perforations.

3.62 After the tape has been retracted into the punch block, the set of code holes above the punch pins may be replaced with the delete code combination.

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

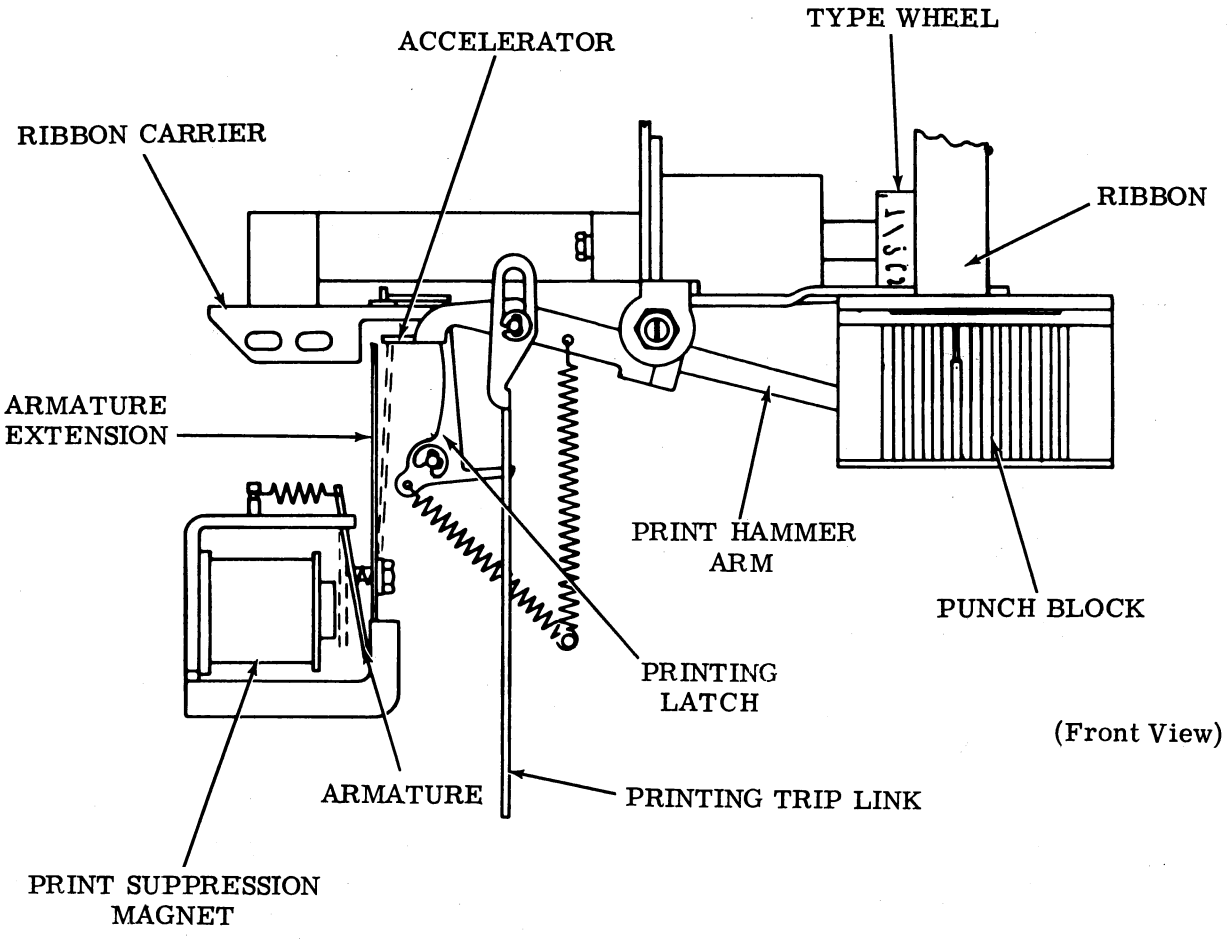
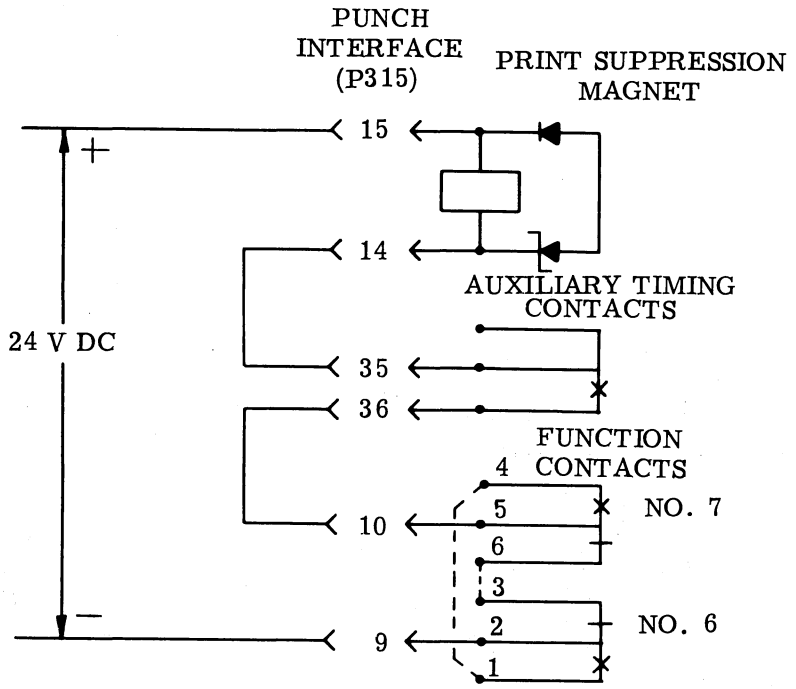


Figure 34 - Print Suppression Magnet and Linkage Mechanism



Note 1: Strap 1 and 4 to suppress lower case and strap 3 and 6 to suppress functions.

Note 2: X = normally open and
- = normally closed.

Figure 35 - Schematic for Print Suppression Using Function Contacts

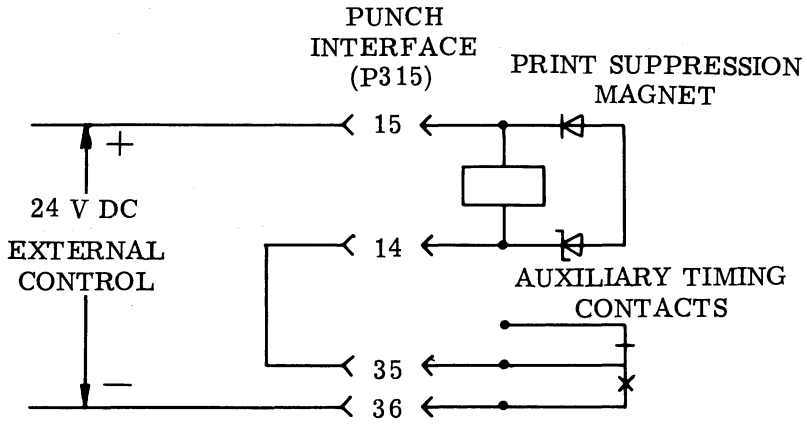


Figure 36 - Schematic for Print Suppression Using External Control

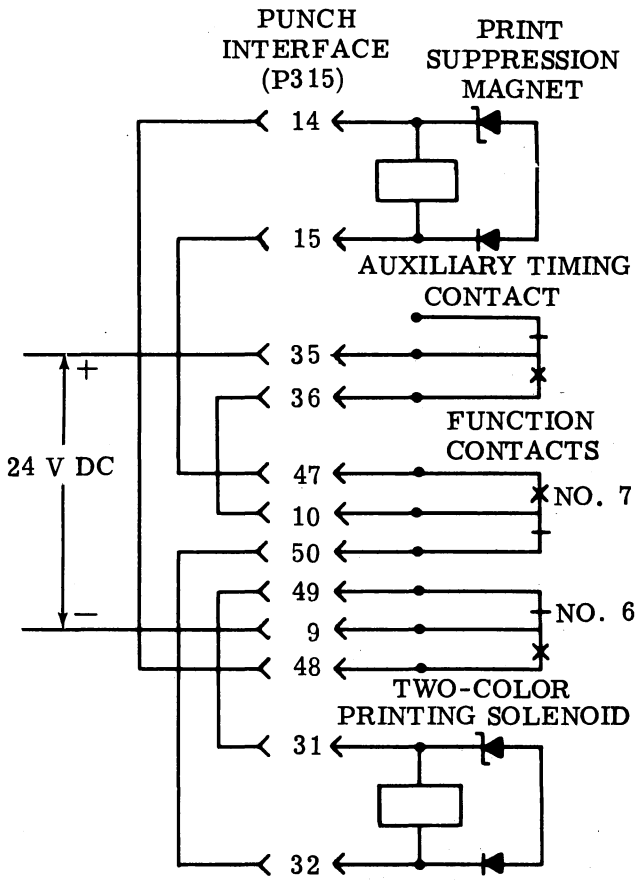


Figure 37 - Schematic for Suppressing Lower Case and Printing Functions in Red

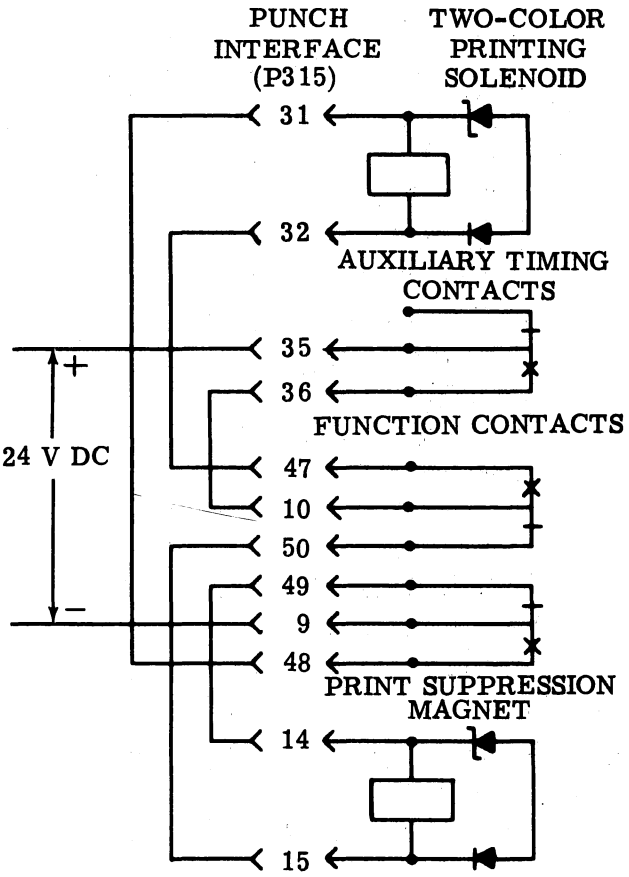


Figure 38 - Schematic for Suppressing Functions and Printing Lower Case in Red

FUNCTION CONTACTS

3.64 The no. 6 and 7 bellcranks have an additional arm which controls a transfer contact assembly in the function contacts. This pair of contacts is used to control the ribbon shift magnet which, in turn, controls the color of the printed character or initiates print suppression. Current is allowed to pass when the no. 6 and no. 7 bits are of the same polarity.

CODE READING TIMING CONTACTS AND AUXILIARY TIMING CONTACTS

3.65 The code reading timing contact assembly and the auxiliary timing contact assembly are mounted to an adjustable bracket, which is mounted to the main frame of the typing reperforator. The code reading timing contact assembly is the forward contact assembly. Each contact assembly consists of two separate transfer-type contacts of the "break-before-make" type. Each transfer-type contact is operated by a bail that pivots from a common shaft on the contact mounting frame. The contact operating bails are spring operated in one direction and cam operated in the other. The contact operating bail is operated by the contact operating bail. The contact operating bail is operated by the cam of the complimentary function cam through an adjustable cam follower that is attached to the contact operating bail. On units requiring the code reading timing contacts only, the rearmost contact assembly (auxiliary timing contact) is omitted. The contacts are wired to a 50-point connector mounted on the unit.

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

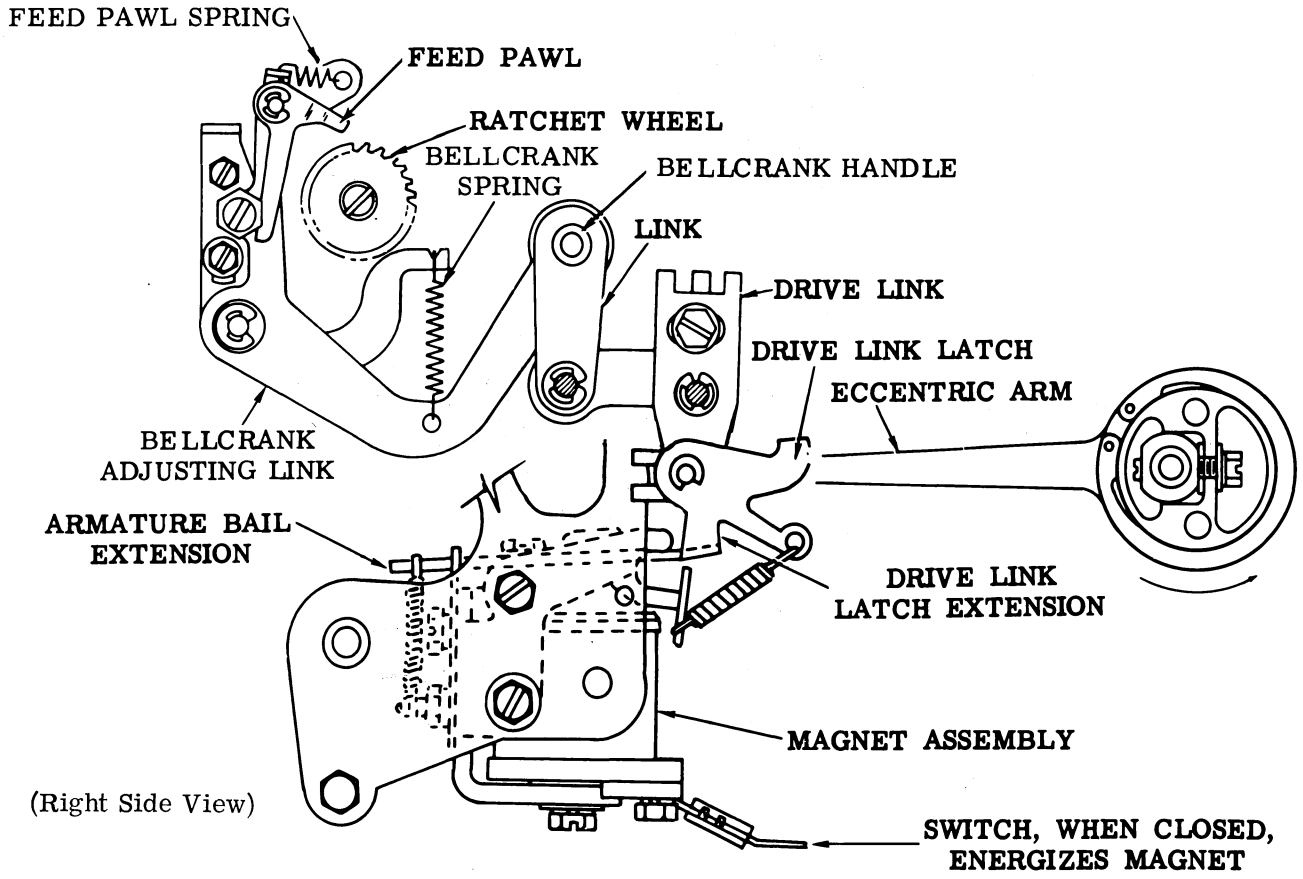


Figure 39 - Backspace Mechanism

CODE READING CONTACTS

3.67 Code reading contacts for tape equipment are used by an external electronic logic for functions such as code recognition, etc. The code reading contact assembly has eight make-before-break transfer-type contacts operated by the punch slides.

CHARACTER RECEIVED CONTACTS

3.68 The character received contacts (Figure 40) are used in system applications that are defined by the customer's requirements. When these contacts are connected to external circuits, the contacts provide electrical pulses which may be synchronized with code reading contacts for circuit control. An example would be to inform the sending station or an internal circuit that a character signal has been received and acted upon. These contacts are available in normally open or normally closed arrangements.

INHIBIT CONTACTS

3.69 The inhibit contacts are located in back of the unit on the function clutch trip plate. These contacts are closed when the type wheel is in the home position. When the function clutch is tripped, the inhibit contacts are operated by the function clutch release lever. The contacts, when operated, are opened, and the last character visibility magnet is de-energized; this allows the unit to receive incoming messages without interference.

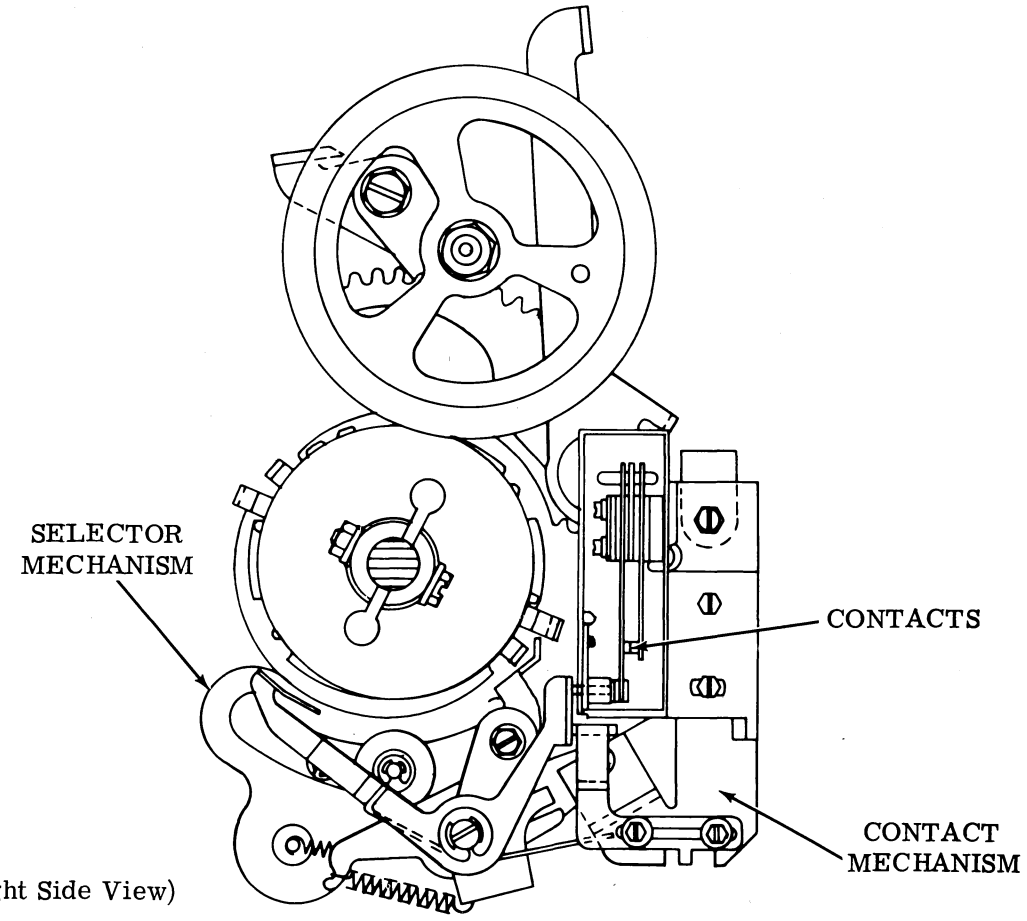


Figure 40 - Character Received Contacts