

### 37 NON-TYPING REPERFORATOR

#### DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS	PAGE
1. GENERAL . . . . .	1
2. DESCRIPTION . . . . .	1
TECHNICAL DATA . . . . .	4
3. PRINCIPLES OF OPERATION . . . . .	4
MECHANISM INDEX . . . . .	4
BASIC UNIT . . . . .	5
VARIATIONS . . . . .	21

#### 1. GENERAL

1.01 This section provides description and principles of operation for the 37 non-typing reperforator (Figure 1).

1.02 The reperforator is an electromechanical unit which records information in tape as combinations of perforations representative of the presence or absence of a signal pulse in each of the eight levels of intelligence applied to the unit electrically. The information is received in a form corresponding to the USA Standard Code for Information Interchange (ASCII) and is translated into the necessary mechanical motions to perforate the code holes and feed the tape. Motive power is supplied through an external motor unit and drive mechanism. The reperforator can operate at speeds up to 150 wpm.

1.03 Character representations, or graphics, are the alphabetic, numeral or symbol intelligence representations. 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 it can be used in conjunction with typing equipment.

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, up or down, etc refer to the reperforator in a normal operating position and viewed by an operator facing the punch block.

#### 2. DESCRIPTION

2.01 The basic reperforator consists of the selector, transfer, function, perforator, backspace, and tape feedout mechanisms. The selector mechanism includes a 2-coil magnet, selecting cam sleeve and a rangefinder. The rangefinder permits adjusting the selector mechanism in relation to the signal code.

2.02 Information received by the selector mechanism is transferred to the perforator mechanism by the transfer mechanism. The function mechanism, consisting of a trip

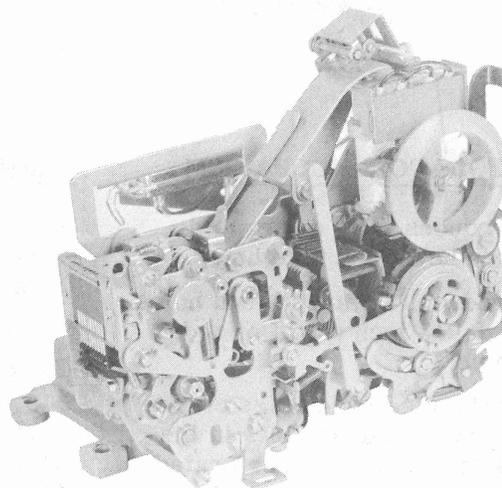


Figure 1 - Non-Typing Reperforator

TAPE FEED MECHANISM

- Single tape threading procedure.
- Ten characters per inch feeding.

HANDWHEEL

- Permits normal tape feeding.

TAPE CHUTE

TAPE DEPRESSOR

- Prevents excess slack in tape.

SELECTOR MAGNETS

RANGE FINDER

- Selects most favorable period for sampling character bits.

SELECTOR MECHANISM

- Receives and converts electrical code input to mechanical code output.

SELECTOR CLUTCH

(Right Side View)

PERFORATOR MECHANISM

- Produces fully perforated code holes and feed holes.
- Produces advanced feed holes — 0.013 inch ahead of code holes.
- Perforated code holes correspond to marking bits in the signal input. Nonperforated portions of the tape correspond to spacing bits in the original input.

TRANSFER MECHANISM

- Transfers data sensed by selector mechanism to perforator mechanism

TAPE FEEDOUT MECHANISM

- Causes a continuous length of delete character tape to feed out.
- Facilitates threading tape.

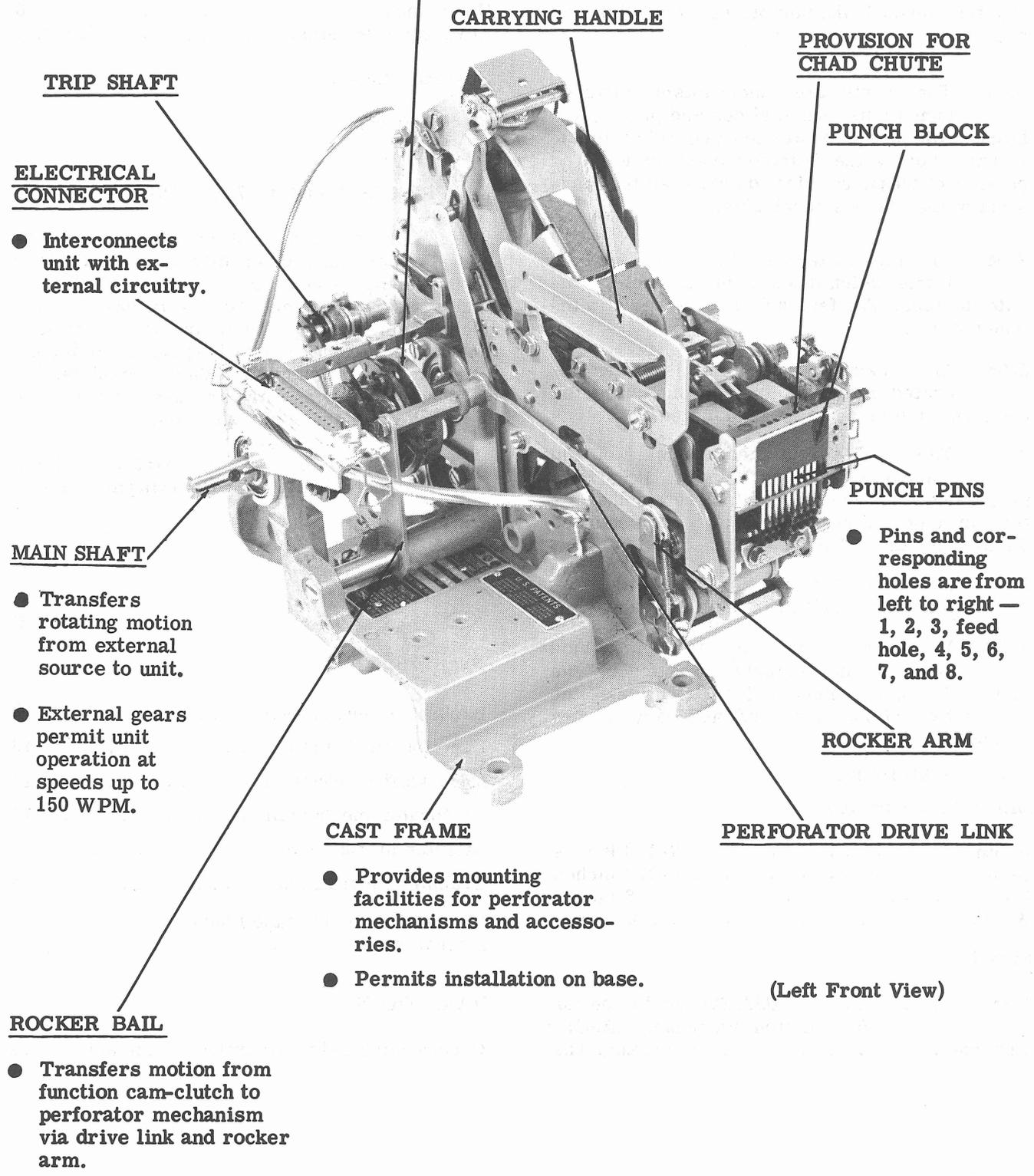
BACKSPACE MECHANISM

- Retracts tape one character each time mechanism is actuated.
- Permits eliminating errors in the tape by overpunching.
- Power operated.

Figure 2 - 37 Non-Typing Reperforator (Basic Unit)

FUNCTION CAM-CLUTCH

- Transfers timed motion to rocker bail.



TRIP SHAFT

ELECTRICAL CONNECTOR

- Interconnects unit with external circuitry.

MAIN SHAFT

- Transfers rotating motion from external source to unit.
- External gears permit unit operation at speeds up to 150 WPM.

ROCKER BAIL

- Transfers motion from function cam-clutch to perforator mechanism via drive link and rocker arm.

CARRYING HANDLE

PROVISION FOR CHAD CHUTE

PUNCH BLOCK

PUNCH PINS

- Pins and corresponding holes are from left to right — 1, 2, 3, feed hole, 4, 5, 6, 7, and 8.

ROCKER ARM

CAST FRAME

- Provides mounting facilities for perforator mechanisms and accessories.
- Permits installation on base.

PERFORATOR DRIVE LINK

(Left Front View)

Figure 3 - 37 Non-Typing Reperforator (Basic Unit)

**SECTION 574-329-100**

assembly, cam clutch, and rocker bail, transfers timed motion to the perforator mechanism. The function cam clutch is tripped by the selector mechanism. It drives the rocker bail which transmits power to the perforator mechanism through the perforator drive link and rocker arm.

2.03 The perforator mechanism includes punch pins, punch slides and punch slide latches which are positioned according to the signal input by the transfer mechanism. The position of the punch slides determines the operation of the various punch pins.

2.04 The tape is fed by a feed wheel and die wheel which indents but does not perforate the tape. The feed hole is perforated in the punch block.

2.05 The backspace mechanism is power operated and retracts tape one character each time the mechanism is actuated.

2.06 The tape feedout mechanism is of the manual interfering variety. It permits preparing a continuous length of delete characters in tape. Signal inputs are not recorded during operation of this feature.

2.07 Features of the reperforator are illustrated and described in Figures 2 and 3.

2.08 Variations of the reperforator include code reading contacts, operated by the punch slides, for electrical distribution of the perforated information, and auxiliary timing contacts.

**TECHNICAL DATA**

Dimensions (approximate)

Width . . . . . 7-1/2 inches  
 Depth . . . . . 6-1/2 inches  
 Height . . . . . 6 inches  
 Weight . . . . . 5-1/2 pounds

Signal

Code . . . . . USA Standard Code for Information Interchange (ASCII)  
 Current . . . . . 0.500 amperes

Tape

Type . . . . . Standard communications  
 Width . . . . . 1 inch  
 Perforations . . . . . 8-level, fully perforated  
 Holes/inch . . . . . 10  
 Advanced feed hole . . . . . 0.013 inch

Operating Speed

Up to 150 wpm

**3. PRINCIPLES OF OPERATION**

3.01 The principles of operation are presented in a block diagram, explanatory text covering the general operation of basic unit, and in a series of mechanism drawings. In each mechanism drawing, the illustrations are supported with text describing the purpose and operation of the mechanism. Where possible, the mechanism drawings are arranged in the order in which the mechanism operates.

3.02 The contents of this part are listed alphabetically in the following mechanism index.

**MECHANISM INDEX**

ITEM	PAGE
<b>BASIC UNIT</b>	
Backspace mechanism . . . . .	19
Function mechanism . . . . .	15
Main shaft mechanism . . . . .	13
Perforator mechanism . . . . .	17
Selector mechanism . . . . .	7
Transfer mechanism . . . . .	14
Manual interfering tape feedout mechanism . . . . .	20

**VARIATIONS**

Code reading and auxiliary timing contacts .	21
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BASIC UNIT

3.03 Unit Operation

GENERAL OUTLINE OF OPERATION

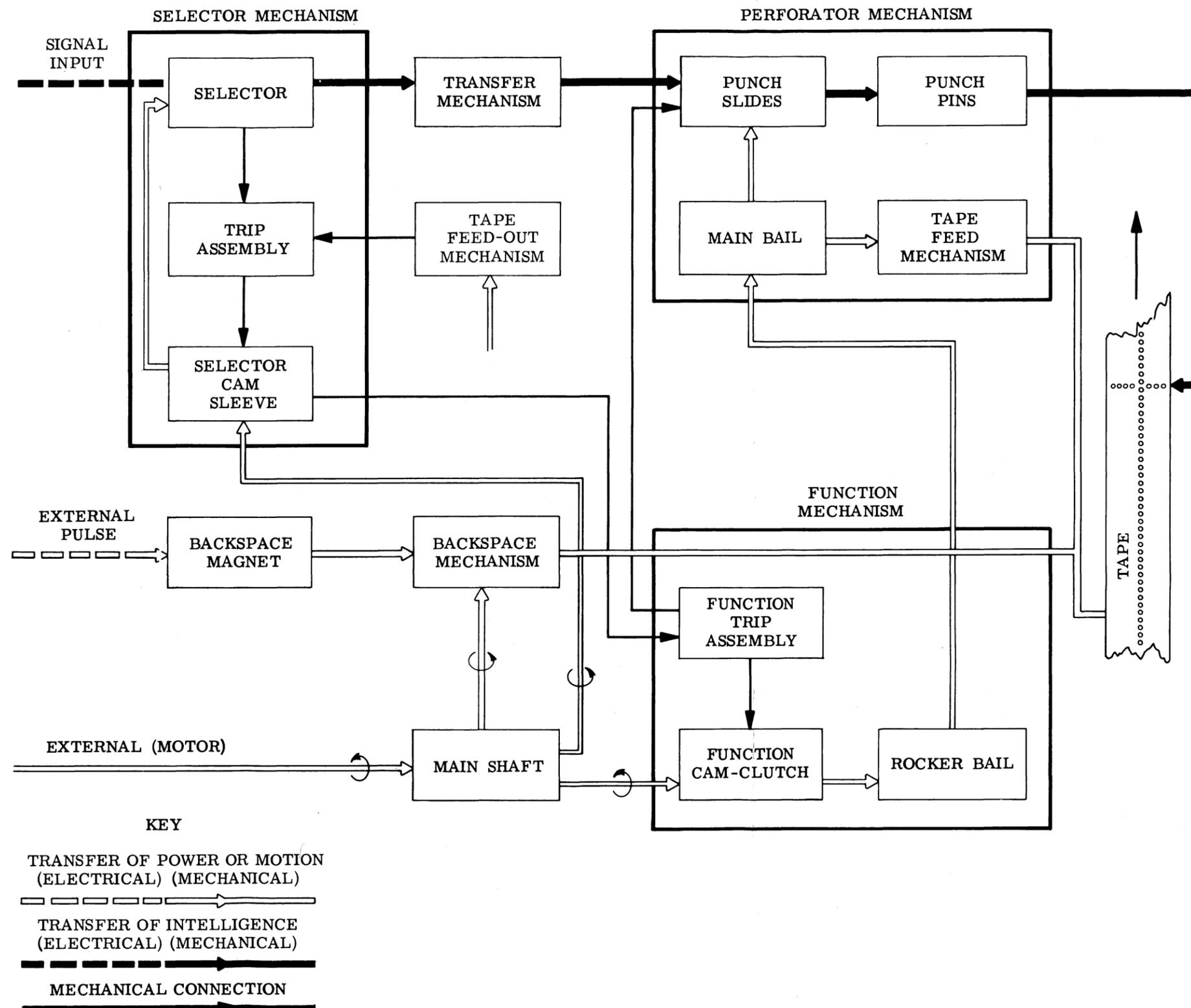
Rotary motion from an external source is applied to main shaft which turns constantly as long as unit is under power.

The serial signal code input is applied electrically to selector mechanism. The start pulse of each code combination causes selector, through a trip assembly, to trip selector cam sleeve. The main shaft then imparts motion to cam sleeve throughout selecting cycle. The selector cam sleeve, in turn, transfers timed motion to selector, which converts the intelligence bits of the code combination into a corresponding mechanical arrangement. Near end of selecting cycle, cam sleeve actuates function trip assembly which trips function cam-clutch and releases punch slides of perforating mechanism so they can receive the code arrangement from selector via transfer mechanism. The selector cam sleeve is then disengaged and remains inoperative until the next code combination is received.

The function cam-clutch, driven by main shaft, imparts motion to rocker bail throughout function cycle. The rocker bail transfers motion to perforator main bail which, in turn, distributes it to punch slides and tape feed mechanism. The punch slides, having received the arrangement from selector mechanism, cause punch pins to perforate code holes in tape corresponding to code pulses received by selector mechanism. Late in function cycle, the tape feed mechanism advances tape one character space. The function cam-clutch is then disengaged and remains stationary until again tripped by selector cam sleeve. The operations of reperfocator may overlap if code combinations are being received fast enough. For example, while perforating mechanism is punching code combination and advancing tape, selector mechanism may be processing the next code combination.

Pulsing backspace magnet actuates backspace mechanism which retracts tape through punch block.

Manually operating tape feedout lever causes reperfocator to run open and to feed out a continuous length of delete character tape.



## 3.04 Selector Mechanism

START-STOP

## Purpose

Engage-disengage selector cam sleeve with main shaft. Responds to start and stop bits of 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.

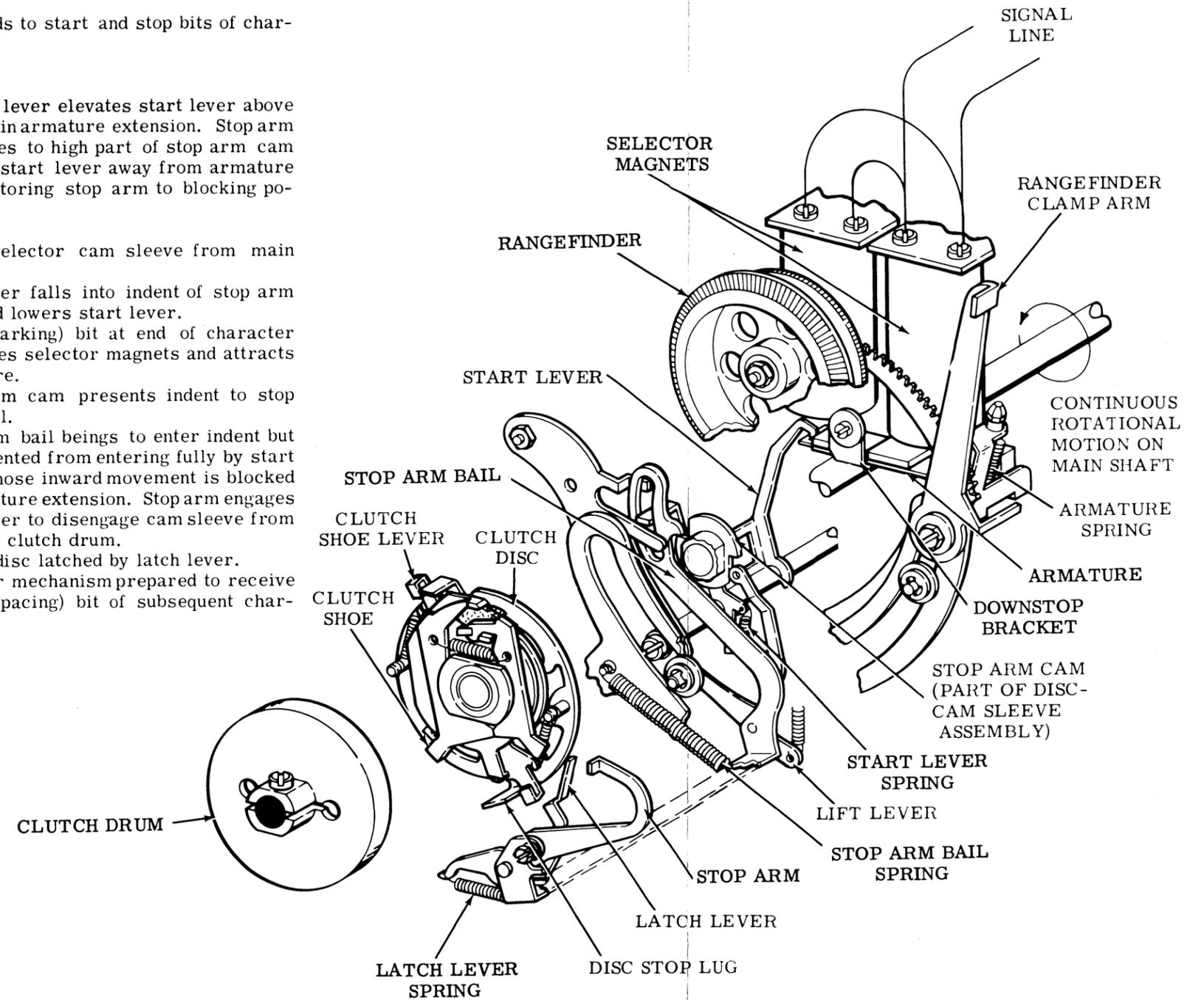
Raise, reset, and lower start lever. Block clutch shoe lever.

- (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 (3.06).
- (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 and restoring stop arm to blocking position.

Disengage selector cam sleeve from main shaft.

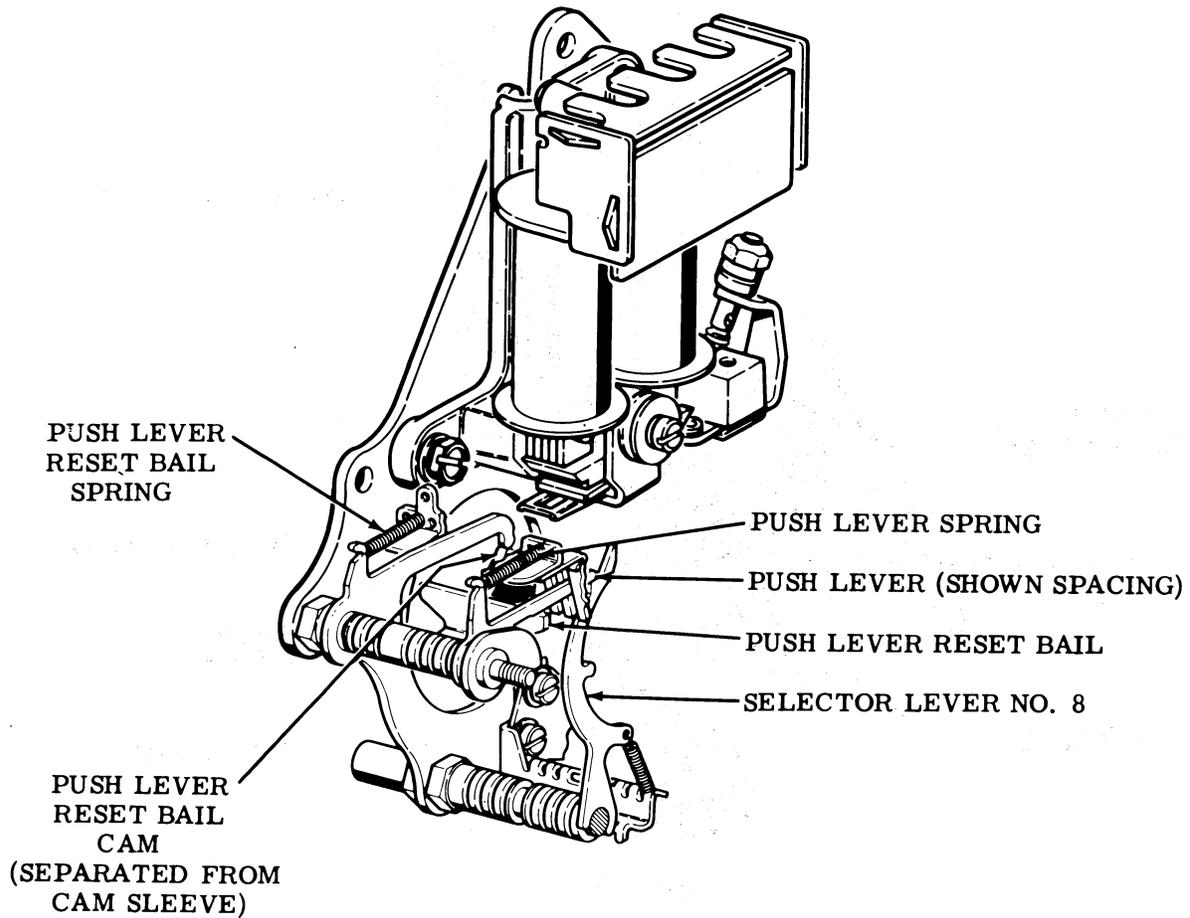
- (1) Lift lever falls into indent of stop arm cam and lowers start lever.
- (2) Stop (marking) bit at end of character energizes selector magnets and attracts armature.
- (3) Stop arm cam presents indent to stop arm bail.
- (4) Stop arm bail beings to enter indent but is prevented from entering fully 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 latch lever.
- (6) Selector mechanism prepared to receive start (spacing) bit of subsequent character.

RANGEFINDER

## Purpose

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 rangefinder scale adjustment.

## 3.05 Selector Mechanism (continued)

PUSH LEVER RESET**Purpose**

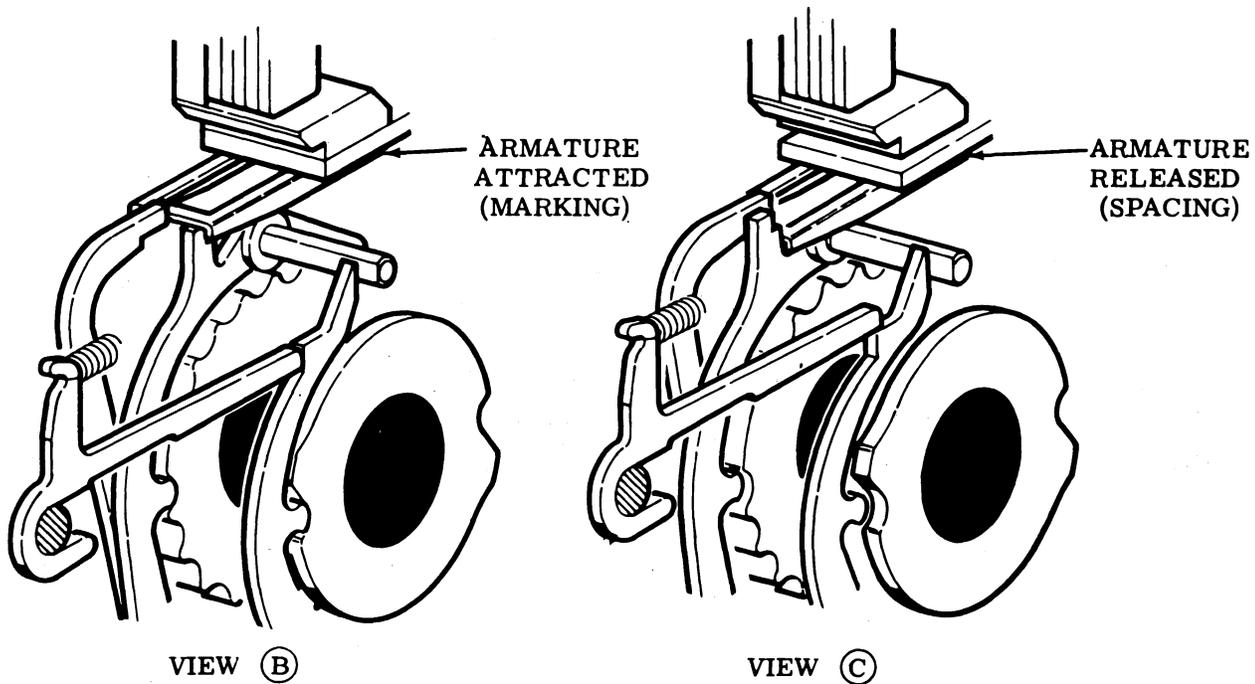
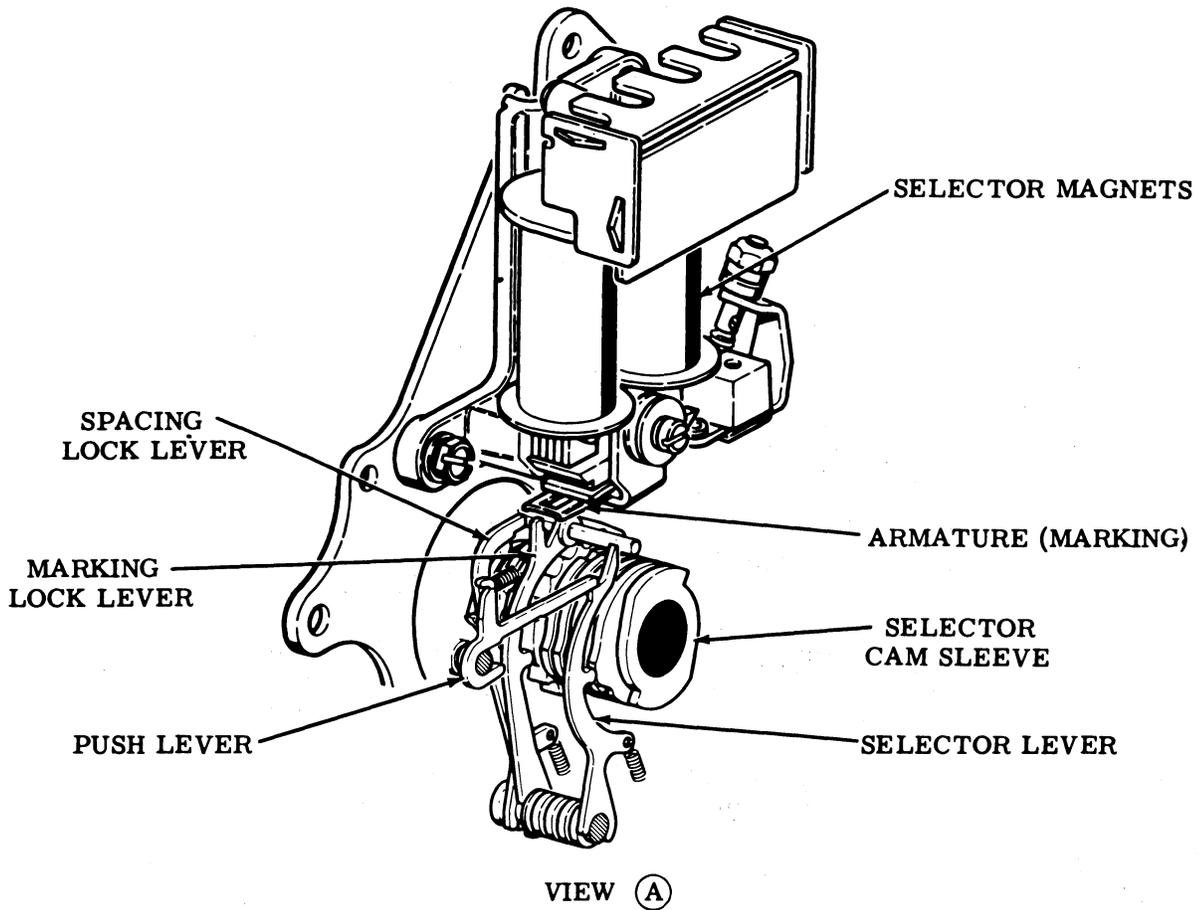
Strip previous character from push levers after start bit causes selector cam sleeve to engage main shaft.

**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 behind their selector

levers. Bail returns to unoperated position when lobe drops from high part of cam. All push levers, except auxiliary push lever (3.07) will then be in spacing condition.

3.06 Selector Mechanism (continued)



SELECTION

## Purpose

Sequentially position 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 lock lever, spacing lock lever, 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 lock lever is blocked by end of armature. Top of marking lock lever moves under armature, supporting armature in marking position until next signal transition is due.
- (2) During marking condition, selector levers are not blocked by armature extensions but are permitted to ride against their respective cams. Only that selec-

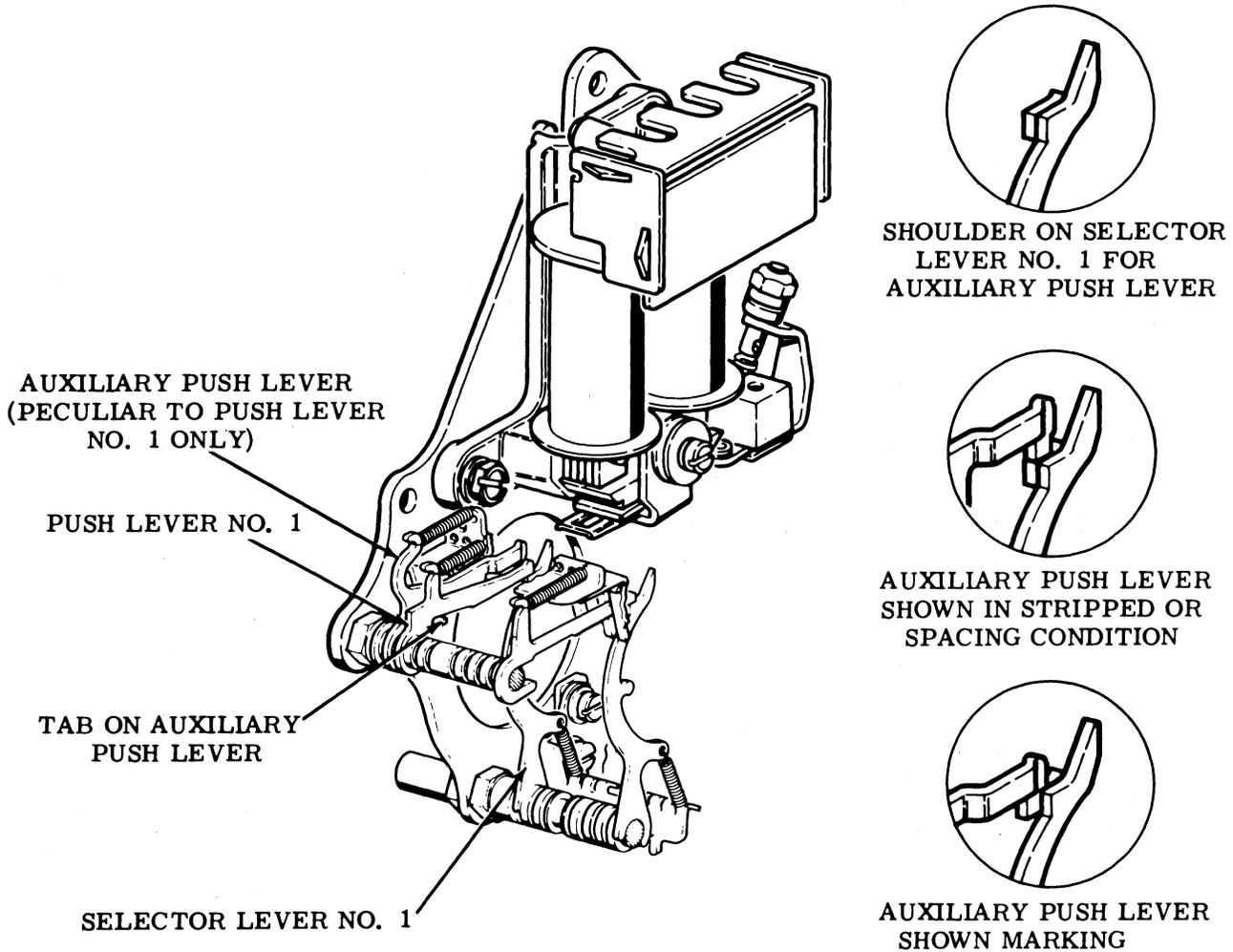
tor lever which is opposite the indent in its cam, can affect its push lever.

- (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 (C) - Spacing Condition

- (1) When spacing interval is received, the marking lock lever is blocked by end of armature. Spacing lock lever 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 behind selector lever but will remain on shelf.

3.07 Selector Mechanism (continued)



AUXILIARY PUSH LEVER

**Purpose**

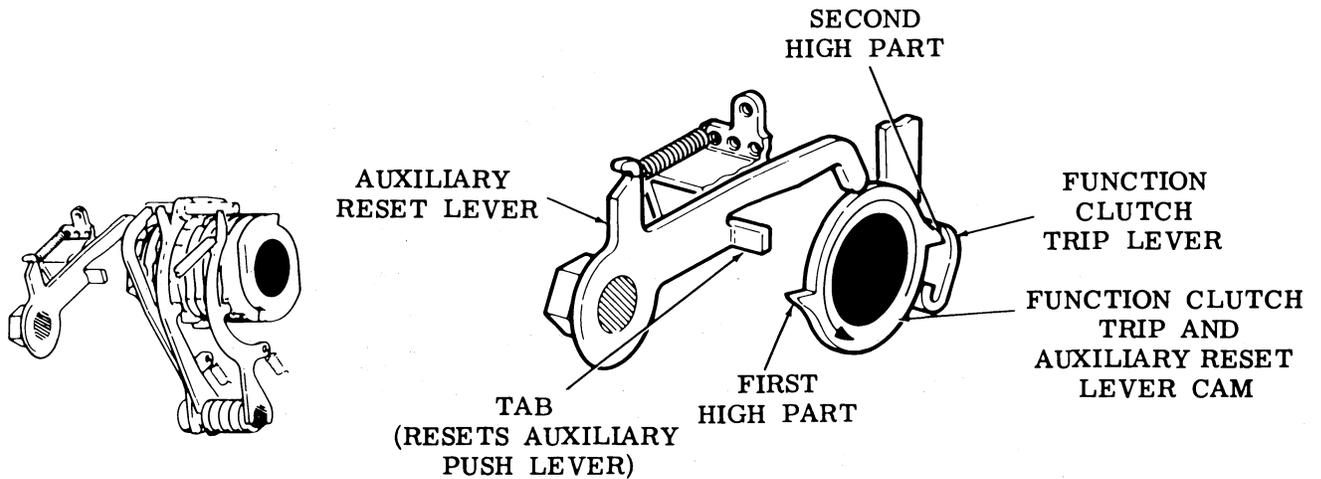
Senses marking or spacing position of selector lever number 1. Normal strip operation (push lever reset) occurs during reception of code bit number 1 and does not permit push lever number 1 to sense position of its selector lever.

**Operation**

Auxiliary push lever responds to marking impulse for push lever number 1. When bit number 1 is marking, auxiliary push lever drops behind shoulder of selector lever as push lever number 1 is stripped. Tab on auxiliary push lever carries push lever number 1 to marking position. When push

lever reset bail (3.05) returns to unoperated position, push lever number 1 is behind, but not touching, its selector lever. Approximately half way through selection cycle, auxiliary push lever is stripped by auxiliary reset lever (3.08). Push lever number 1 is then latched by selector lever number 1.

3.08 Selector and Main Shaft Mechanisms (continued)



TRIP AND RESET OTHER MECHANISMS

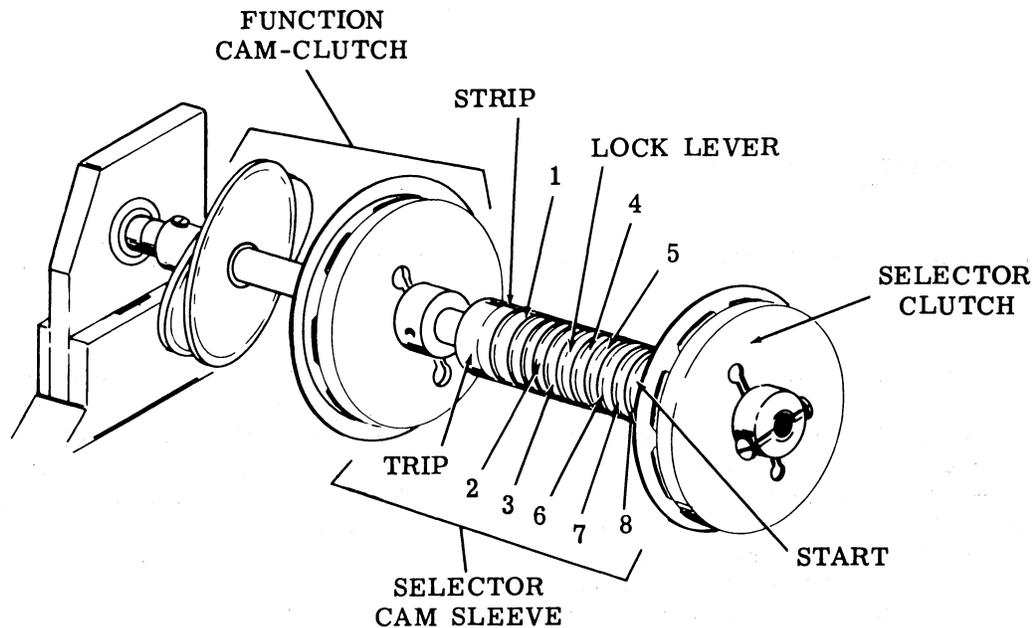
**Purpose**

Reset auxiliary push lever.

**Operation**

Consider that selector clutch is engaged and cam sleeve is rotating in direction illustrated. Approximately mid cycle the second high part of cam operates auxiliary reset lever. Tab

on auxiliary reset lever strips auxiliary push lever. About the same time, first high part of the cam operates the function cycle trip lever to initiate the function cycle (3.10).



MAIN SHAFT

**Purpose**

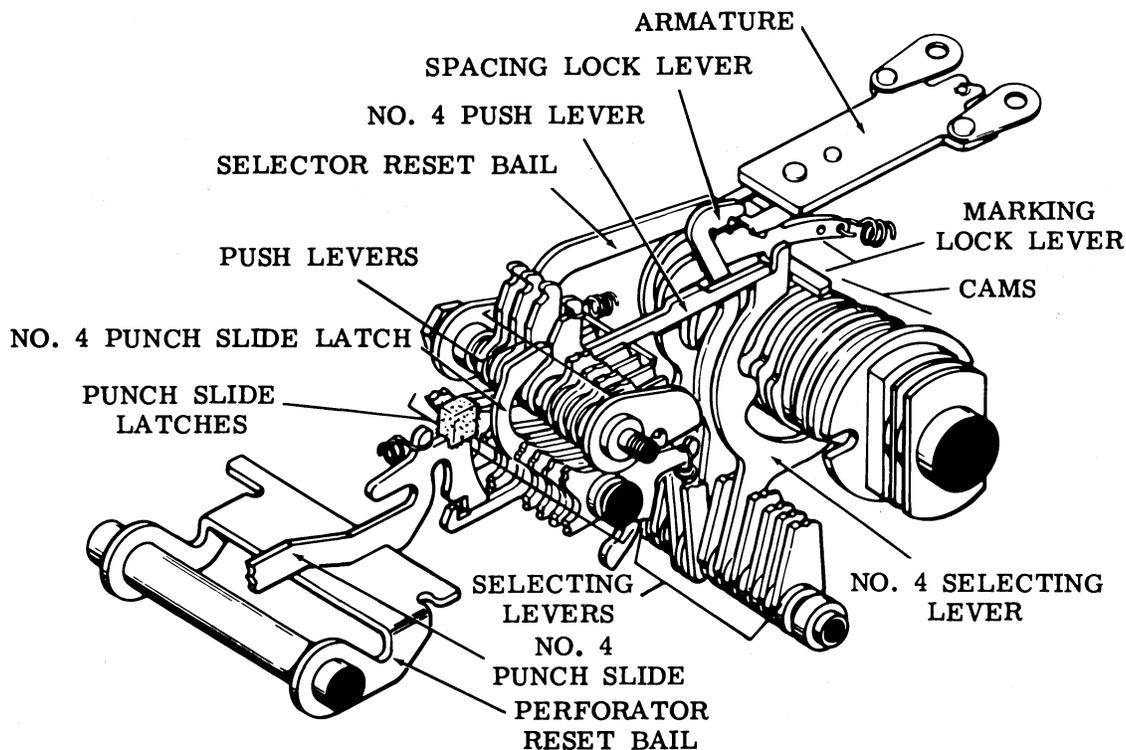
Transfer motor electro-mechanical rotating motion (power) and drive the reperforator mechanisms.

**Operation**

Rotary motion from an external source is received by the main shaft which rotates continuously as long as the unit is under

power. Selecting and function cam-clutches distribute this motion to the selector and function mechanisms.

## 3.09 Transfer Mechanism

TRANSFER OF SELECTED DATA**Purpose**

To provide a path for transferring the signal intelligence from the selector mechanism to the punch slides in the perforator mechanism.

**Operation**

Selected push levers, in moving to the left as determined by their respective cams, rotate associated punch slide latches counterclockwise. Just before the eighth push lever is selected, the selecting cam through the function trip assembly carries the perforator reset bail to release the punch slides. Unselected latches retain their associated slides to the right while the selected latches

permit their slides to move to the left under spring tension. During the latter part of the function cycle, the reset bail returns the punch slides to their unselected position. The latches return under spring tension to their unselected position when the push levers are repositioned at the start of the next selection cycle.

3.10 Function Mechanism

TRANSFER OF CONTROLLED MOTION FOR PERFORATION

**Purpose**

To convey timed and controlled motion to the perforator mechanism.

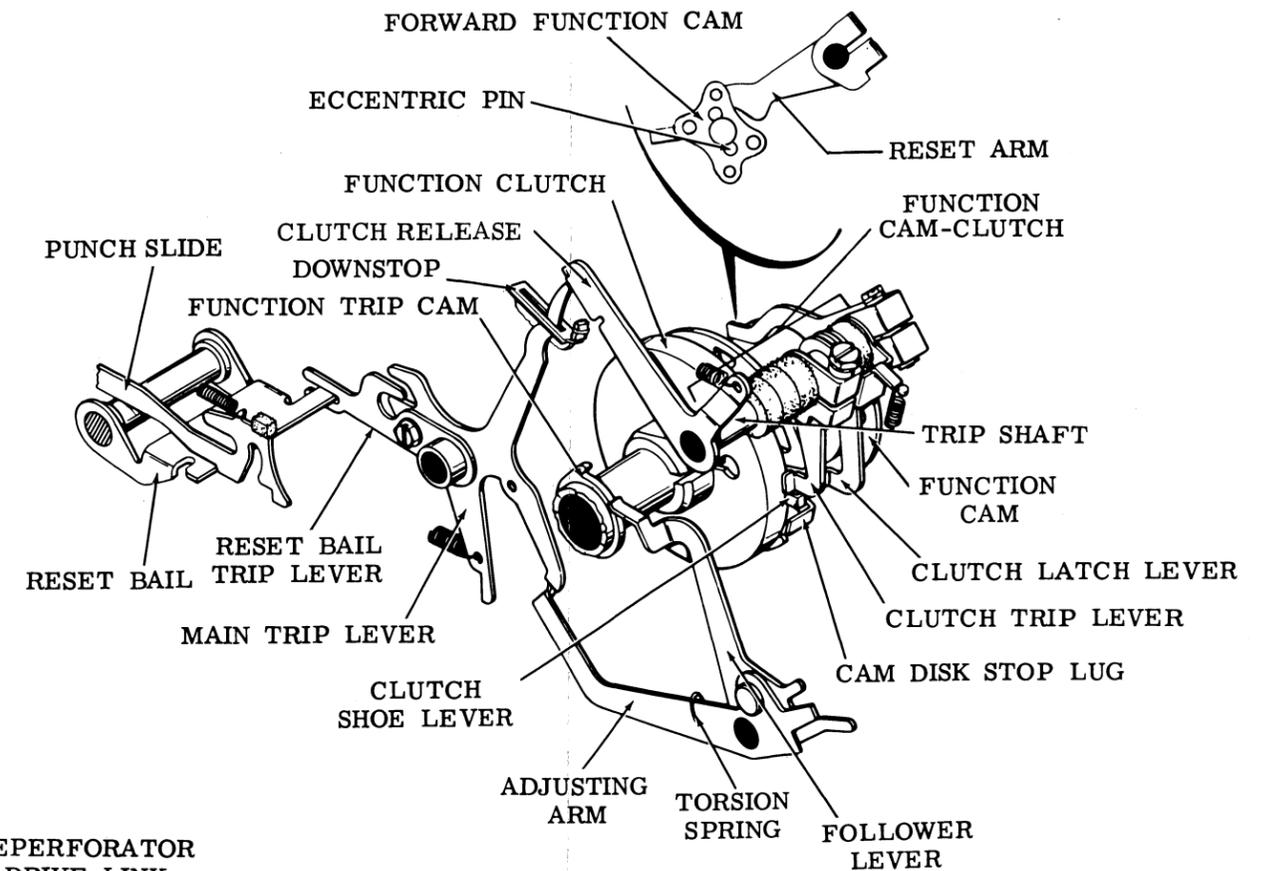
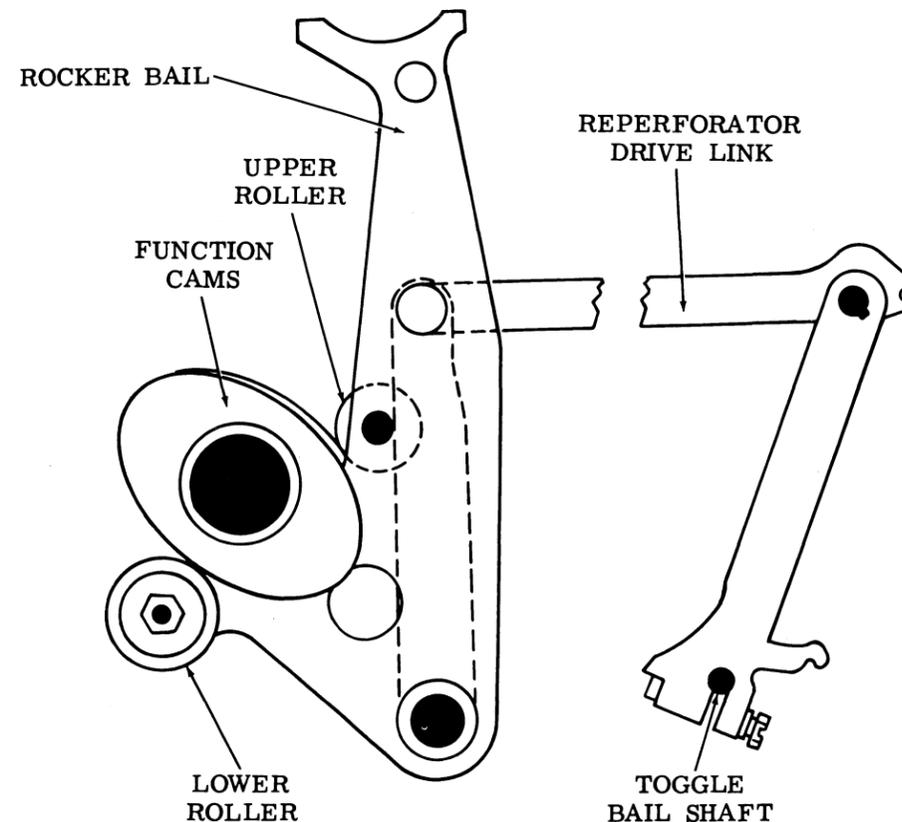
**Operation**

Main shaft motion is conveyed to the perforator mechanism by the function mechanism, comprised of the cam-clutch, rocker bail and a clutch trip assembly. A follower lever rides on the function clutch trip cam which is part of the selector cam sleeve (3.08). Near the end of the selecting cycle, as the main shaft rotates counterclockwise, the high part of the cam pivots the follower lever which, through an attached adjusting arm, rotates the main trip lever counterclockwise. The reset bail triplerver attached to the main trip lever lowers the perforator reset bail and releases the punch slides (3.11), and the upper arm of the main trip lever moves away from the clutch release, which falls against the down-stop and rotates the trip shaft counterclockwise. Immediately, the low part of the trip cam allows the follower lever to return to its unoperated position, and the upper arm of the main trip lever moves down against the release. When the trip shaft is rotated by the release, it moves an attached clutch trip lever out of engagement with the clutch shoe lever. The clutch engages, and the cam-clutch begins its cycle.

The function cam and the rocker bail translate the rotation of the shaft into simple harmonic motion which the rocker bail transfers to the perforator mechanism (3.11).

Each function cycle, the function cams bear against the upper and lower rollers and causes the rocker bail to rock to the left during the first part of the cycle and then back to its home position during the latter part of the cycle.

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



## 3.11 Perforator Mechanism

TAPE PERFORATIONPurpose

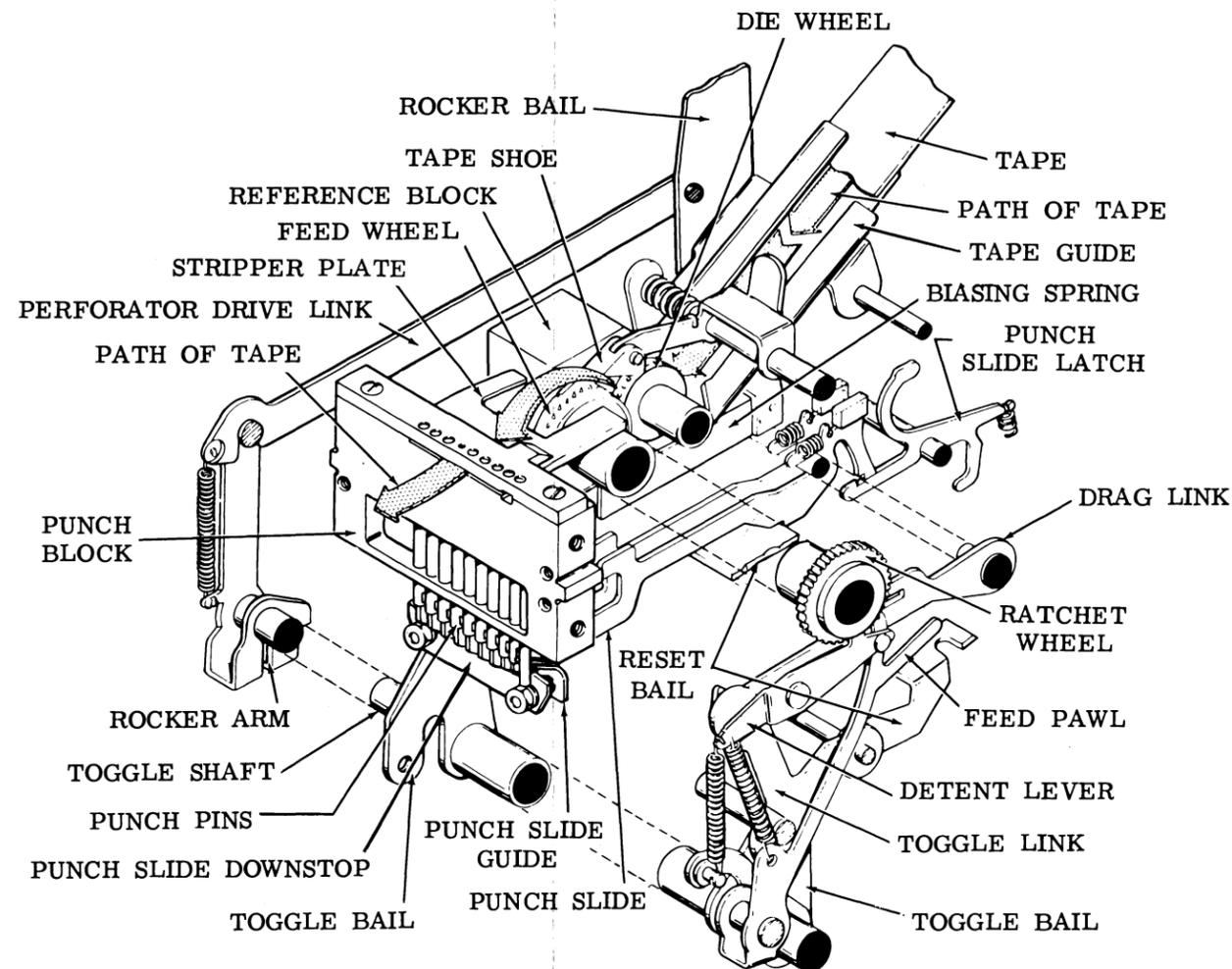
To translate the motion received from the function mechanism into feed holes and code holes in the tape.

Operation

The perforator mechanism rolls the tape between a feed wheel and a die wheel which does not perforate the feed hole but merely regulates the amount of tape feed. The punch perforates round holes corresponding to the code combinations received from the signal line and perforates a smaller feed hole positioned between the third and fourth intelligence levels. Intelligence is received from the transfer mechanism by the punch slides, which select the proper punch pins in the punch block assembly. Motion from the rocker bail is distributed to the pins and the tape feed parts by the main bail assembly, which includes the toggle bail, toggle shaft, slide post, toggle links, drag links and the punch slide reset bail. Near the end of the selecting cycle (3.10) the reset bail is lowered and releases the eight punch slides. 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. Dur-

ing the first part of the function cycle, the rocker bail moves to the left and, by means of a drive link and rocker arm, rotates the toggle shaft and bail counterclockwise. Toggle links attached to the front and rear of the bail lift the slide post and move the reset bail to the left. The selected slides are carried upward by the post and force the associated pins through the tape. The slides thus become an integral part of the main bail assembly during the perforating stroke. Approximately midway through the function cycle, the function trip assembly lifts the reset bail.

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

TAPE FEEDINGPurpose

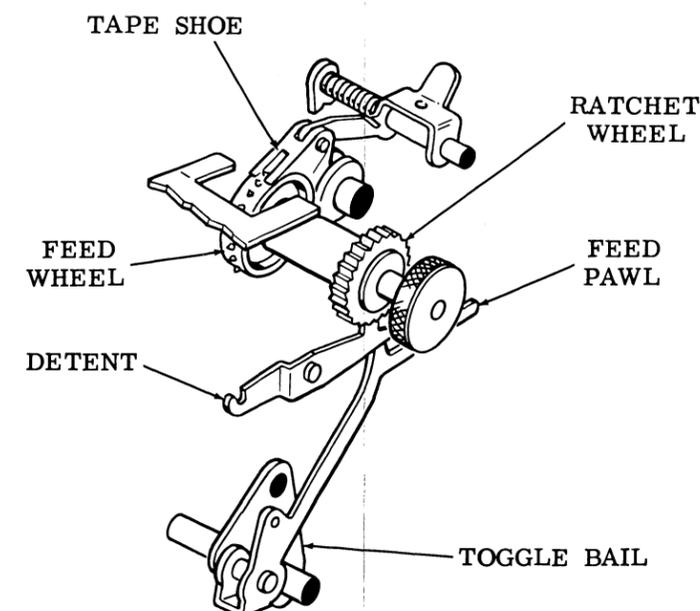
To provide regulated feeding of tape for perforation.

Operation

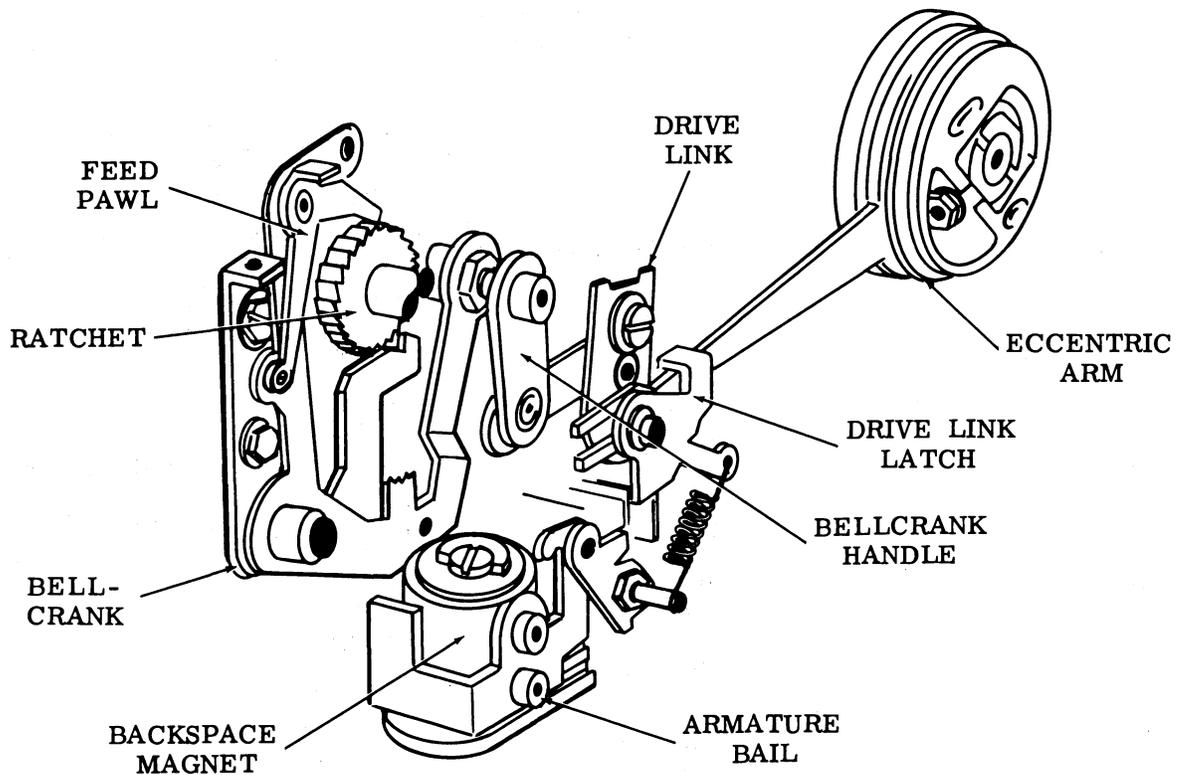
Tape feeding occurs after perforation during the last half of each function cycle. Tape is threaded down through the tape guide and then up between the feed wheel and die wheel. The feed pawl, driven by the toggle bail, acts upon a ratchet and rotates the feed wheel which, by means of sharp pins and a slot in the die wheel, advances the tape one character at a time. A detent with a roller that rides on the ratchet holds the feed wheel and tape in position during perforation. The detent and feed pawl springs are so positioned that the pressure of the detent on the ratchet is high

during the first half of the perforation, but is low during idling and the last half of the cycle to facilitate tape threading and feeding.

A tape shoe retains the tape on the feed wheel, and a biasing spring holds it back against a reference block so that the feed holes are punched a constant distance from the edge. The tape is stripped from the feed wheel by a stripper plate, passes into the punch block where it is perforated, and finally emerges through a slot in the punch block.



## 3.12 Backspace Mechanism

POWER DRIVE BACKSPACING**Purpose**

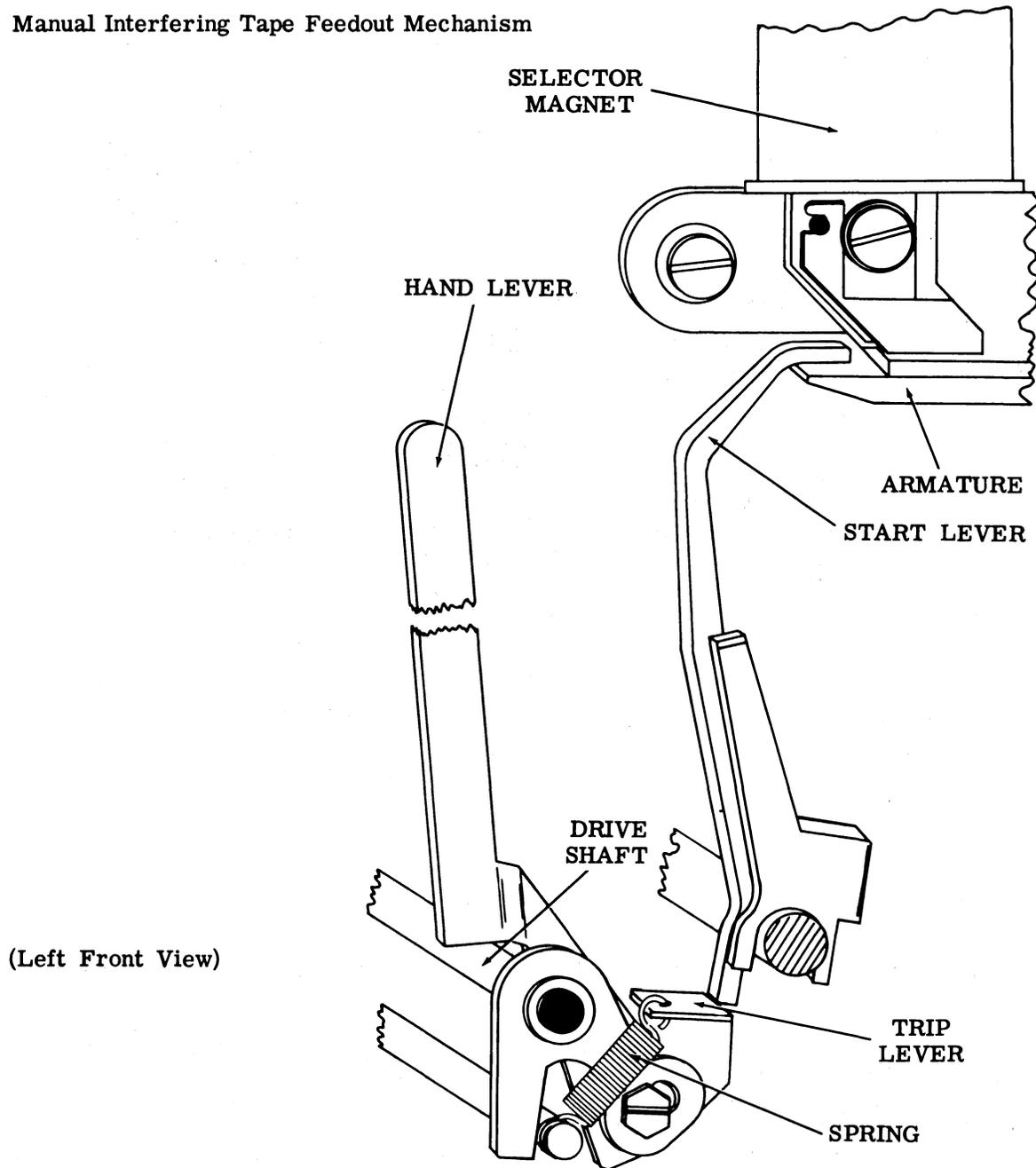
To retract the tape in the punch block so that errors in the tape can be deleted by overpunching.

**Operation**

The application of an external pulse (initiated by a backspace key on an associated keyboard unit) retracts the perforated tape one code space with each pulse. When the backspace magnet is energized, the armature bail is pulled downward. An extension on the bail disengages a drive link latch, which drops, engaging a notch on the eccentric arm. As the main shaft moves the eccentric arm to

the left, the bellcrank is depressed, contacting the perforator feed pawl and disengaging it. The backspace feed pawl engages the feed wheel ratchet and rotates the feed mechanism counterclockwise. When the magnet is de-energized, the drive link is disengaged from the eccentric arm, which slides freely along the pivot post of the drive link.

3.13 Manual Interfering Tape Feedout Mechanism



(Left Front View)

MANUAL INTERFERING TAPE FEEDOUT

**Purpose**

To provide means for manually producing delete characters in the tape.

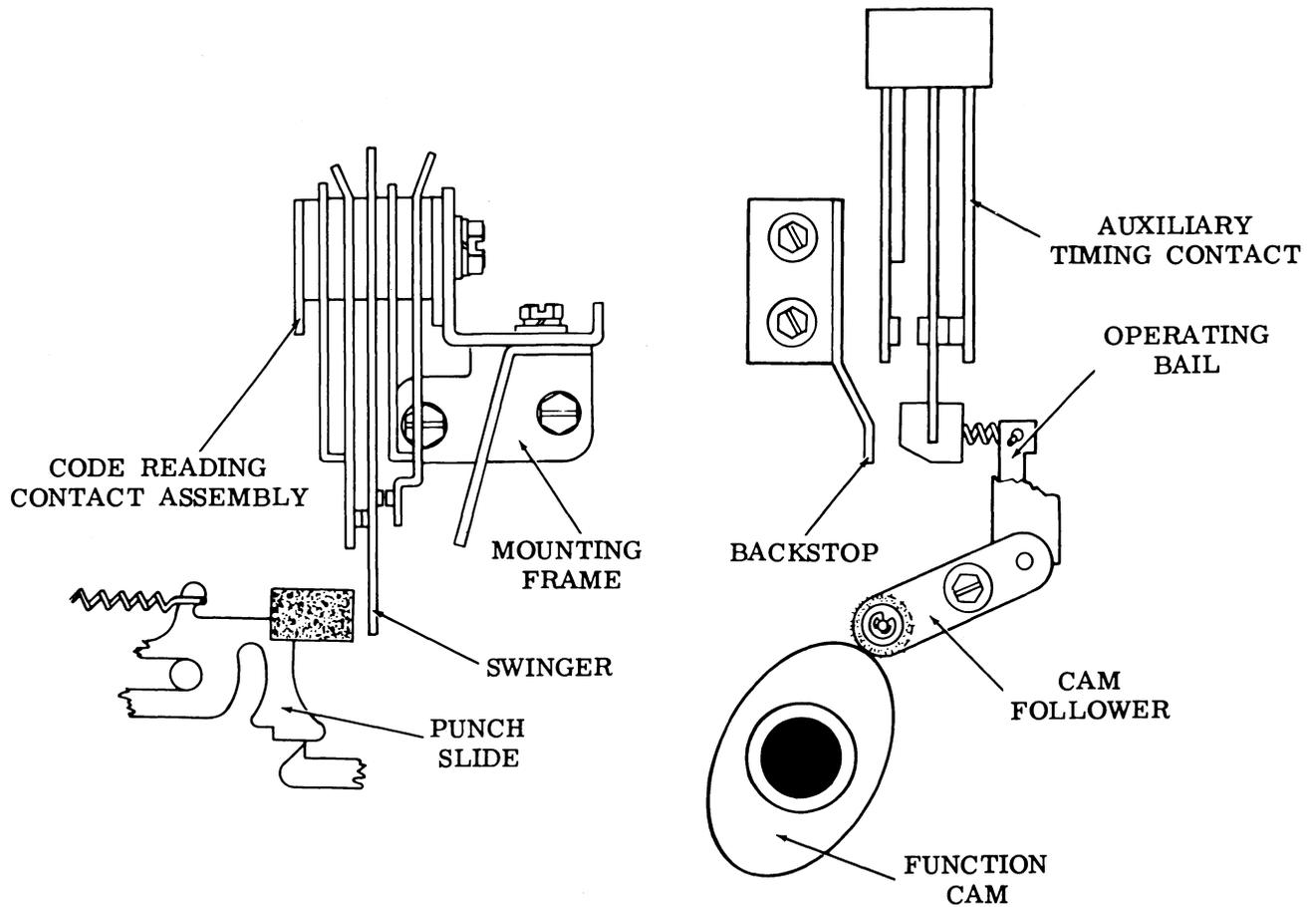
**Operation**

When the hand lever is operated, the manual interfering tape feedout mechanism causes the reperfocator to run open and generate delete characters and, therefore, signal inputs received during this time are not reproduced in the tape (operation interferes

with signal input). The projection on the hand lever engages the lower projection on the selector start lever tripping the selector clutch. This causes the reperfocator to run open and perforate delete characters in the tape until the hand lever is released.

## VARIATIONS

## 3.14 Code Reading and Auxiliary Timing Contacts

CODE READING AND TIMINGPurpose

Code reading contacts provide an electrical output corresponding to the information perforated. The auxiliary timing contact provides an electrical output for control of external equipment.

Operation

The code reading contacts are arranged in a bank of eight break-before make transfer type contacts operated by the corresponding punch slides. The electrical circuit for the code reading contacts is completed externally. When the reperforator is idling, the spacing position of the code reading contacts is held closed by the punch slides and the marking position held open. When the selected punch slides move into their selected position (toward the punch block) near the end of the selection cycle, the punch slides permit the contact positions to reverse. Code reading contacts associated with unselected punch slides remain in the spacing condition. In this way an electrical output is produced corresponding to the perforated information. The auxiliary timing contact is composed of a break-before-make transfer contact operated by a spring-operated bail in one direc-

tion and a function cam in the other direction. When the reperforator is idling, the contact closest to the mounting bracket is closed, the contact swinger is away from the backstop, and the cam follower is resting on the high part of the function cam. As the function cam rotates, the rear contact operating bail engages its swinger and operates the contact. The contact operating bail engages its swinger insulator and operates its associated contact. The swinger insulator comes to rest against its backstop and the cam follower leaves the cam.

During the second half of the function cycle, the function cam engages the cam follower and restores the contact to its idle position. These operations of the auxiliary timing contact produce electrical outputs relative to reperforator timing.