

32 AND 33 TAPE PUNCH  
PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section is issued to provide principles of operation for the 32 and 33 tape punch and to present the principles as a separate section.

1.02 The tape punch's basic function is to convert start-stop electrical signals into a form that can be stored. It accomplishes this function by punching holes into tape according to a teletypewriter code. The teletypewriter code is described in the appropriate typing unit section. This tape punch section outlines in general terms the overall operation of the tape punch and explains in detail the operation of the components that make it up.

1.03 References to "left," "right," "front," or "rear," etc, consider the tape punch to be viewed from a position where the tape guide assembly faces up and the backspace lever is to the viewer's left.

1.04 In the illustrations, fixed pivots are solid black and floating points—those mounted on parts that move—are cross hatched.

2. BASIC UNIT OPERATION

GENERAL

2.01 The tape punch attaches to the left side of the typing unit base casting. The individual mechanisms and subassemblies that form the tape punch mount on the tape punch base casting, which serves as the main structural member.

2.02 Rotation of the typing unit's function rocker shaft provides a pre-determined controlled motion for the drive mechanism (Figure 1). The drive mechanism oscillates about a post mounted to the tape punch base casting and receives its motion from the typing unit's function rocker shaft through the drive link mechanism (Figure 1). This motion is transferred to the nudger, tape feed mechanism, and into the punch mechanism to perform the tape feed functions.

2.03 The individual members that compose the drive mechanism perform the following functions.

- (a) Drive Post: The drive link imparts motion to the drive mechanism through the drive post.
- (b) Nudger Arm: There is a cam profile perforated in the nudger arm which transfers motion to the nudger.
- (c) Feed Pawl Arm: The feed pawl derives its motion from the feed pawl arm.
- (d) Stripper Bail: The stripper bail pivots from a post that is supported by the nudger and feed pawl arms.
- (e) Sensing Lever Bail: Motion is transferred to the sensing levers through a post supported by the nudger and feed pawl arms.

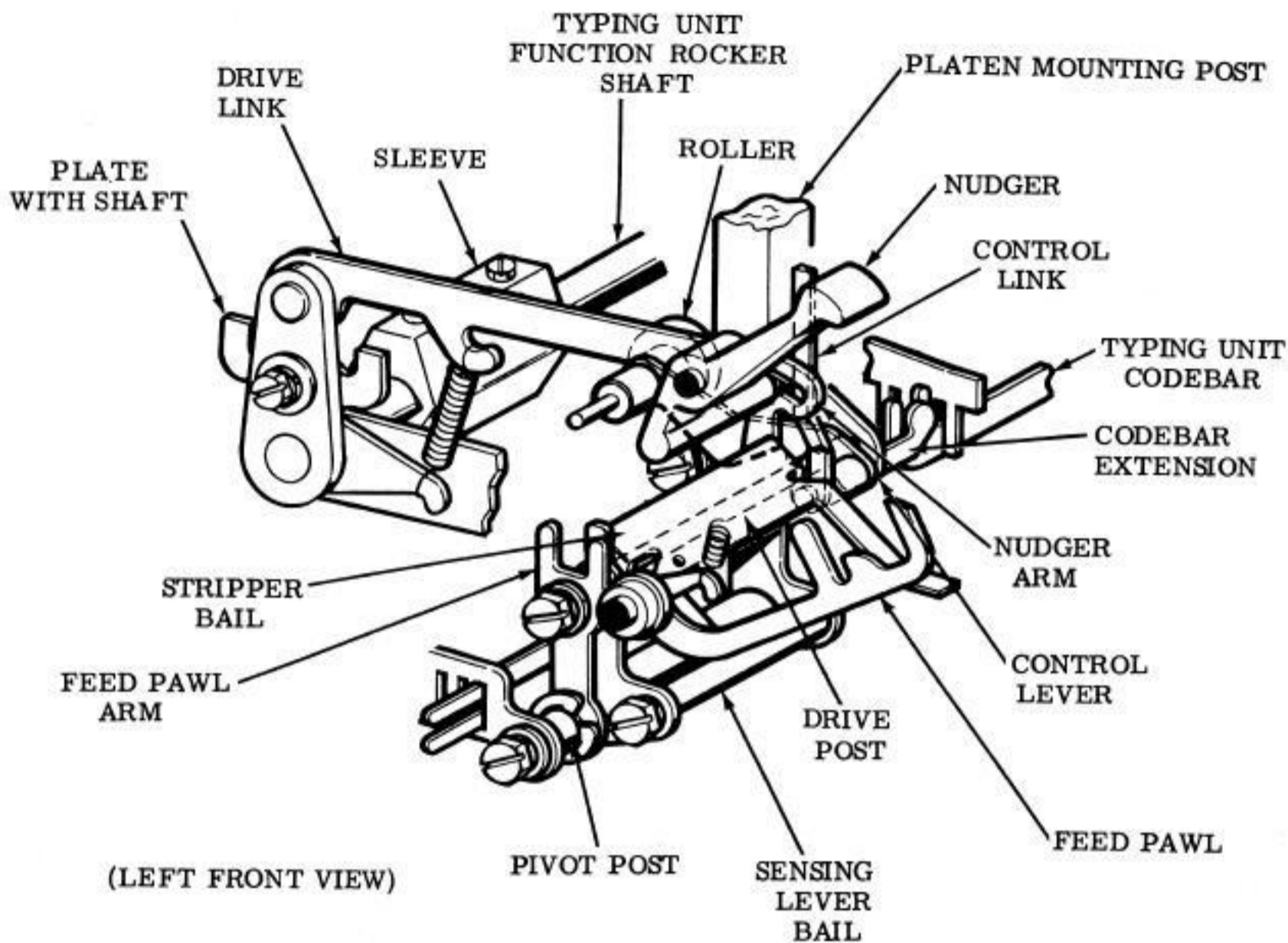


Figure 1 — Drive Link Mechanism and Drive Mechanism

2.04 There is a codebar extension (Figure 2) for each typing unit codebar. Motion is imparted to the codebar extensions by the codebars through the typing unit's codebar reset bail. A bracket and a plate mounted to the tape punch base casting provide the support and the guiding for the codebar extensions.

- (a) The tape punch receives its intelligence from the typing unit's selector.
- (b) The typing unit selector's blocking levers control the mark or space position of the codebars which, in turn, transfer this position to the codebar extensions. A blocked codebar represents a space and an unblocked codebar represents a mark.

(c) Each codebar extension contains a tab located on its underside which is oriented to line up with its respective sensing lever, pawl, lever, and code-punch pin combination.

2.05 The tape feed and tape perforation sequence of operation is as follows:

- (a) The tape punch basically has the same timing as the typing unit's function mechanism.
- (b) The typing unit selector trips the typing unit codebar clutch at the end of its cycle. The character combination stored

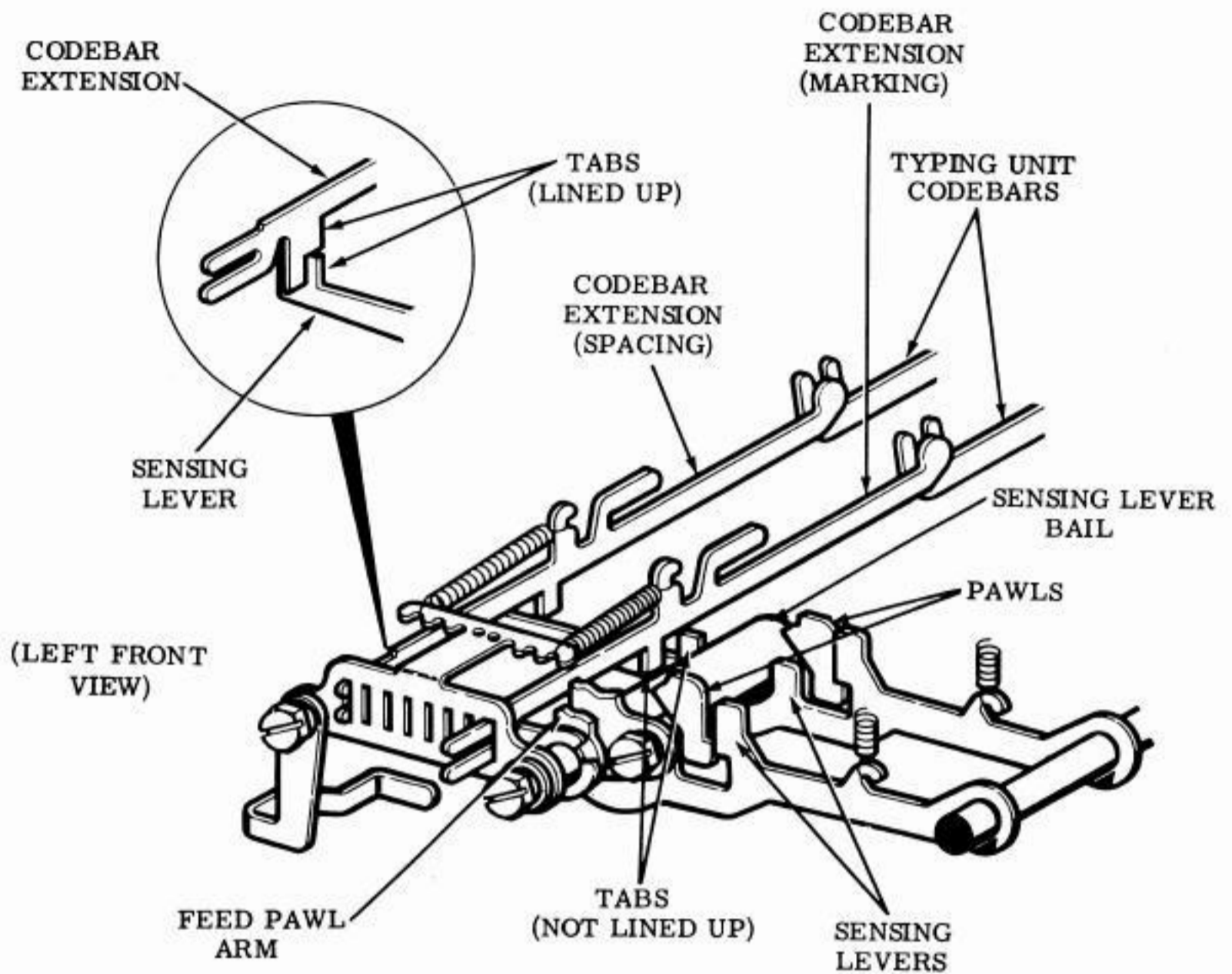


Figure 2 - Intelligence - Transfer Mechanism

in the typing unit selector's blocking levers is transferred to the codebar extensions as explained above.

(c) The typing unit function clutch is tripped when the codebar reset bail reaches its most counterclockwise position.

(d) As the drive mechanism rotates counterclockwise from its stop position, the feed pawl (Figure 3) engages a tooth on the feed wheel ratchet. When the drive mechanism reaches its most counterclockwise position, the feed wheel ratchet has been indexed one full tooth space, and the tape has advanced 0.100 inches by the feed wheel.

(e) There is a sensing lever, pawl, lever, and code-punch pin combination for each code level (Figure 4).

(f) The feed-punch pin has its own sensing lever, pawl, and lever.

(g) During the drive mechanism's counterclockwise travel, each sensing lever is permitted to pivot clockwise and sense the codebar extensions. Each sensing lever, except the feed lever, contains a tab (Figure 2) on its top side, which lines up with its respective codebar extension.

(h) When a codebar extension is spacing, the tab located on its underside lines up with the tab on the sensing lever. The



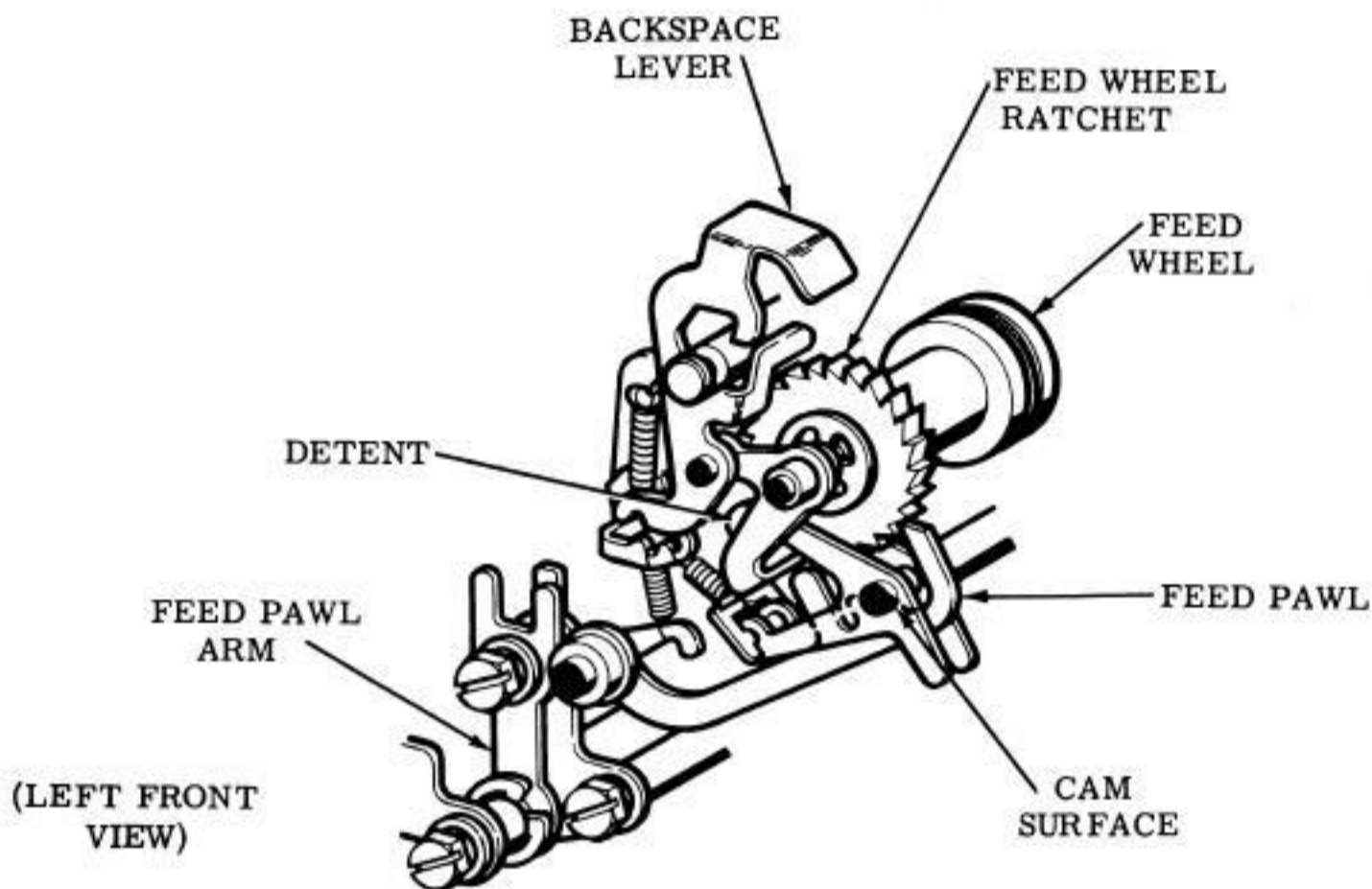


Figure 3 — Feed Wheel Mechanism (Tape Feed Mechanism)

tabs engage each other, and the sensing lever is blocked from pivoting to its most counterclockwise position.

(i) When a codebar extension is in the mark position, its tab is not in line with the sensing lever tab. As a result, the sensing lever pivots to its most clockwise position.

(j) The feed sensing lever always travels to its most clockwise position, since it has no tabs. This motion is presented to the pawl, lever and feed-punch pin combination through a latching surface (Figure 4) located on the pawl.

(k) When the tape punch is in the OFF position each pawl is in its highest vertical position, each lever is in its most clockwise position, and each code-punch pin is in its most downward position—below the surface of the tape.

(l) When a sensing lever is in the spacing position (Figure 4), its latching surface is prevented from engaging with its associated pawl's latching surface. As a result the pawl is not selected.

(m) When a sensing lever is in the marking position, its latching surface engages the latching surface on its associated pawl. When the two latching surfaces engage, the pawl is in the selected position.

(n) As the drive mechanism (Figure 1) rotates clockwise, the feed pawl slides along the inclined surface of the adjacent ratchet tooth, drops behind it, and is cammed away from the feed wheel ratchet (Figure 3). Occurring simultaneously, the sensing levers in the marking position (Figure 4) rotate counterclockwise and transfer their motion to the selected pawl, lever and code-punch pin combination. Also occurring simultaneously, the drive mechanism transfers its motion to the sensing levers which are spacing. Since their pawl, lever and code-punch pin combinations are in the non-selected position, no motion is transferred to them. This results in no perforation of the tape, since the code-punch pins remain in their most downward position below the tape's surface. As the drive mechanism continues and reaches its most clockwise

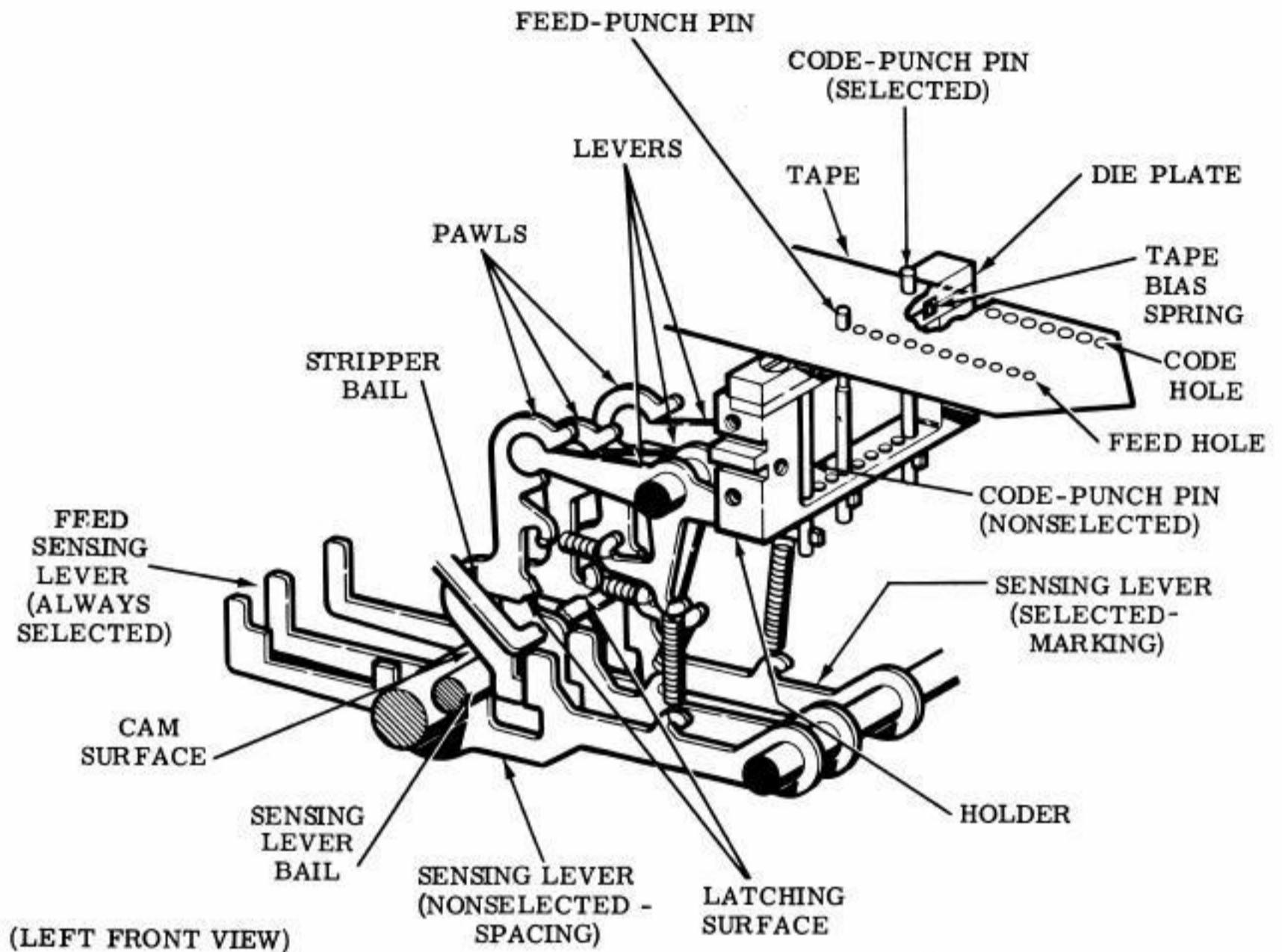


Figure 4 - Tape Punch Mechanism

position, the code-punch pin of a selected pawl, lever, and code-punch pin combination travels upwards, perforates a hole in the tape, and continues to its most vertical position. The feed hole is always perforated in the tape since its pawl and lever are always selected. Just prior to the end of the drive mechanism's most clockwise travel, the stripper bail (Figure 4), through its bias spring, engages a latching surface located under the spring hook(s) of selected pawl(s).

(o) During the drive mechanism's clockwise motion, the nudger (Figure 5) performs its function. Motion is transferred from a cam profile located on the nudger arm through a post molded as an

integral part of the nudger. The nudger rotates counterclockwise, engages, and nudges the tape gently when the selected code-punch pins are engaged with the tape. This enables the tape roll to be indexed a small amount without affecting tape feed spacing, since only the weight of the paper between the tape roll is reflected to the feed wheel when the tape is being advanced.

(p) As the drive mechanism rotates counterclockwise to its stop position, the stripper bail strips the selected pawls (Figure 5) from their sensing levers. The selected pawl, lever, and code-punch pin combinations return to their stop positions through their bias springs and the retractor

mechanism. The sensing lever bail of the drive mechanism also acts as a part of the retractor mechanism. As the stripper bail strips the pawls, a cam surface on the pawl which acts as the other member of the retractor mechanism engages the sensing lever bail post and cams the pawl upwards to the stop position. During this portion of the drive mechanism's travel, the codebar extensions are reset by the codebar reset bail (Figure 2).

2.06 The tape guide assembly (Figure 5) consists of a bracket, two rollers, three posts, a wheel, and a compression spring held together by retainers. A tension spring biases the tape guide assembly in the clockwise direction. The knurled roller settles against the knurled feed wheel with a predetermined

force. It is the combination of force and the knurled wheels that provide adequate tape spacing. The tape guide assembly is shaped in the form of a funnel to provide easy tape threading. A pushbutton (Figure 6) located in the cover lid, when pushed down against a tab located on the REL. bracket, disengages the tape guide assembly from the feed wheel, thereby providing easy tape removal from the tape punch.

2.07 The punch block assembly consists of code-punch pins, a feed-punch pin, a holder, a die plate, and a tape bias spring (Figure 4). The code-punch pin and feed-punch pin are oriented to the die plate through slots which engage levers for their respective code level. The tape bias spring always biases the tape against one edge of the holder. This results in the code hole and feed hole relation to the tape edge to be held constant.

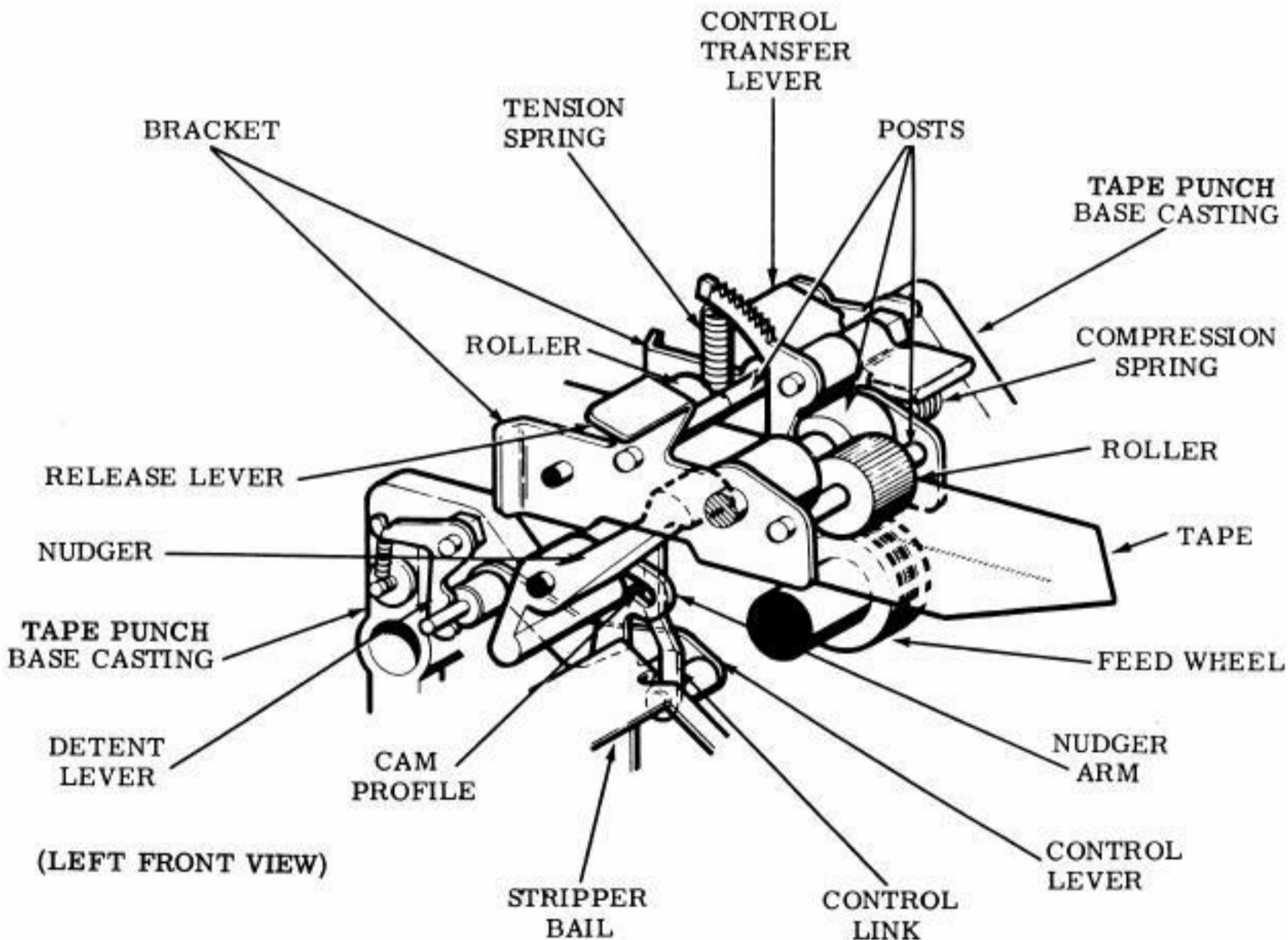


Figure 5 - Tape Guide Assembly (Tape Feed Mechanism)



2.08 The backspace lever (Figure 3), when depressed manually to its most downward position, backspaces the feed wheel ratchet one tooth space. This results in the tape being backspaced one full character. The backspace lever, through another lever, cams out the feed pawl during the backspace operation. This is a safety feature to prevent a jam if the operator accidentally operates the backspace mechanism while the tape punch is running.

#### DRIVE LINK MECHANISM

2.09 The drive link mechanism (Figure 1) consists of a separate set of parts which, when assembled together on the typing unit provides a means for transferring driving motion to the tape punch. The tape punch drive post receives the driving motion from the typing unit's function rocker shaft through a sleeve, plate with shaft, drive link, and associated parts.

- (a) The drive link pivots from a post and is biased in the clockwise direction by a tension spring.
- (b) Located on the drive link's underside and at the end opposite of the pivot is a "V" groove that engages the tape punch drive post.
- (c) There is a link (Figure 1) that is included in the drive link mechanism. One end mounts over a shaft of the plate with shaft, and the other end mounts to the typing unit's platen mounting post and is separated from the platen mounting post by a spacer.

#### CONTROL MECHANISM

2.10 The ON and OFF pushbuttons are located in the tape punch lid. A spider-leaf spring held captive to the underside of the tape punch lid biases the pushbuttons upward. The underside of the ON and OFF pushbuttons line up with the flat surfaces of a control transfer lever that pivots from a post mounted to the tape punch base casting.

- (a) The ON and OFF pushbutton motion is transferred to the control lever (Figure 5) through a control transfer lever and a control link.

- (b) When the ON pushbutton is depressed, the control lever rotates to its most counterclockwise position, the control link rises to its highest position, and the control transfer lever rotates to its most clockwise position.

- (c) As the control lever rotates counterclockwise, its "V" groove disengages from the tape punch drive post (Figure 1). A roller located on the control lever allows the drive link, under spring tension, to move in the clockwise direction. The "V" groove on the drive link engages the drive post while the "V" groove on the control lever is partially disengaged. When the "V" groove on the control lever is in its most counterclockwise position, it completely clears the path of the drive post, while the roller is completely disengaged from the drive link.

Note: The interaction of the "V" grooves is designed so that either "V" groove controls the drive post before the other becomes totally disengaged.

- (d) A detent lever (Figure 5), biased in the counterclockwise direction by a tension spring, holds the drive link mechanism in its OFF position.
- (e) The opposite action occurs when the OFF pushbutton is depressed. The control lever is detented in its most clockwise direction, the control link is moved to its lowest position, and the control transfer lever is rotated to its counterclockwise position. The drive link (Figure 1) is completely cammed out of the path of the drive post by the roller on the control lever. The control lever always locks the drive post in the OFF position.

### 3. VARIATIONS TO BASIC UNITS

#### FIGS "D"

3.01 Some 5-level applications may require that the answer-back code combination (FIGS "D") be converted to a "figures" code combination to prevent tripping of the answer-back mechanism when the tape is read by the tape reader. The tape punch design includes provision for adding an auxiliary drive bail for converting FIGS "D" "answer-back" code combination to the "figures" code combination by perforating additional holes in the tape.

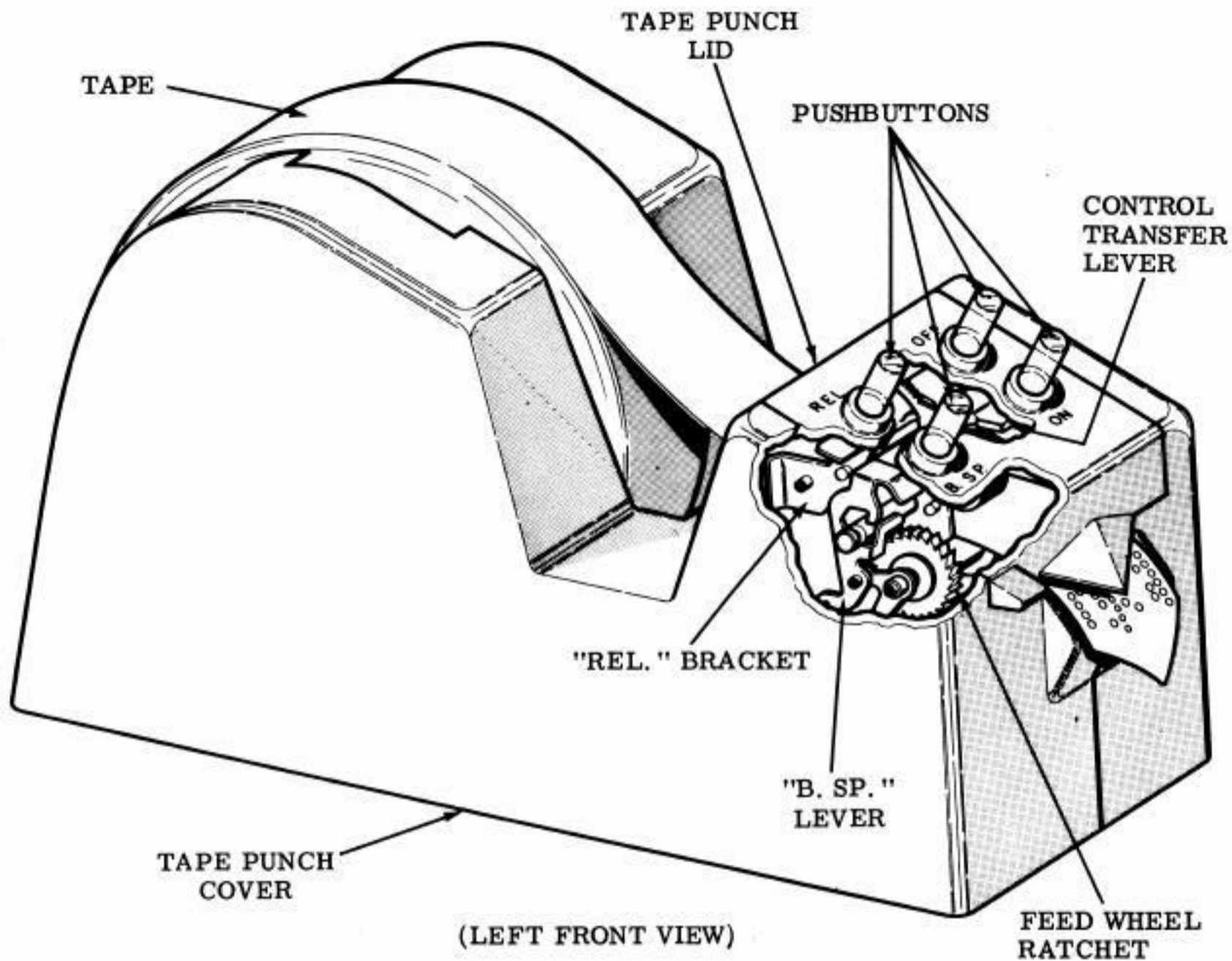


Figure 6 — Control Mechanism

(a) The auxiliary drive bail consists of two sensing levers, two pawls, two levers, and a shaft which, when assembled together, form an auxiliary drive bail that drives preselected sensing levers (Figure 4).

(b) Tabs (Figure 2) precoded with the FIGS D code combination on the underside of the codebar extensions are sensed by the no. A-0 and the no. A-8 sensing levers. All code combinations except the FIGS D code combination block the no. A-0 and no. A-8 sensing levers from reaching their most clockwise position.

(c) On sensing the FIGS D code combination (no. 0, 1 and 4 codebars marking), the no. A-0 and no. A-8 sensing levers impart motion to the auxiliary drive bail.

(d) To convert the FIGS D code combination to the "figures" code combination, the no. 2 and no. 5 sensing levers have tabs located on their underside which line up with the shaft of the auxiliary drive bail.

(e) When the FIGS D code combination is received by the tape punch, the no. 0, 1, and 4 sensing lever, pawl lever, and



code-punch pin combinations are actuated by the drive mechanism through their sensing levers, and the no. 2 and no. 5 code-punch pins are actuated by the auxiliary drive bail through the tabs located on the underside of the no. 2 and no. 5 sensing levers. The resulting perforations in the tape is a "figures" code combination.

(f) The auxiliary drive bail design to convert one code combination to another is based on adding perforations to the first code combination to get the desired code combination. The auxiliary drive bail can

only add perforations in the tape; it cannot delete them.

#### AUTOMATIC CONTROLS

3.02 As a variation to the basic tape punch which is manually operated, an automatically operated tape punch is available. Provisions have been made for automatically starting and stopping a tape punch upon receipt of certain code combinations. The ASCII code has assigned device control code combinations for this purpose, and they appear on the key-tops of the keyboard as TAPE (tape punch on), ~~TAPE~~ (tape punch off), and EOT (end of transmission, tape punch off).