

33 TAPE PUNCH

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section provides a general description and principles of operation for the 33 tape punch (Figure 1). It is reissued to include information on the remote on-off punch for Computer Input/Output Sets, the tape punch for 3300 Series Coded Sets, and to incorporate some corrections. Because the revision is fairly extensive marginal arrows ordinarily used to indicate changes or additions have not been used.

1.02 The 33 tape punch is an 8-level device which perforates paper tape according to ASCII (American National Standard Code for Information Interchange). The tape punch does

not receive signals from a transmitting set directly but uses the coded arrangement of the typing unit codebars. The 33 tape punch is a generic title referring to three basic types of punches, a manual, an automatic, and a remote on-off punch.

1.03 The manual punch is turned on or off manually. It has four pushbuttons: ON, OFF, B.SP., and REL.

1.04 The automatic punch can be turned on or off both manually and automatically. For manual operation these pushbuttons are present on the lid: ON, OFF, B.SP., REL. In automatic operation the tape punch will turn on upon receipt of the DC2 code and turn off upon receipt of the DC4 code.

1.05 The 3300 Series Coded Sets are equipped with a manual/automatic punch, that is, the punch may be operated as a manual punch or as an automatic punch. The punch, as shipped from the factory, has two clips installed in slots A-0 and A-8 which enable the punch for manual operation. Removing the clips enables the punch for automatic operation. Refer to Figure 2 for positions of the A-0 and A-8 slots.

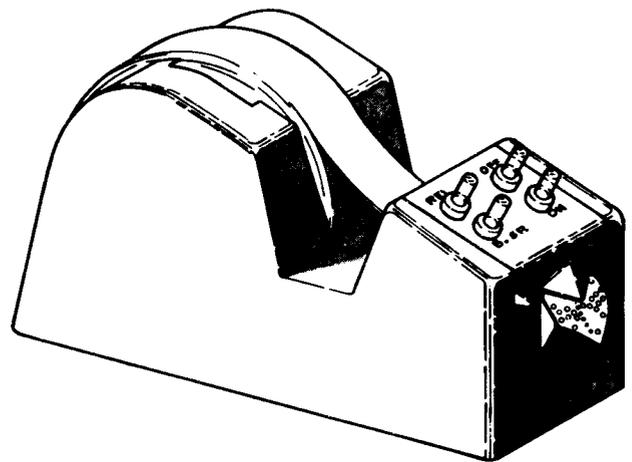


Figure 1 - 33 Tape Punch

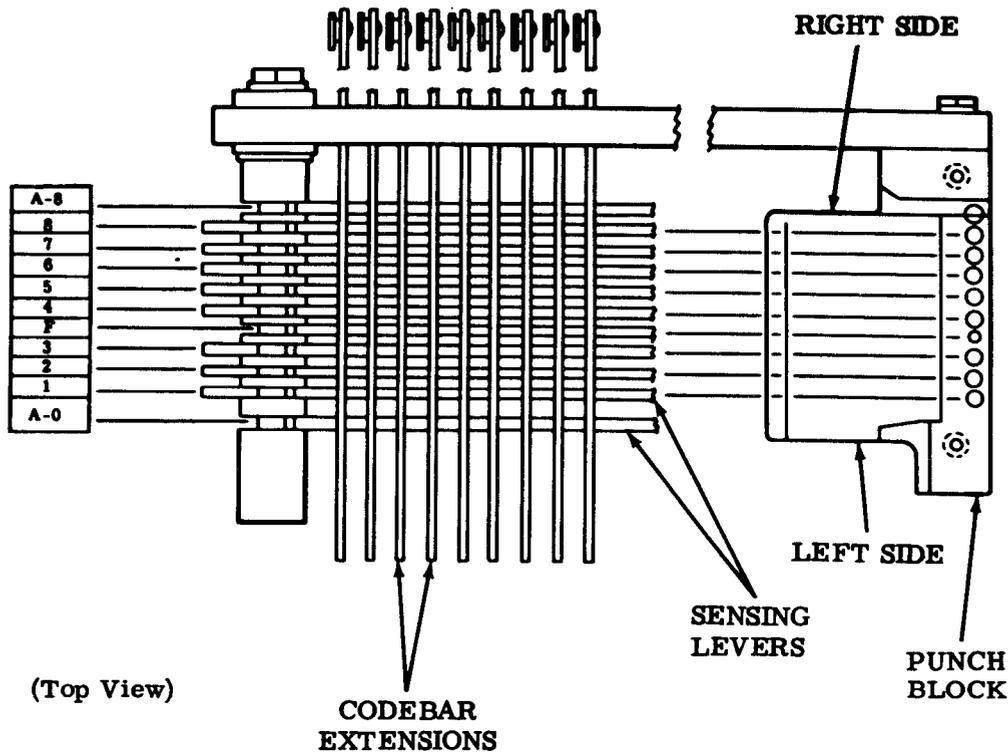


Figure 2 - Sensing Levers Slot Assignment

1.06 The remote on-off punch is solenoid operated. When the solenoid is energized the punch is off. With the solenoid de-energized the punch is on. Since the solenoid responds to remote signals there are no ON or OFF push-buttons on the lid. The only pushbuttons present are B.SP. and REL. The remote on-off tape punch is used on Computer Input/Output Sets.

1.07 References to left, right, front, or rear, etc, consider the tape punch as viewed by the teletypewriter operator.

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

2. TECHNICAL DATA

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

2.01 Dimensions and Weight

Width	4 inches
Height	6 inches
Depth	6 inches
Weight	21 ounces

2.02 Tape Specifications

Level	8 level
Width	1 inch
Code combination per inch	10
Feed hole diameter	0.046 inch

2.03 Chad Box

Width	2 inches
Length	6.5 inches
Height	7.5 inches

2.04 The 33 tape punch is capable of operating at 60, 66, 75, or 100 words per minute.

3. DETAILED OPERATION

Note: The following paragraphs give a detailed description of the major mechanisms (Figure 3) in the punch. This description applies to all three of the punches mentioned in 1.02 thru 1.06. Control features peculiar to each punch will be discussed in Part 4.

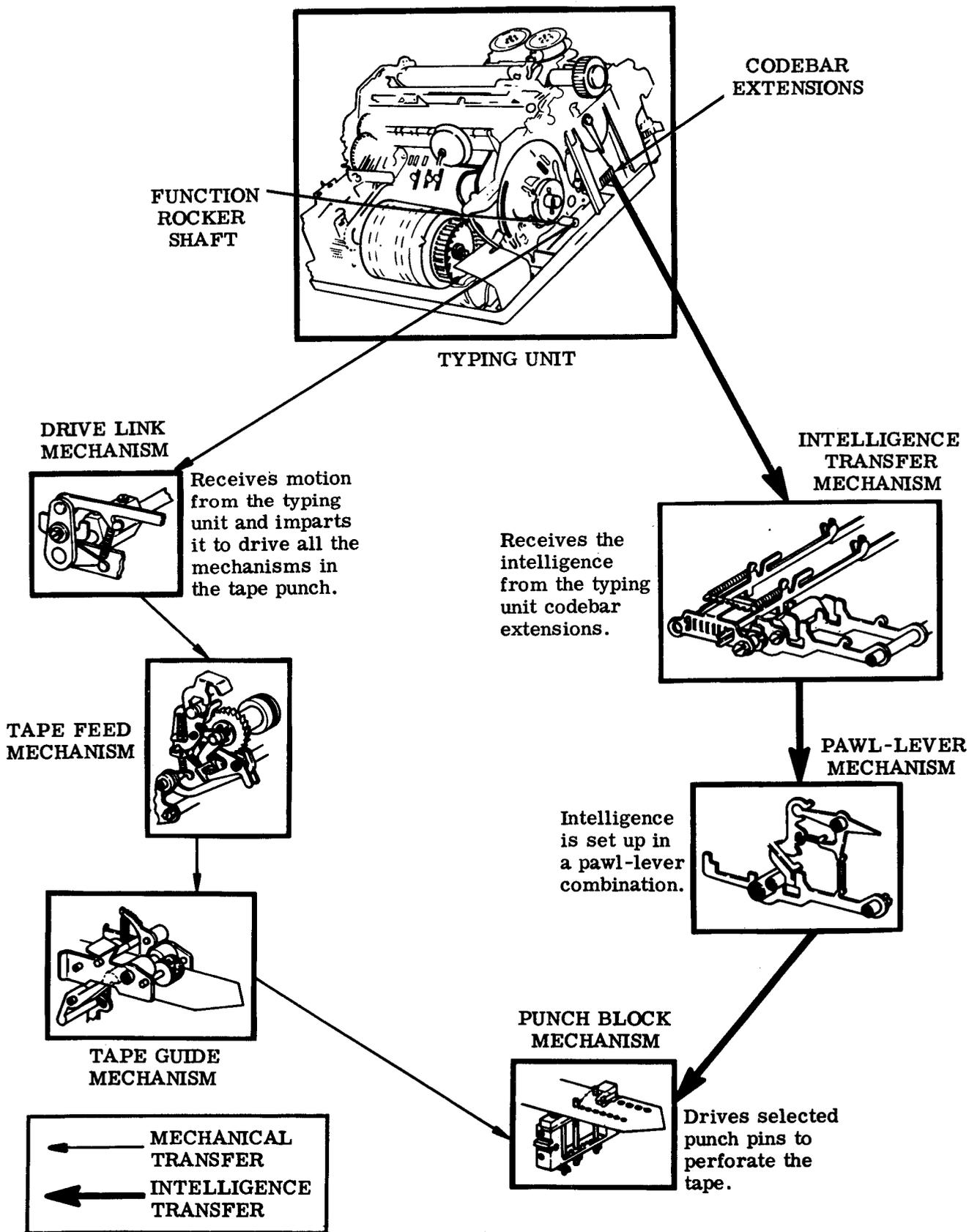


Figure 3 - Functional Diagram of the Tape Punch and Major Mechanisms

DRIVE MECHANISM

3.01 The rocking motion of the typing unit function rocker shaft is imparted to the tape punch by means of a sleeve which connects to a plate with shaft (Figure 4). A drive link, attached to the plate with shaft, connects to a drive post which simultaneously drives the nudger, feed pawl, and stripper bail, and supplies the downward force to pull the selected pawls by means of the sensing lever bail.

INTELLIGENCE TRANSFER MECHANISM

3.02 There is a codebar extension (Figure 5) for each typing unit codebar. Motion is imparted to the codebar extensions by the codebars through the typing unit reset bail. A plate mounted to the tape punch casting guides the codebar extensions.

3.03 The typing unit selector 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; an unblocked codebar represents a mark.

3.04 Each codebar extension has a tab on its underside which lines up with its respective sensing lever, pawl, lever, and punch-pin combination.

3.05 During the drive mechanism's counter-clockwise travel, the sensing levers, under spring tension, move up and sense the codebar extensions. Each sensing lever, except the feed lever, has a tab on its top side which lines up with its respective codebar extension.

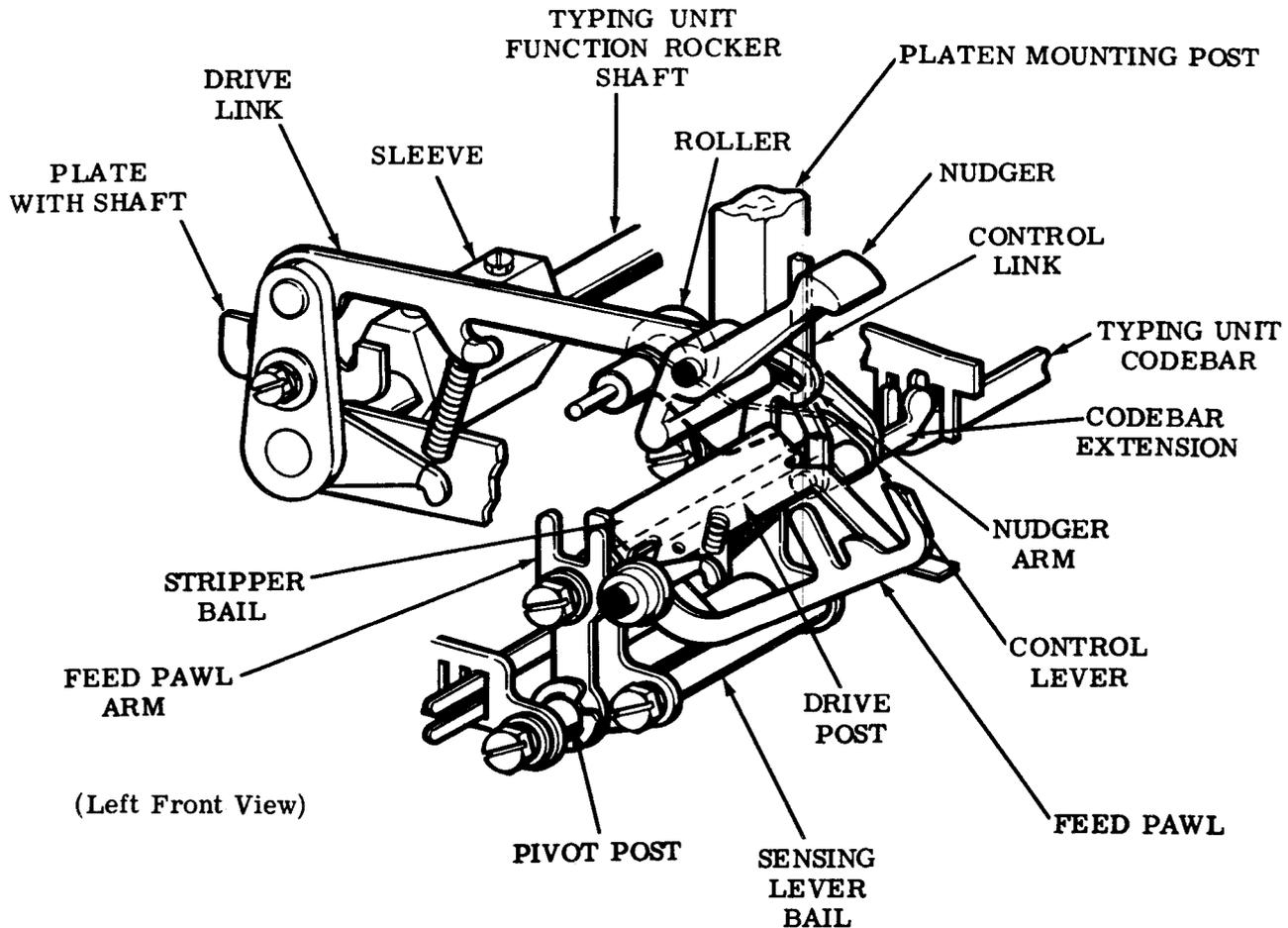


Figure 4 - Drive Link Mechanism and Drive Mechanism

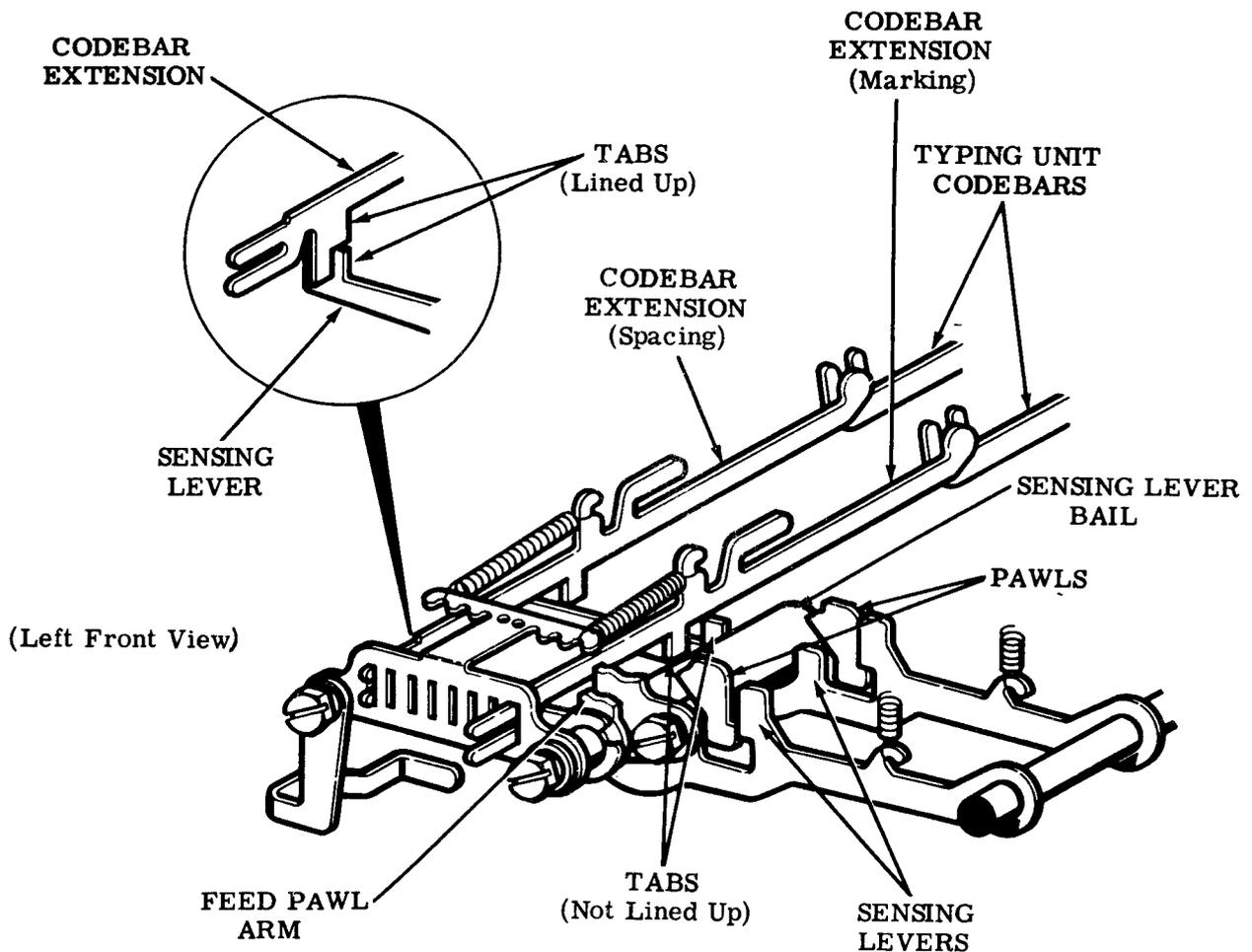


Figure 5 - Intelligence Transfer Mechanism

3.06 When a codebar extension is spacing, the tab, located on its underside, lines up with the tab on the sensing lever. The tabs engage each other, and the sensing lever is blocked from pivoting to its most counterclockwise position.

3.07 When a codebar extension is marking, its tab is not in line with the sensing lever tab. As a result the sensing lever pivots to its most clockwise position.

3.08 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 on the pawl.

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

3.10 When a sensing lever is in the spacing position, its latching surface is prevented from engaging with its associated pawl latching surface. As a result the pawl is not selected.

3.11 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.

3.12 As the drive mechanism (Figure 4) 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. Occurring simultaneously, the sensing levers in the marking position rotate counterclockwise and transfer their motion to the selected pawl, lever, and code-punch pin combination. At the same time, the drive mechanism transfers its motion to the sensing levers which are spacing. Since the pawl, lever, and code-punch pin combinations

are in the nonselected 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 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.

3.13 Just prior to the end of the drive mechanism's most clockwise travel, the stripper bail, through its bias spring, engages a latching surface located under the spring hook(s) of the selected pawl(s). As the drive mechanism rotates counterclockwise to its stop position, the stripper bail strips the selected pawls 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 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 leverbail 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.

3.14 During the drive mechanism's clockwise motion, the nudger (Figure 4) 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 to be advanced 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.

TAPE FEED MECHANISM

3.15 As the stripper bail moves to the rear, the feed pawl engages a tooth on the feed wheel ratchet (Figure 6). When the stripper bail completes its travel to the rear, the feed wheel ratchet has indexed one full tooth and the tape is advanced 0.100 inch by the feed wheel.

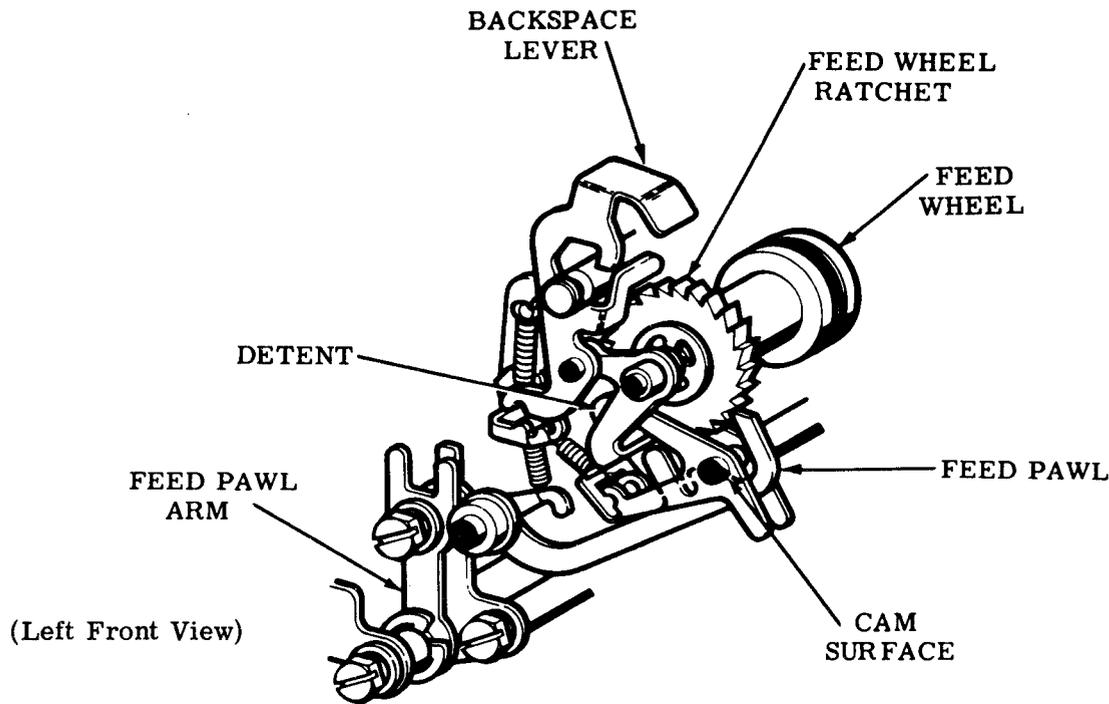


Figure 6 - Feed Wheel Mechanism (Tape Feed Mechanism)

TAPE GUIDE MECHANISM

3.16 The tape guide mechanism (Figure 7), consists of a bracket, two rollers, three posts, a sleeve, and a compression spring held together by retainers. A tension spring biases the tape guide mechanism in a 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 provides adequate tape spacing. The tape guide assembly is shaped in the form of a funnel to provide easy tape threading. A push-button (Figure 9), located in the cover lid, when manually 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.

PUNCH BLOCK MECHANISM

3.17 The punch block mechanism consists of code-punch pins, a feed-punch pin, holder, die plate, and a tape bias spring (Figure 8). 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.

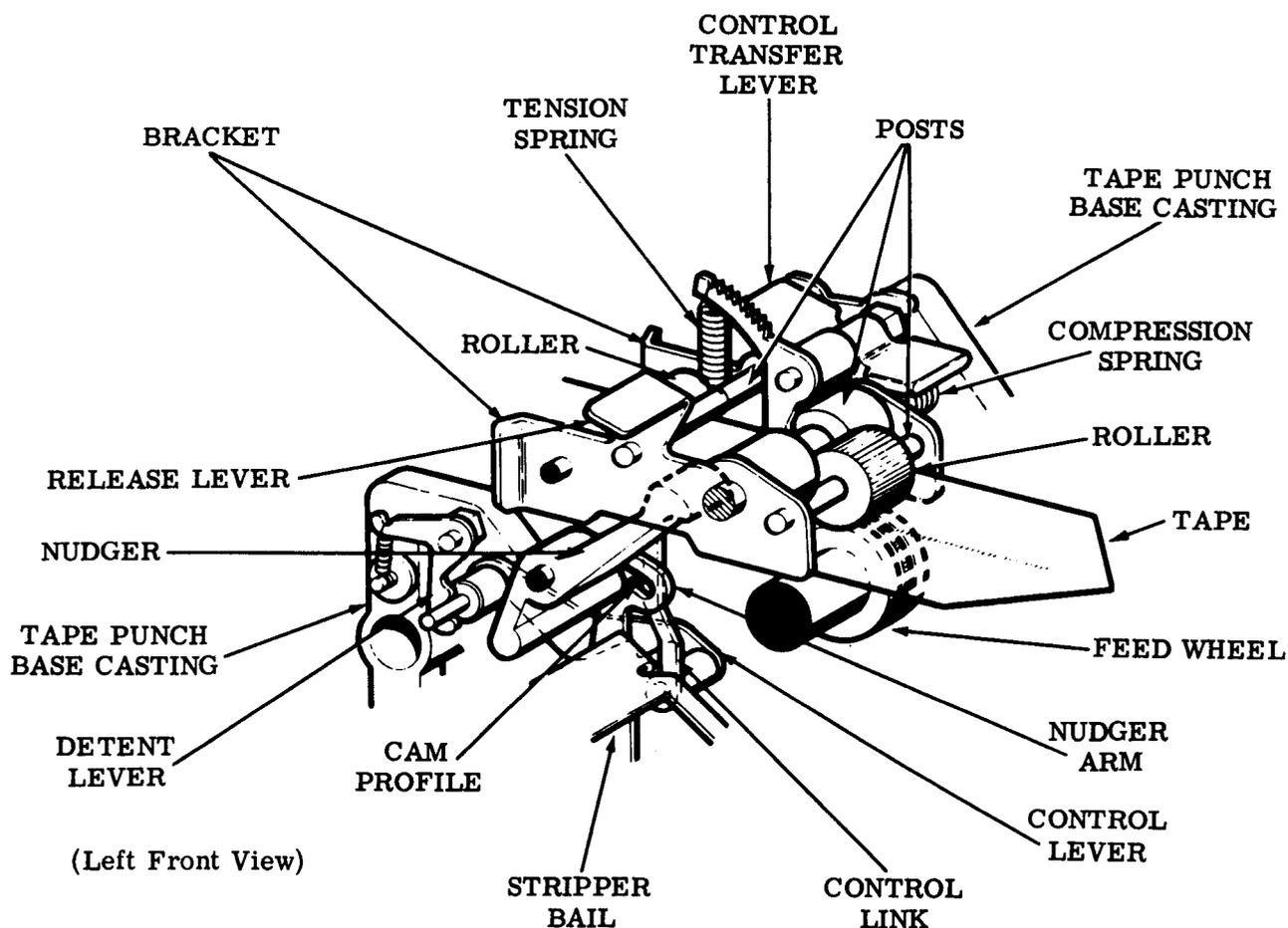


Figure 7 - Tape Guide Assembly (Tape Feed Mechanism)

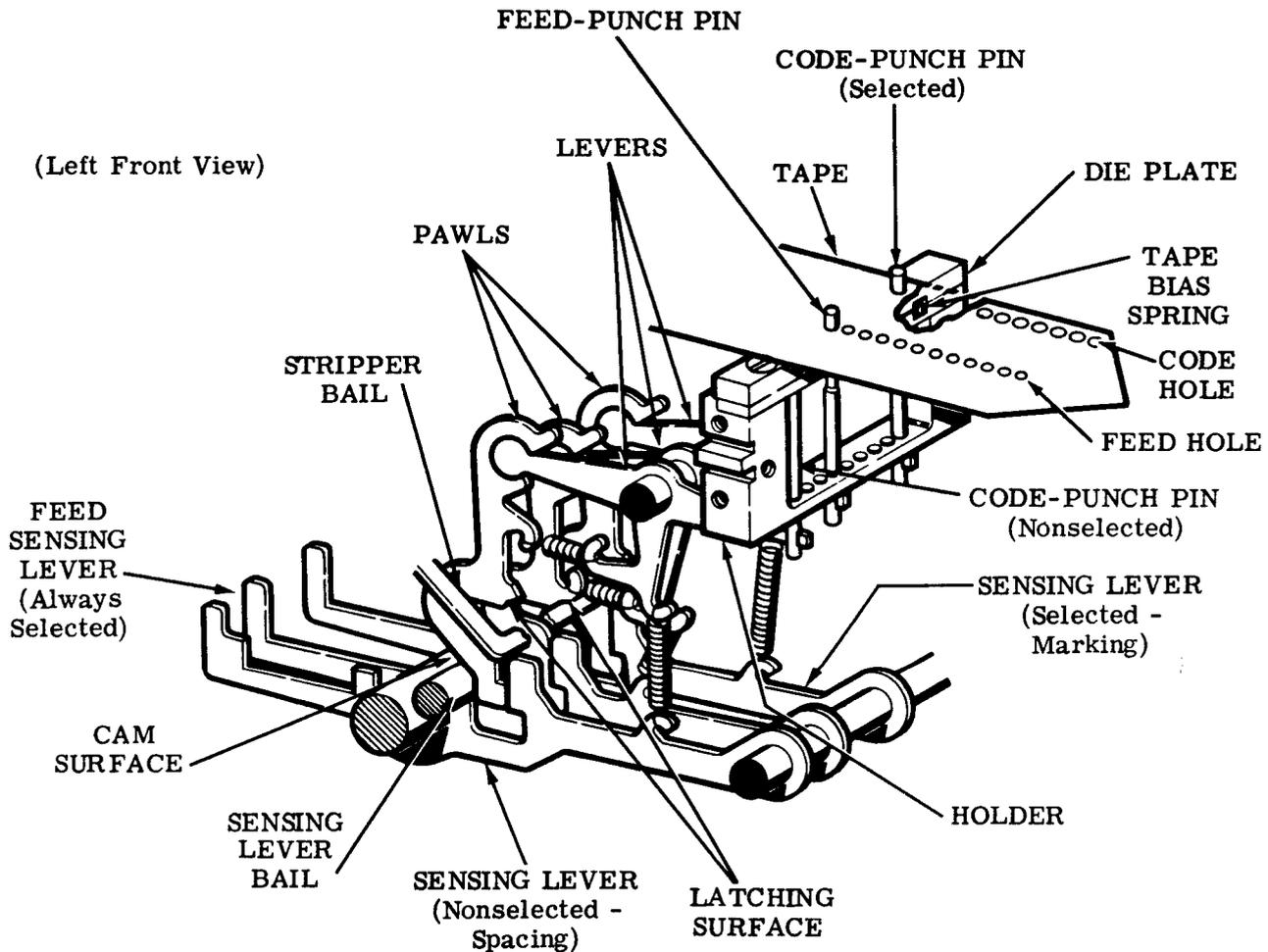


Figure 8 - Tape Punch Mechanism

BACKSPACE MECHANISM

3.18 The backspace lever (Figure 6), 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.

4. CONTROL FEATURES

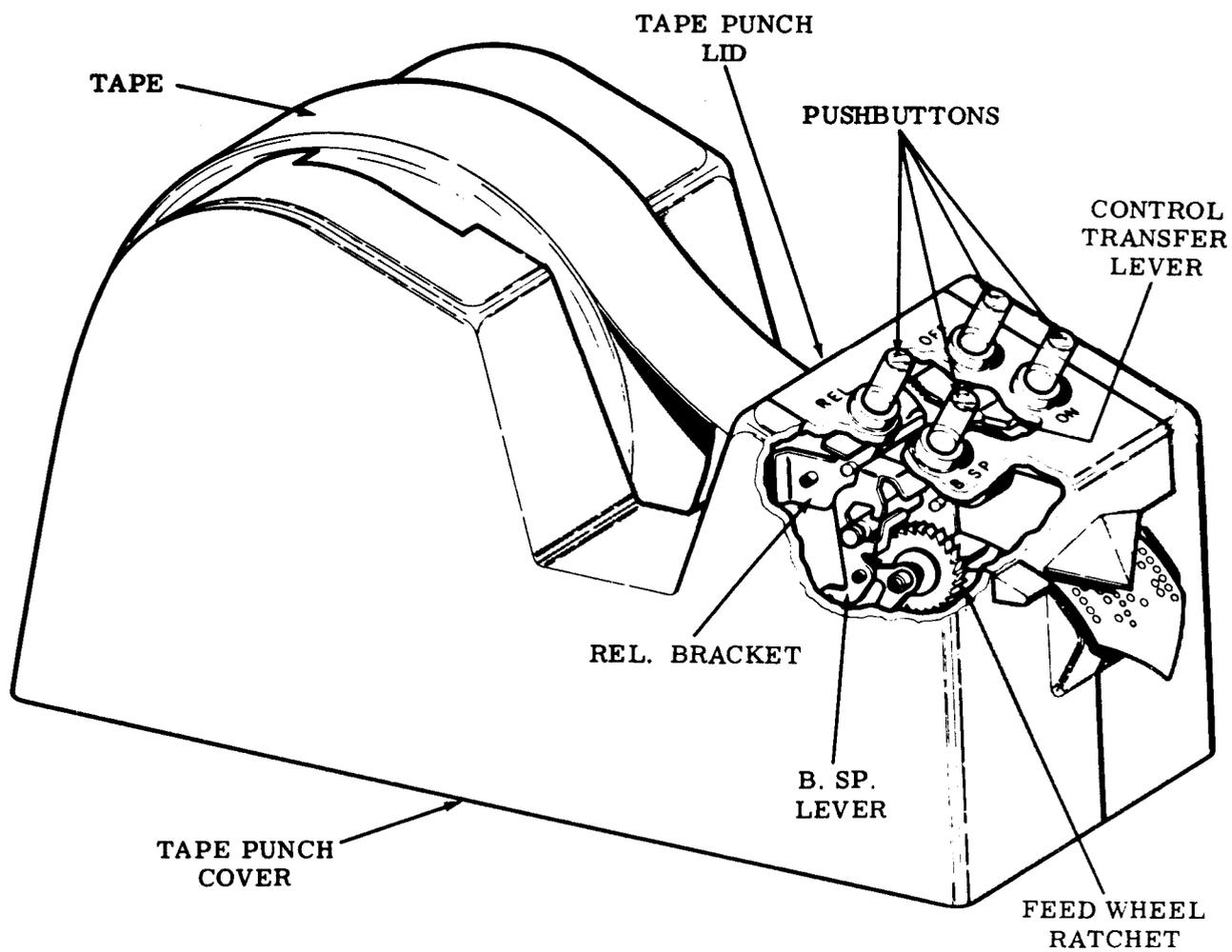
MANUAL PUNCH

4.01 The manual punch has four pushbuttons: ON, OFF, B.SP., and REL. (Figure 9), whose functions are:

ON — When the ON pushbutton on the cover is depressed, (Figure 10) the control transfer lever operates a

control link which, in turn, rotates the control lever. The control lever has a roller on one end and a detent on the other. The detent engages a drive post while the roller guides the drive link. When the control lever is rotated in the ON mode, the detent disengages from the drive post while the roller pivots downward. The drive link, under spring tension, is pulled downward to engage the drive post.

OFF — When the OFF pushbutton on the cover is depressed, the control transfer lever operates the control link and then the control lever is operated. The detent on the control lever travels downward to engage the drive post while the roller pivots upward, disengaging the drive link from the drive post.



(Left Front View)

Figure 9 - Control Mechanism

B.SP. — When the B.SP. pushbutton on the cover is depressed, the backspace mechanism, described in 3.18, is operated. The backspace lever, when depressed, moves down to engage a tooth on the back side of the feed wheel ratchet (Figure 11). Simultaneously, a lever pivots the feed pawl away from the feed wheel ratchet which then turns counterclockwise, backspacing one tooth. The feed wheel is mounted on the same shaft as the ratchet. When the ratchet backspaces, the feed wheel also backspaces.

REL. — When the REL. pushbutton on the cover is depressed, the entire backspace mechanism (Figure 7) pivots counterclockwise raising the roller away from the feed wheel. The tape can thus be pulled out freely.

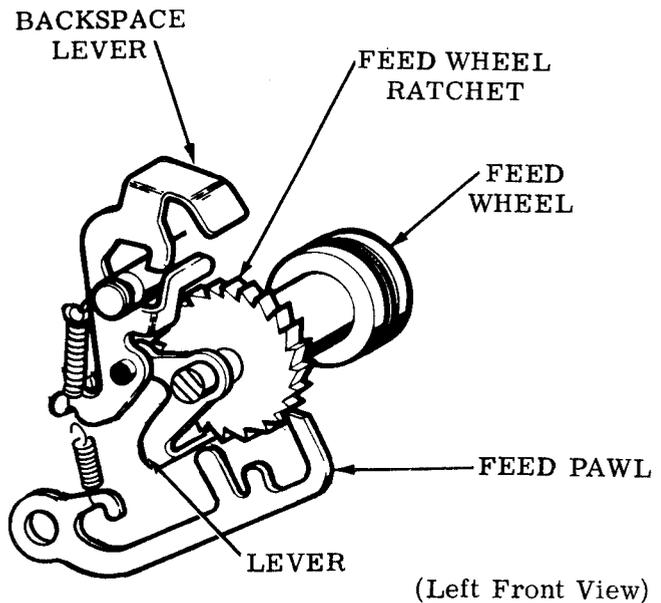


Figure 11 - Feed Wheel Mechanism
(Tape Feed Mechanism)

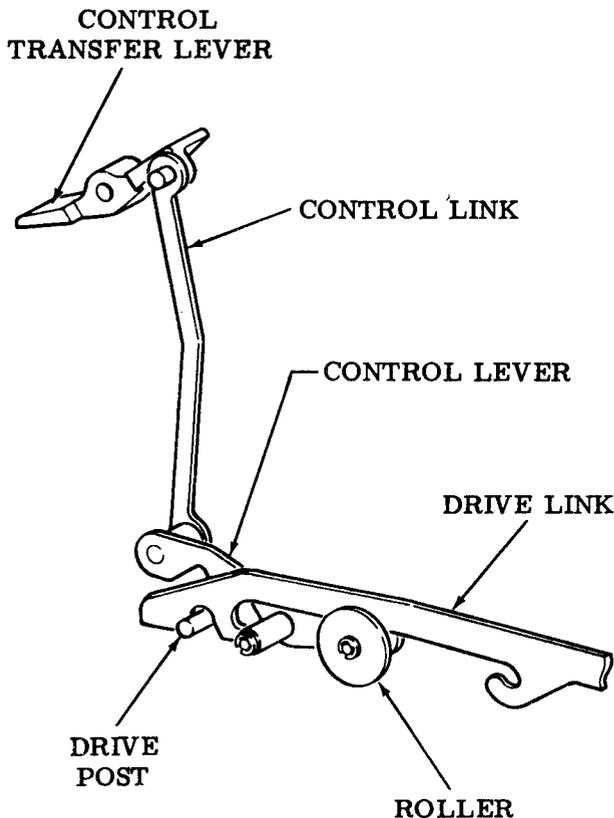


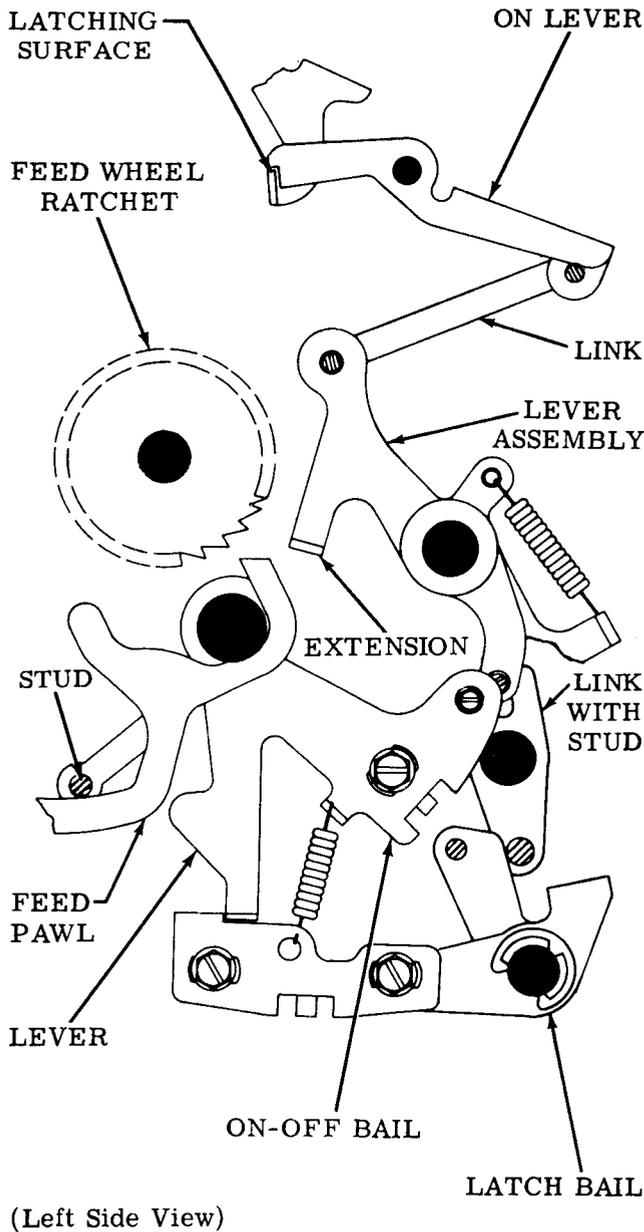
Figure 10 - Manual ON and OFF
Mechanism

AUTOMATIC PUNCH

4.02 The automatic punch has four pushbuttons, similar to the manual punch. The pushbuttons are: ON, OFF, B.SP., and REL.

ON — Depressing the ON pushbutton (Figure 12) on the cover lid causes a lever, link, the lever assembly, and the link with stud to pivot. In its pivoting motion, the stud causes the latch bail to pivot counterclockwise disengaging the ON-OFF bail lever, allowing it to move towards the rear. In this rearward travel the stud, which in the OFF condition holds the feed pawl down away from the feed wheel ratchet, also moves towards the rear allowing the feed pawl to reach up and engage a tooth on the feed wheel ratchet.

OFF — When the OFF pushbutton (Figure 12) is depressed, its lever is pivoted away from the engaging surface of the ON lever allowing the spring-biased levers to return to their OFF position. The latch bail pivots upward to engage the ON-OFF bail lever and the stud moves the feed pawl downward away from the feed wheel ratchet teeth.



(Left Side View)

Figure 12 - Automatic ON and OFF Mechanism

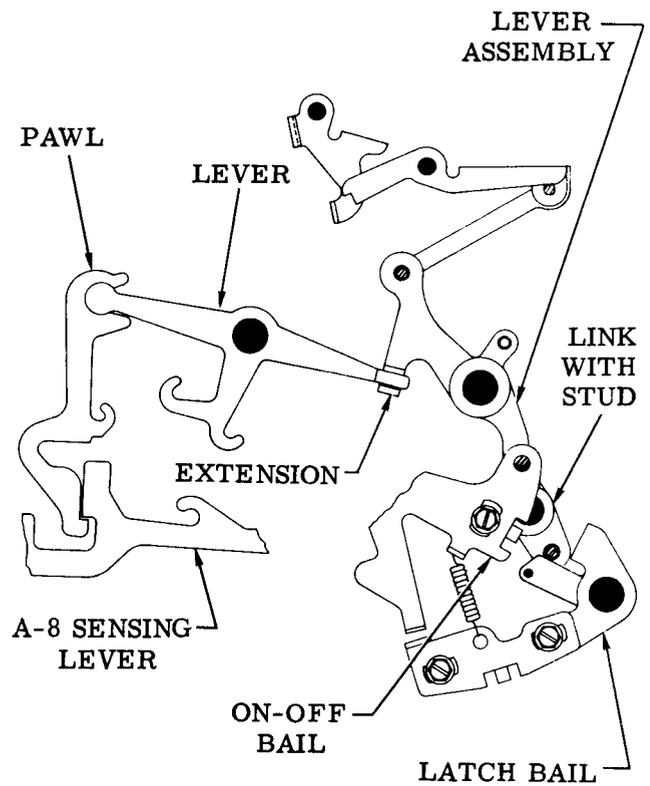
B.SP. — Same as the manual punch back-space operation described in 4.01

REL. — Same as the manual punch release operation described in 4.01

4.03 Automatic ON (Figure 13) — For turning the tape punch ON automatically the same mechanism that turns it ON manually is used. When the "R" and "Control" keytops of the local

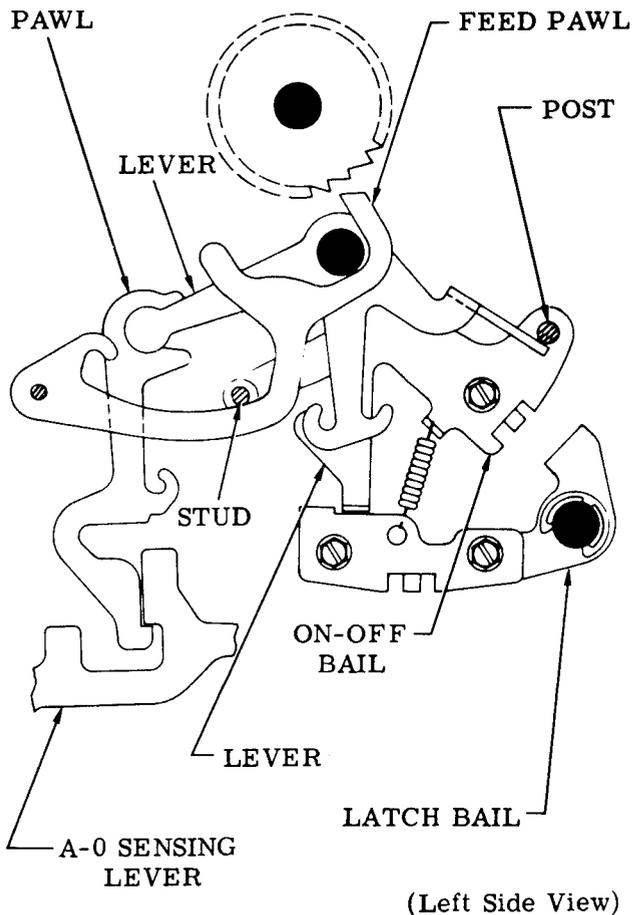
set or the distant set are depressed, a code combination is set up in the typing unit codebars and codebar extensions. The A-8 sensing lever senses the codebar extensions and travels upwards, positioning a pawl and lever. In its pivoting motion the lever engages an extension of the lever assembly causing it to pivot as described in 4.02. The pivoting action of the lever assembly causes the link with stud to pivot. Subsequently, the latch bail moves downward disengaging the ON-OFF bail whose stud moves away from the feed pawl. The feed pawl then reaches up to engage a tooth on the feed wheel ratchet.

4.04 Automatic OFF (Figure 14) — When the "T" and the "Control" keytops are depressed on the keyboard, the tape punch OFF code combination is set up in the typing unit codebars and codebar extensions. The A-0 sensing lever senses the codebar extensions and positions a pawl and lever. The lever has an extension which causes the post of the ON-OFF bail to move upward. Simultaneously, the stud engages the feed pawl and pulls it down disengaging it



(Left Side View)

Figure 13 - Automatic ON Mechanism



(Left Side View)

Figure 14 - Automatic OFF Mechanism

from the feed wheel ratchet. The ON-OFF bail lever drops in the engaging surface of the spring biased latch bail. During subsequent cycles, the sensing levers will sense incoming code combinations but the selected pawls will be stripped each time. Likewise, there will be no action of the feed pawl and the tape will not be advanced.

REMOTE ON/OFF PUNCH

4.05 The remote on/off punch has two push-buttons: B.SP. and REL. The ON and OFF pushbuttons present on the manual and automatic punches are not present on this punch.

4.06 The remote on/off punch is turned on and off by means of a solenoid located between the typing unit casting and the right side of the tape punch. The solenoid will energize upon command from the PUNCH ON button on the set control switch assembly or when the set receives the DC2 (Tape Punch On) code.

4.07 When the punch is off, the solenoid (Figure 15) is energized, causing the plunger to be drawn into the coil. With the plunger pulled into the coil the solenoid bail extension is pivoted to the left, raising the roller. As the drive link is driven forward and backwards in response to the action of the function rocker shaft it fails to engage the drive post and the punch fails to operate.

4.08 Receipt of the punch on code de-energizes the solenoid. Due to spring tension the solenoid bail extension pivots to the right. The roller moves downward allowing the spring biased drive link to engage the drive post when the drive link is moved back and forth in response to the action of the function rocker shaft.

5. VARIABLE FEATURES

5.01 Tape Punch Interlock - When the typing unit is in a nonprint condition, the nonprint codebar connects to a post on the right side of the latch bail and cams it in a counterclockwise direction. This action turns the tape punch on and prevents it from being turned off as long as the codebar remains in the nonprint mode. When the nonprint codebar is not in the nonprint mode, the ON-OFF mechanism returns to its normal condition.

5.02 ON-LOCK - This variable feature consists of an ON-LOCK pushbutton on the tape punch cover which, when depressed, locks the ON lever so that the OFF lever is disabled and cannot be operated. The tape punch will be on as long as the ON-LOCK pushbutton is held down.

5.03 UNLOCK - This variable feature consists of an UNLOCK pushbutton on the tape punch cover which, when depressed, removes the locked condition described in 5.14. Depressing the UNLOCK pushbutton will not turn the tape punch off, but will allow the tape punch to accept an OFF signal. It will then be able to turn off automatically.

5.04 Code Option - The codebar extensions may be coded with various code combinations to turn the tape punch on or off. For the ON mode the no. 7 bit should be a spacing bit so no interference will occur between the no. 7 codebar extension tab and no. 7 sensing lever tab.

5.05 E. O. T. - The tape punch can be turned off when the end of transmission code is selected. The A-0 sensing lever is coded to

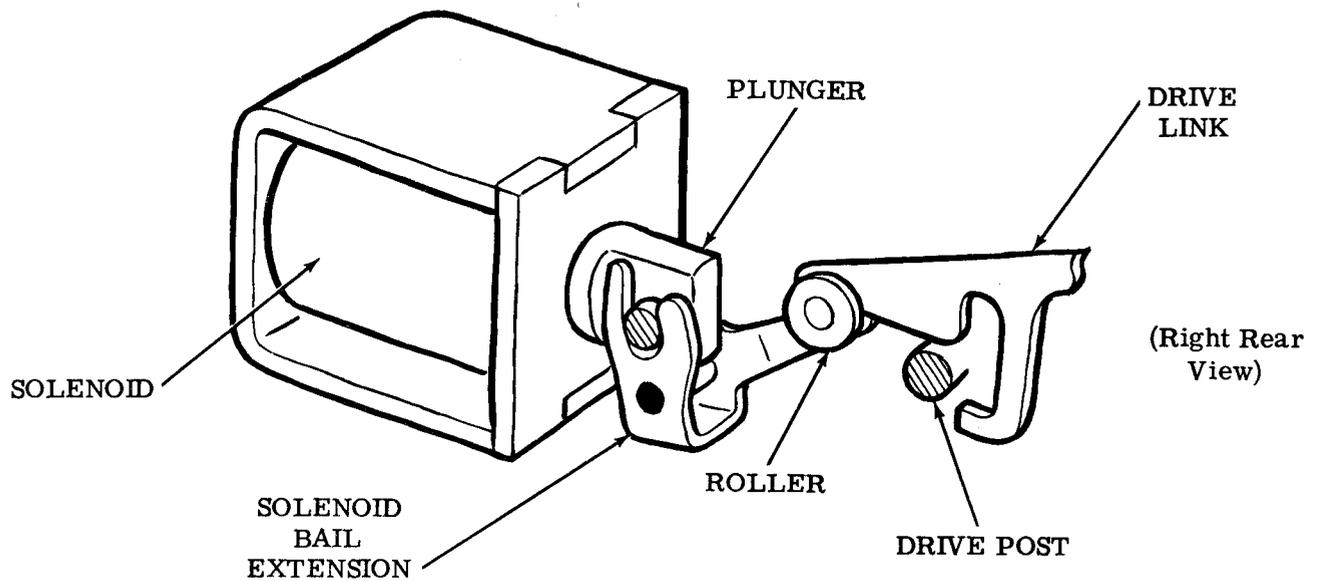


Figure 15 - Solenoid Mechanism for Remote ON/OFF Tape Punch

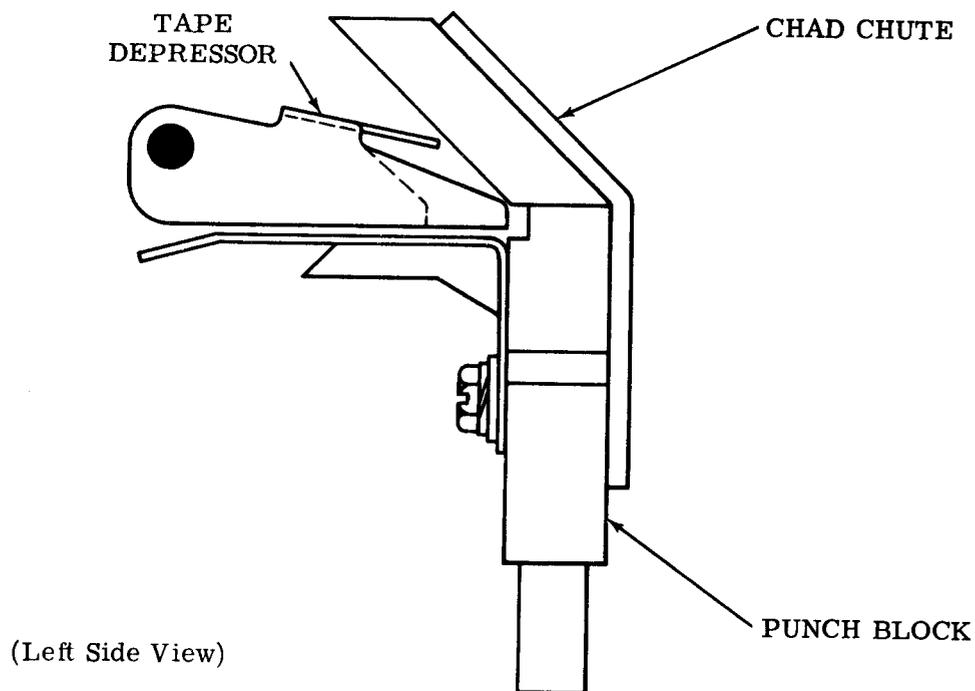


Figure 16 - Tape Guide for Folded Tape

read the E. O. T. code combination and will originate the motion to turn the tape punch off as described in 4.04.

5.06 Sense Suppression - This mechanism blocks the sensing levers from sensing when the tape punch is off.

5.07 Tape Guide For Folded Tape — This feature allows the use of folded tape without the tape becoming jammed in the punch block. The mechanism consists of a shelf attached to the punch block, between the roller and the punch block, and a tape depressor straddling the roller above the tape. Refer to Figures 7 and 16.