

**33 TAPE PUNCH**  
**GENERAL DESCRIPTION**  
**AND**  
**PRINCIPLES OF OPERATION**

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**1. GENERAL**

1.01 This section provides general description and principles of operation for the 33 tape punch (Figure 1). It is reissued to remove information covering the 32 tape punch, which now appears in Section 574-175-100TC, to incorporate engineering changes and to add information on the manual and automatic control features, and variable features. Since this is a general revision, marginal arrows normally used to in-

dicating changes have been omitted.

1.02 The 33 tape punch is an 8-level device which perforates paper tape according to a code. The tape punch does not receive pulses from a transmitting set directly but uses the coded arrangement of the typing unit codebars. The signaling code is described in the appropriate typing unit section.

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

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

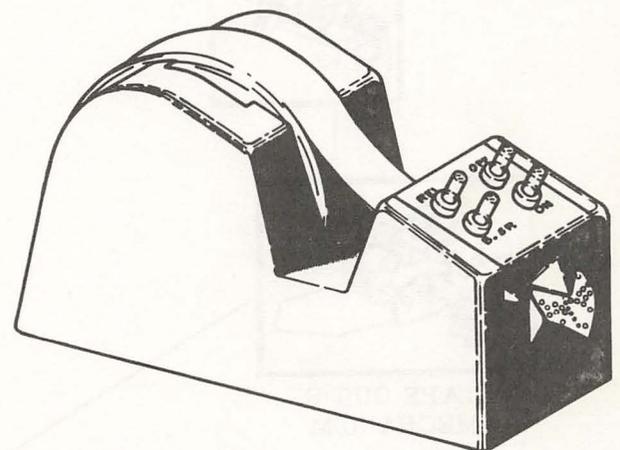


Figure 1 - 33 Tape Punch

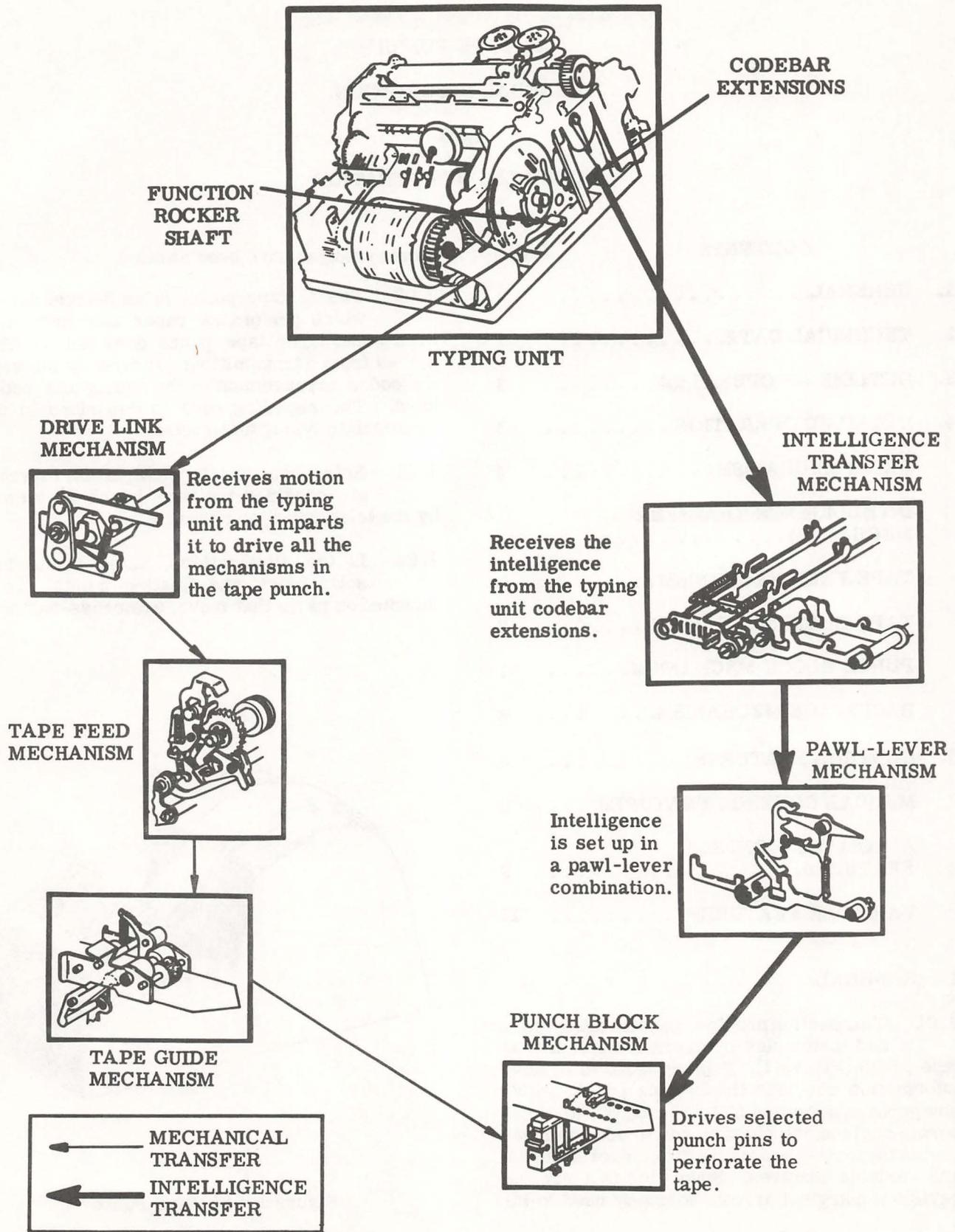


Figure 2 - Functional Diagram of the Tape Punch and Major Mechanisms

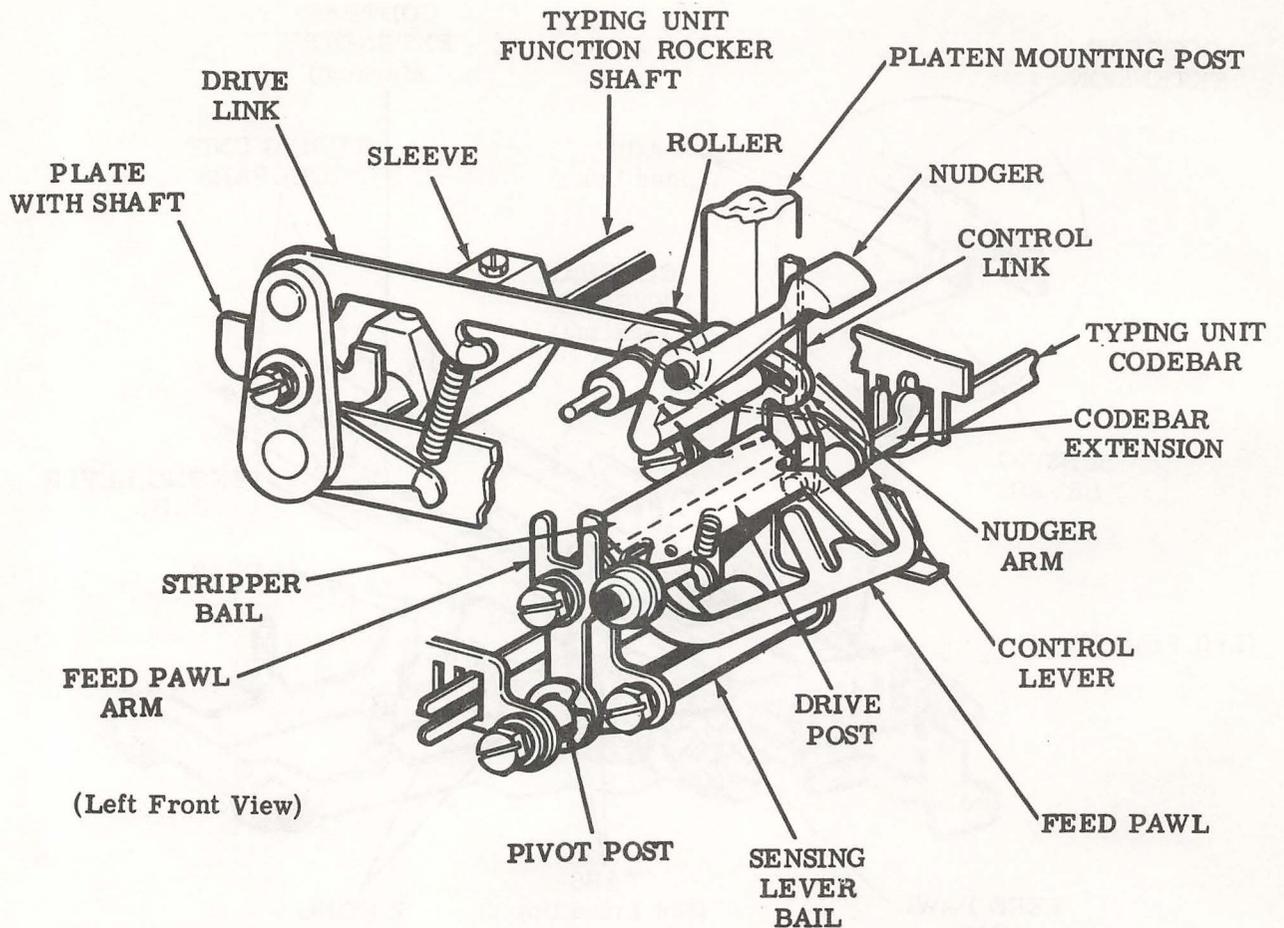


Figure 3 - Drive Link Mechanism and Drive Mechanism

**2. TECHNICAL DATA**

**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. OUTLINE OF OPERATION**

3.01 The tape punch receives its drive motion and intelligence from the typing unit (Figure 2).

3.02 The drive motion originates in the typing unit function mechanism. A cam on the function clutch imparts motion to the function rocker shaft. The motion of the function rocker shaft is then transferred to the tape punch by means of drive linkages.

3.03 The tape punch receives its intelligence from the typing unit codebars. Pulses received by the selector mechanism are converted into a mechanical arrangement of the

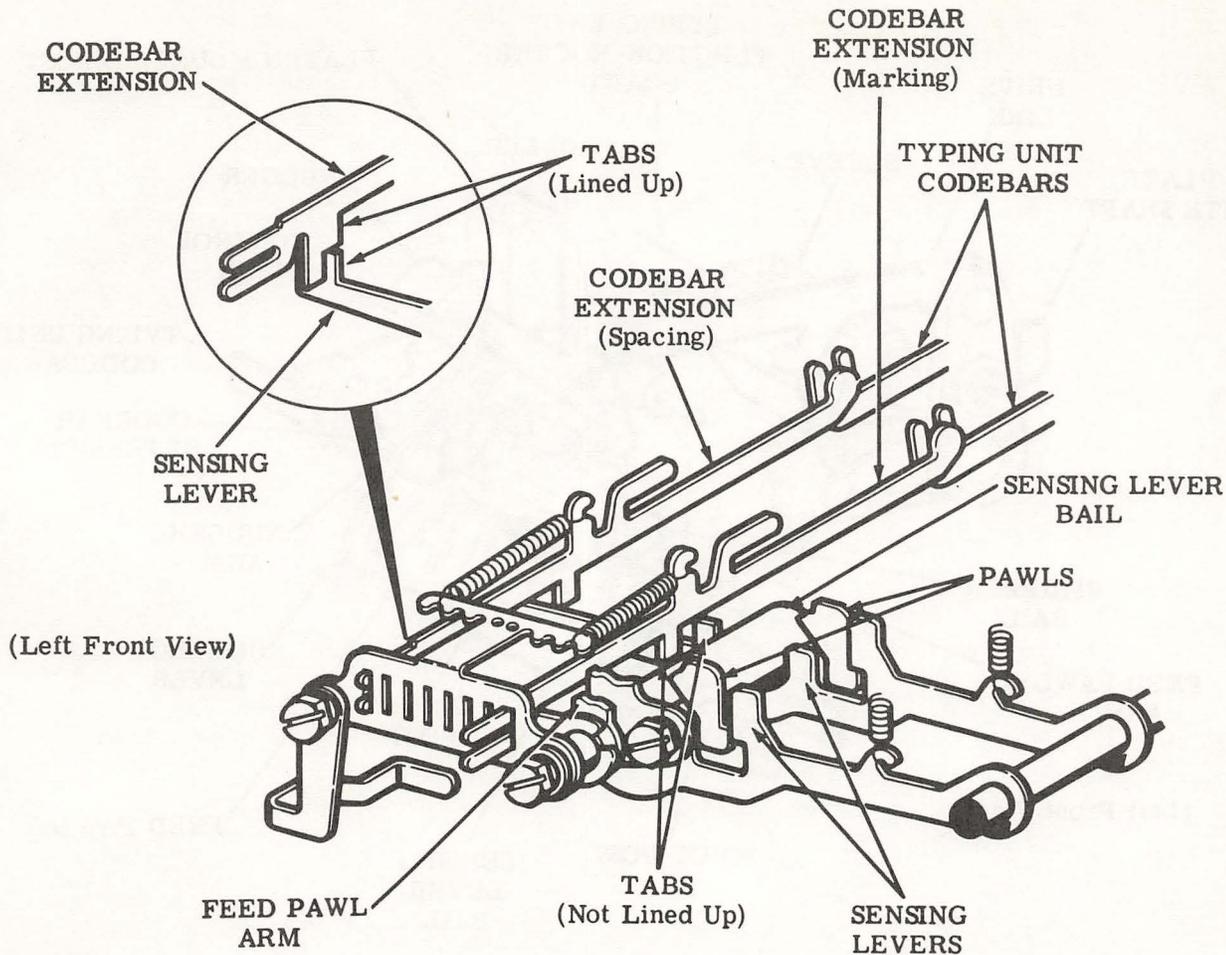


Figure 4 - Intelligence Transfer Mechanism

codebars. Codebar extensions, attached to the codebars, present this arrangement to mechanisms in the tape punch which, in turn, translate it into perforations in the tape. Briefly, the drive mechanism imparts the motion received from the rocker shaft to advance, guide, punch, and backspace the tape. The intelligence transfer mechanism duplicates the code arrangement of the typing unit codebars by setting up punch pins which rise to perforate the tape (Figure 2).

#### 4. DETAILED OPERATION

##### DRIVE MECHANISM

4.01 The rocking motion of the function rocker shaft is imparted to the tape punch by means of a sleeve which connects to a plate with shaft (Figure 3). 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

4.02 There is a codebar extension (Figure 4) 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.

4.03 The typing unit selector blocking levers control the marker 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.

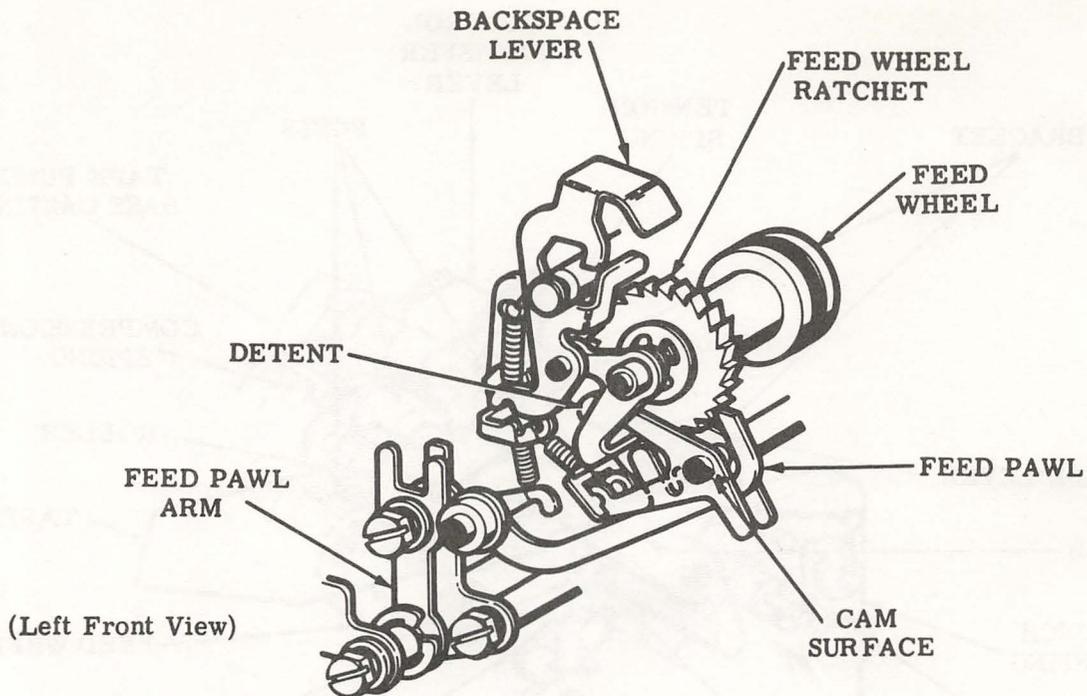


Figure 5 - Feed Wheel Mechanism (Tape Feed Mechanism)

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

4.05 During the drive mechanism's counterclockwise 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.

4.06 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.

4.07 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.

4.08 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.

4.09 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.

4.10 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.

4.11 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.

4.12 As the drive mechanism (Figure 3) 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

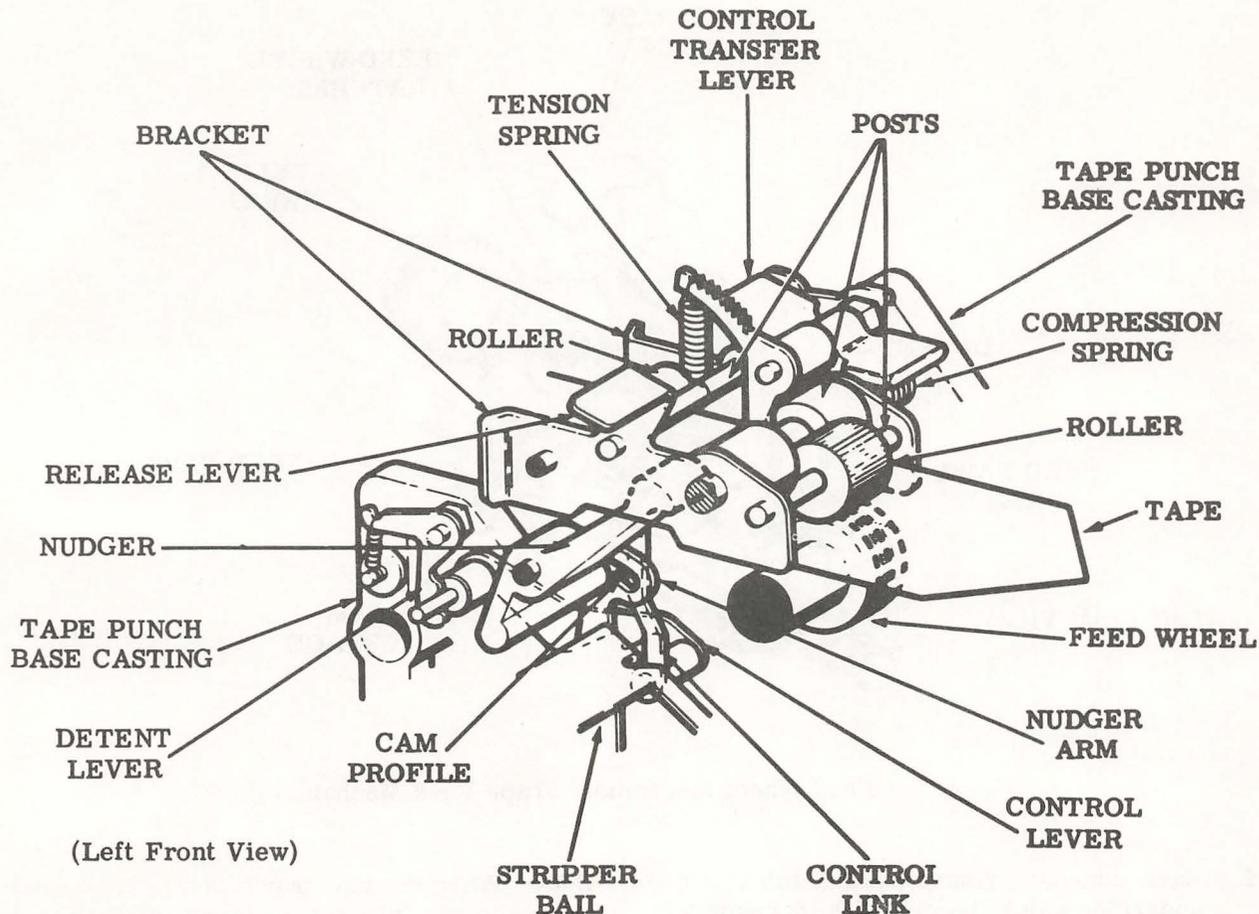


Figure 6 - Tape Guide Assembly (Tape Feed Mechanism).

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.

4.13 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 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.

4.14 During the drive mechanism's clockwise motion, the nudger (Figure 3) 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

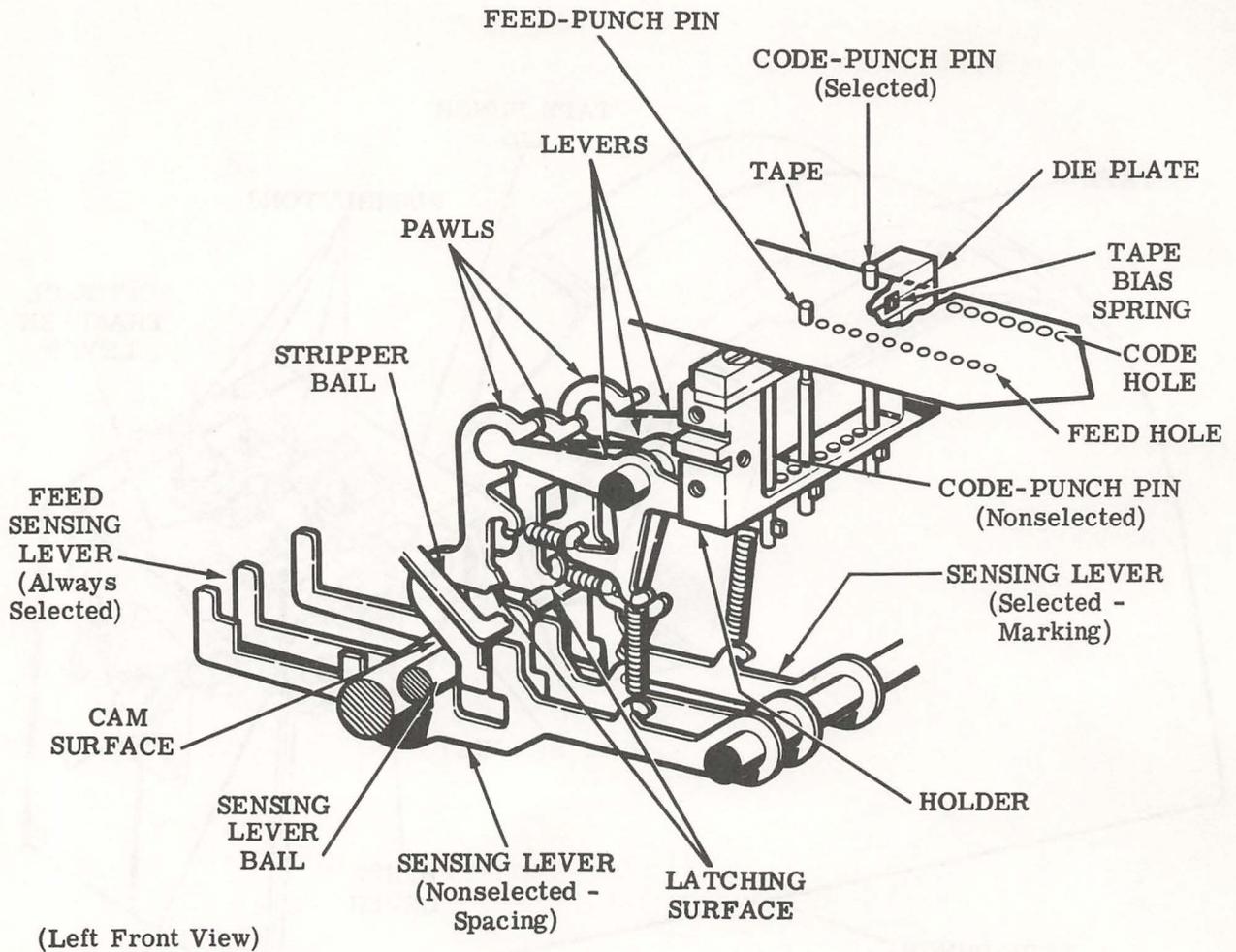


Figure 7 - Tape Punch Mechanism

the weight of the paper between the tape roll is reflected to the feed wheel when the tape is being advanced.

#### TAPE FEED MECHANISM

4.15 As the stripper bail moves to the rear, the feed pawl engages a tooth on the feed wheel ratchet (Figure 5). 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.

#### TAPE GUIDE MECHANISM

4.16 The tape guide mechanism (Figure 6), 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 8), 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

4.17 The punch block mechanism consists of code-punch pins, a feed-punch pin, holder, die plate, and a tape bias spring (Figure 7). 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

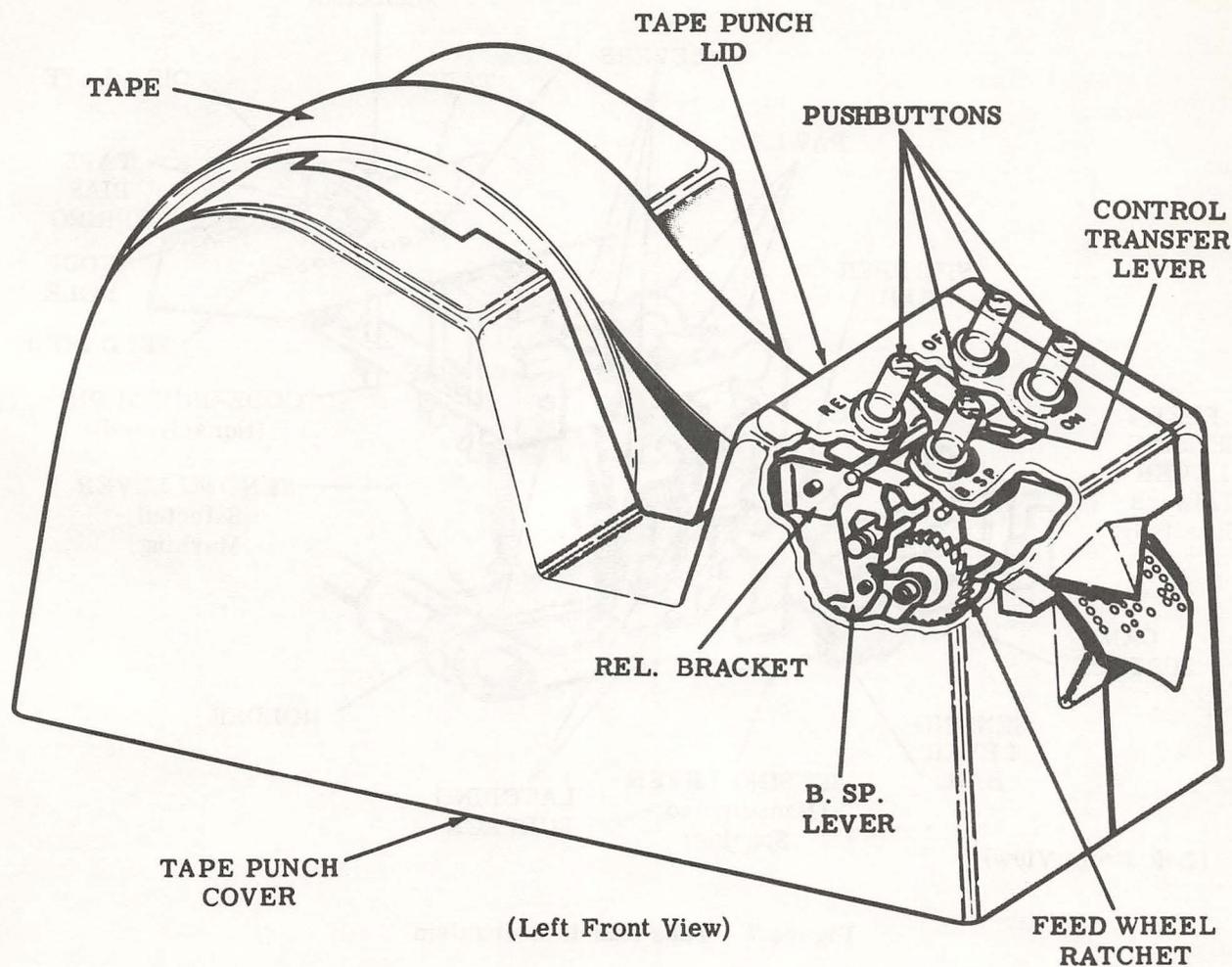


Figure 8 - Control Mechanism

the code hole and feed hole relation to the tape edge to be held constant.

#### BACKSPACE MECHANISM

4.18 The backspace lever (Figure 5), 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.

#### 5. CONTROL FEATURES

5.01 The control features on the tape punch are of two types:

- (a) Manual control features found on both the manual and the automatic punch.
- (b) Automatic control features found on the automatic punch only.

5.02 The difference between these control features is the way in which the punch can be turned ON or OFF. A punch with manual control features can only be turned ON or OFF

manually; a punch with automatic control features can be turned ON or OFF both manually and automatically.

<b>Manual Control Features</b> Manual and Automatic Punch	
ON OFF B. SP. (Backspace) REL. (Release)	
<b>Automatic Control Features</b> Automatic Punch Only	
Manual ON Manual OFF Automatic ON Automatic OFF	Manual B. SP. (Backspace) Manual REL. (Release)
<b>Variable Features</b>	
TAPE PUNCH INTERLOCK ON-LOCK UNLOCK CODE OPTION VISUAL ON-OFF NONCONTENTION E. O. T. (End of Transmission) SENSE SUPPRESSION	

#### MANUAL CONTROL FEATURES

**5.03 Tape Punch ON (Figure 9)** - When the ON pushbutton on the cover is depressed, 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.

**5.04 Tape Punch OFF (Figure 9)** - When the OFF pushbutton on the cover is depressed, the process described in 5.03 is reversed. 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.

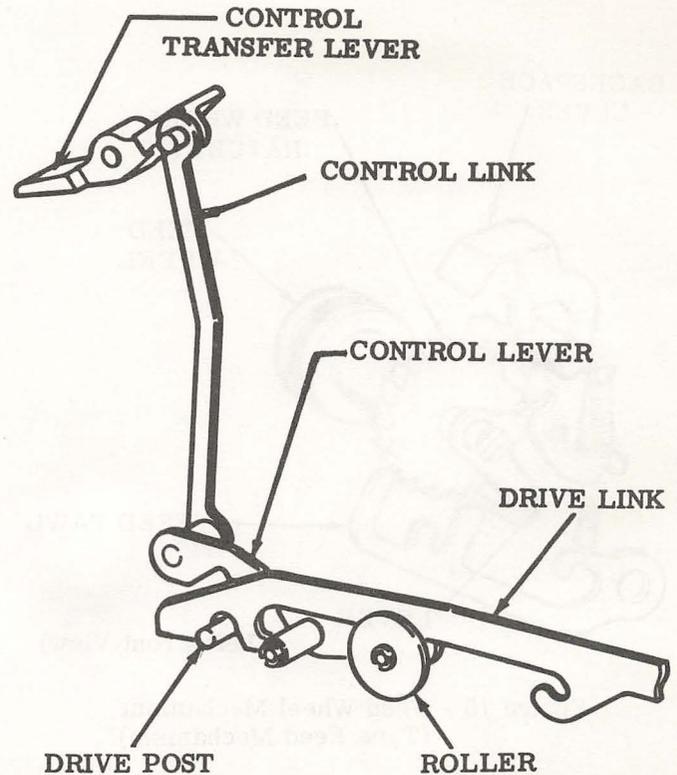


Figure 9 - Manual ON and OFF Mechanism

**5.05 Backspace** - When the B. SP. pushbutton on the cover is depressed, the backspace mechanism, described in 4.18, is operated. The backspace lever, when depressed, moves down to engage a tooth on the back side of the feed wheel ratchet (Figure 10). 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.

**5.06 Release** - When the REL. pushbutton on the cover is depressed, the entire backspace mechanism (Figure 6) pivots counterclockwise raising the roller away from the feed wheel. The tape can thus be pulled out freely.

#### AUTOMATIC CONTROL FEATURES

**5.07 Manual ON (Figure 11)** - Depressing the ON pushbutton 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

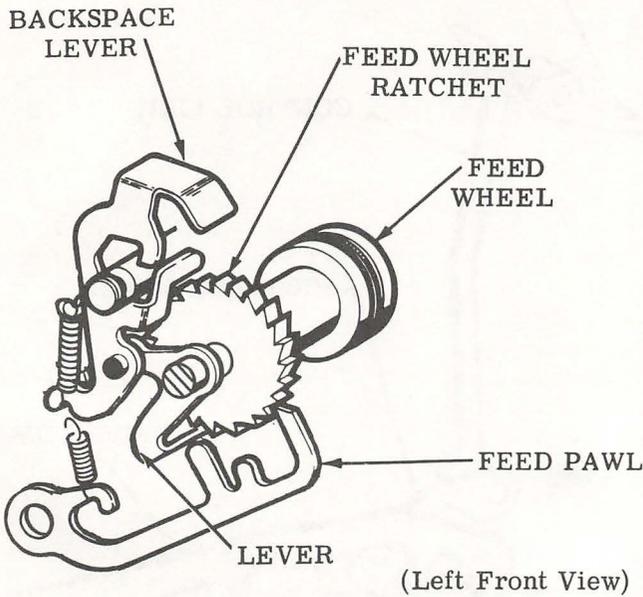


Figure 10 - Feed Wheel Mechanism (Tape Feed Mechanism)

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.

5.08 Manual OFF (Figure 11) - When the OFF pushbutton 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.

5.09 Manual Backspace - Same as the manual punch backspace operation described in 5.05.

5.10 Manual Release - Same as the manual punch release operation described in 5.06.

5.11 Automatic On (Figure 12) - For turning the tape punch ON automatically the same mechanism that turns it ON manually is used. When the "R" and "Control" keytops on the keyboard 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 upward, 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 5.07. 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.

5.12 Automatic OFF (Figure 13) - When the "T" and the "Control" keytops are depressed on the keyboard, the tape punch OFF

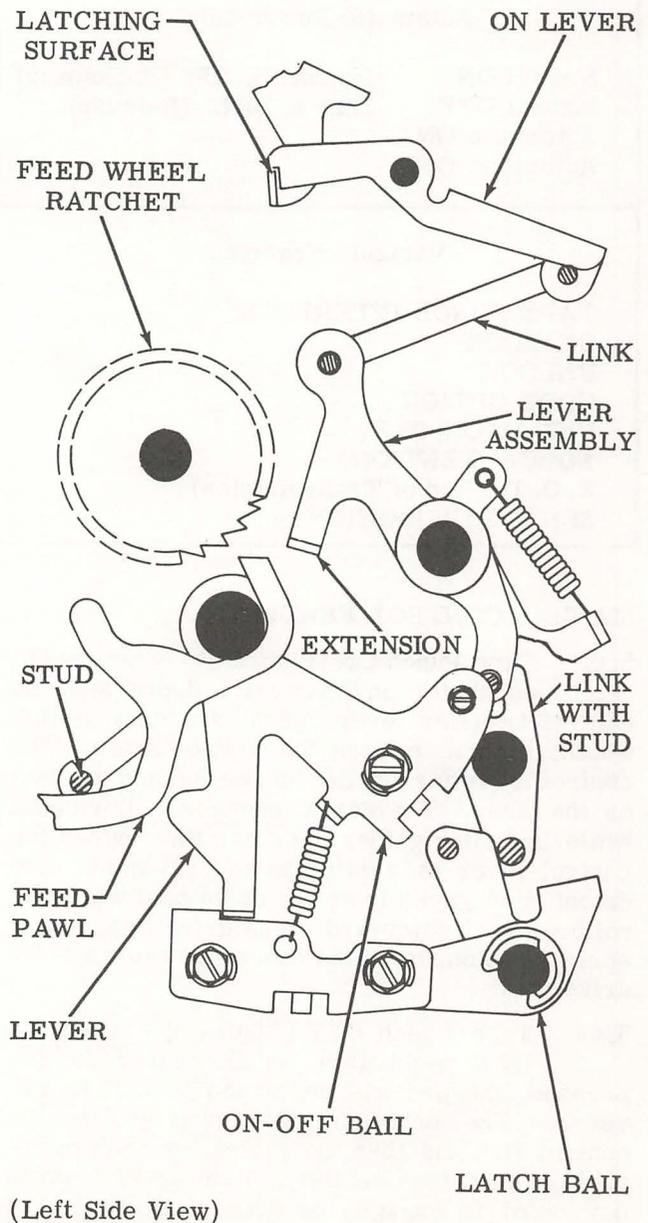


Figure 11 - Automatic ON and OFF Mechanism

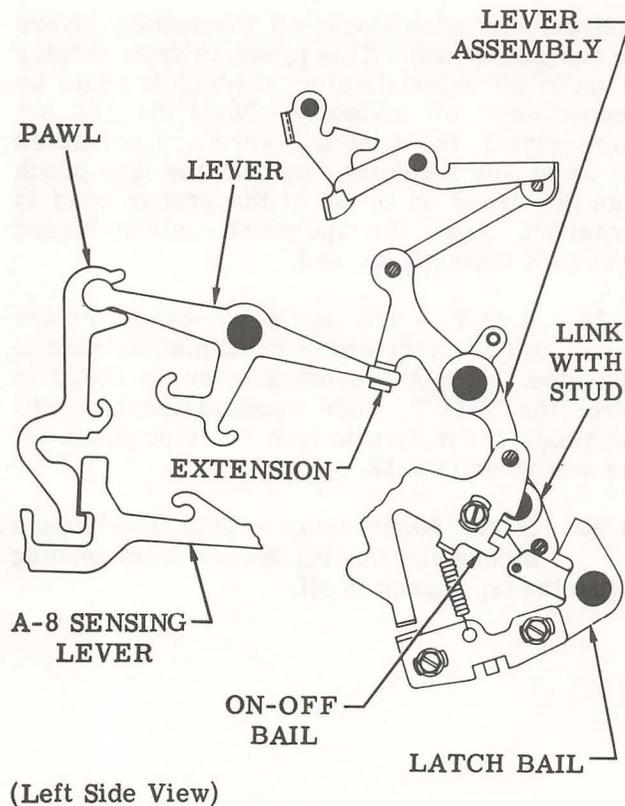


Figure 12 - Automatic ON Mechanism

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 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.

#### VARIABLE FEATURES

**5.13 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.

**5.14 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.

**5.15 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.

**5.16 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

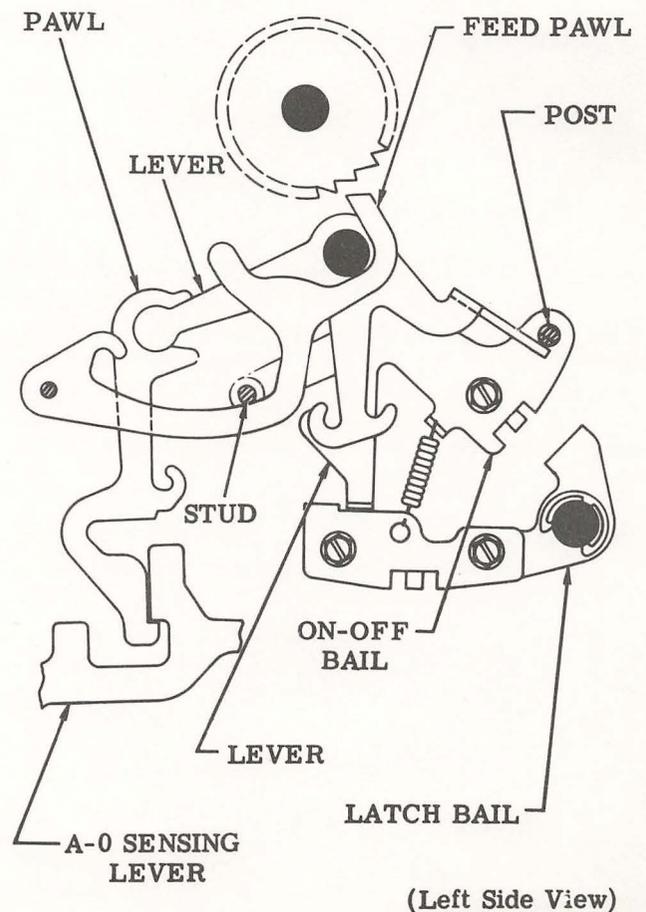


Figure 13 - Automatic OFF Mechanism

codebar extension tab and no. 7 sensing lever tab.

5.17 Visual ON-OFF Indicator - The indicator mounts on the ON and OFF lever mounting post and protrudes through the surface of the cover. The OFF lever positions the indicator; when the OFF lever is down it moves the indicator to the OFF position, when it is up it moves the indicator to the ON position.

5.18 Noncontention - In Automatic Send Receive (ASR) teletypewriter sets equipped with the noncontention mechanism an additional codebar and codebar extension operate to allow the tape punch to be turned on or off. When the ASR set is transmitting, the noncontention codebar is marking. When the ASR set is receiving, the noncontention codebar is spacing. When the ASR set is transmitting, the

codebar extension blocks all the sensing levers in the tape punch. This prevents from turning it on or off automatically, although it could be turned on or off manually. When the ASR set is receiving, the sensing levers are permitted to sense any incoming code and the tape punch can be turned on or off if the proper code is received. Again the tape punch could be turned on or off manually as well.

5.19 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 read the E. O. T. code combination and will originate the motion to turn the tape punch off as described in 5.12.

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