OPERATION OF THE TELETYPEWRITER, PERFORATOR AND TRANSMITTER-DISTRIBUTOR

CONTENTS

1. GENERAL

1.01 This section describes the mechanisms for producing and utilizing 5-unit teletypewriter signals.

1.02 The transmission of these signals may be made from the keyboard directly by hand operation or through automatic sending equipment which requires a previously prepared tape perforated according to the teletypewriter code.

1.03 The means of obtaining the perforated tape is also discussed.

1.04 This section revises and replaces Section AB95.103, Issue 1, dated August, 1938.

2. BASIC REQUIREMENTS OF THE TELETYPEWRITER

2.01 The sending arrangement in a teletypewriter is required to perform three functions:

(1) It must transmit the spacing "start" signal which will start the selecting cycle of the distant machine.

(2) It must apply the proper current condition to the line for each of the five accurately timed selecting intervals.

(3) It must send the marking "stop" signal to return the line to the normal idle condition.

2.02 The selecting arrangement in a receiving teletypewriter must perform the following functions:

(1) It must start the selecting cycle on receipt of the "start" signal.

(2) It must determine the line condition for each of the five selecting elements, and store this information.

(3) It must come to rest during the "stop" interval, and start the printing operation which converts the stored line conditions of the five signal elements into the proper typed character or other function.

3. KEYBOARD TRANSMITTING MECHANISM

3.01 The signaling code used to transmit characters is the "start-stop" 5-unit code which consists of five selecting intervals used in various combinations of current and no current conditions. To maintain synchronism between all teletypewriters on the circuit, each group of five selecting elements is preceded by a start signal and followed by a stop signal. The signal elements which energize the selector magnet are designated as "marking" and those which do not are designated as "spacing." The code used is shown graphically in Fig. 1.

3.02 The teletypewriter keyboard, employed on 14, 15 and 26-type machines, is a device to convert the mechanical operation of keys into electrical signal elements. The keyboard consists of a set of key levers, a bank of sending contact springs, operating cams, clutch and gear. The sending cams are normally held stationary because the clutches on the driving shaft are held disengaged by the clutch throwout lever.

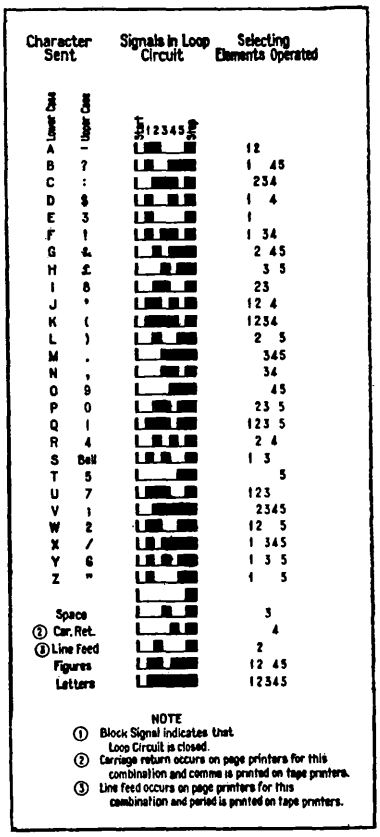


Fig. 1 - 5-Unit Start-Stop Teletypewriter Code

3.03 When a key lever is depressed, the driven member of the clutch is permitted to move into mesh with the driving member causing the cam sleeve assembly to revolve. At the end of one revolution the driven member of the clutch is disengaged by the clutch throw-out lever and the cam assembly brought to a stop until the next key lever is depressed. (Fig. 2.)

3.04 Beneath the key levers are five selector bars and a universal bar extending across the width of the keyboard. The selector bars are provided with notches as shown in Fig. 3 according to the requirements of the signaling code. When a key lever is depressed, it strikes the sides of these notches, moving the bars either to the right or left depending upon whether the signal element corresponding to the particular bar is to be spacing or marking.

3.05 The universal bar which is connected to the trip off pawl controlling the starting and stopping of the sending cams is pivoted at its two ends in such a way that the depressing of any key moves it downward to actuate the intermediate pawl and the clutch throwout lever. Thus, whenever a key is depressed, the selector bars are set and the universal bar is operated permitting the sending cams to start rotating. (Fig. 2.)

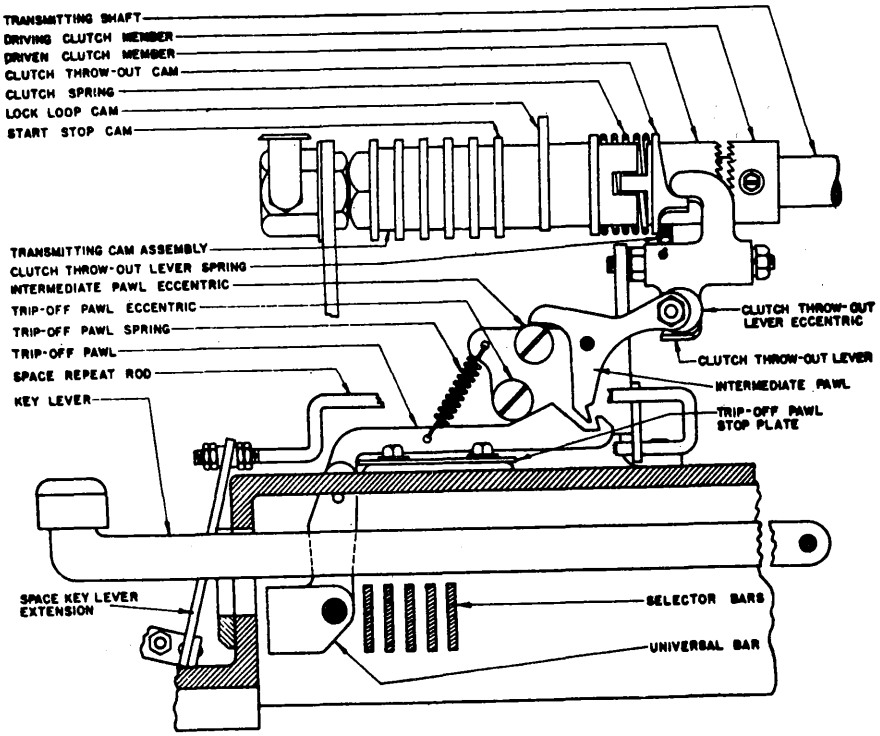


Fig. 2 - Transmitting Cam Assembly

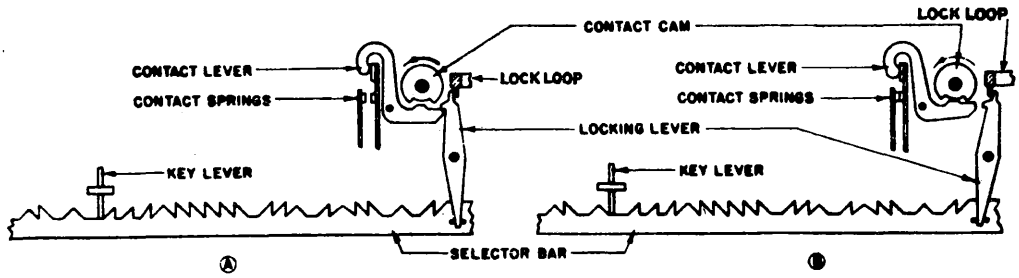


Fig. 3 - Selector Bars and Lock Levers

3.06 Each selector bar engages a locking lever at its right hand extremity and positions it to correspond with the signal element to be transmitted. (Fig. 3.) Each locking lever controls the motion of a contact lever by either allowing the contact lever to close its contact when the cams revolve or by restricting the motion of the contact lever so that the contacts remain open. If the upper end of the locking lever is positioned to the left corresponding to a spacing signal, it engages the contact lever and prevents it from rising into the indent of the cam as it rotates, thus holding the circuit open for that interval. (Position A in Fig. 3.) If the locking lever is positioned to the right corresponding to a marking signal, it does not interfere with the movement of the contact lever. (Position B in Fig. 3.) Then as the cam revolves the contact lever rides on the cam surface and rises into an indent thereby allowing its contact to close, sending out the marking signal. As the cams rotate, the signals, either marking or spacing, are transmitted in succession.

3.07 The start-stop cam (Fig. 2) controls an additional contact lever which in turn actuates the start-stop contacts. These contacts are opened at the beginning of each

revolution of the cam shaft to transmit the start signal (spacing) and remain open during the transmission of the five selecting signal elements. After the fifth element has been transmitted, the "start-stop" contacts again close, transmitting the "stop" signal (marking). At the end of the revolution of the cam sleeve assembly, the clutch throw-out lever disengages the driven clutch member from the driving clutch member and prevents the cam sleeve assembly from rotating further. The start-stop contacts will remain closed until the cam sleeve assembly again starts rotating when a key lever is depressed. The lock loop (Fig. 3), i raised by the lock loop cam at the end of each revolution of the cam assembly. When the sending shaft starts to rotate the lock loop is lowered to engage the upper projections of the locking levers, thus preventing a change in the selection while the cam assembly is rotating. This arrangement makes it impossible to depress another key lever until the signal for the previous character has been transmitted.

3.08 The keyboard may be equipped with a space repeat device (Fig. 2) which permits continuous transmission of the space code combination. When the space bar is depressed, the space repeat rod attached to the space key lever extension will cause the intermediate pawl to hold the clutch throw-out lever out of engagement with the projection on the driven member of the clutch as long as the space key lever is held depressed. Thus the transmitting cam assembly will rotate continuously until the space key lever is released.

3.09 Fig. 4 illustrates more clearly the arrangement of the keyboard cam sleeve assembly which operates the keyboard sending contacts. There are only six cams, one for each of the five signal elements and one for both the start signal and the stop signal. It will be noted that the indent on the No. 1 cam begins a short interval after the end of the start-stop cam indent (in 60-speed operation this interval is 22 milliseconds, constituting the start signal). The indent on the No. 2 cam begins at the end of the indent on the No. 1 cam, and similarly for the other cams to the No. 5 cam where the start-stop cam indent begins at the end of the indent on the No. 5 cam. In 60-speed operation the interval of each signal element cam indent is 22 milliseconds and of the start-stop cam indent is 31 milliseconds. For 75-speed operation the cam sleeve assembly is exactly the same but the speed of rotation is faster thereby making the same No. 1 to No. 5 cam indents 17.6 milliseconds each and the stop indent 25 milliseconds.

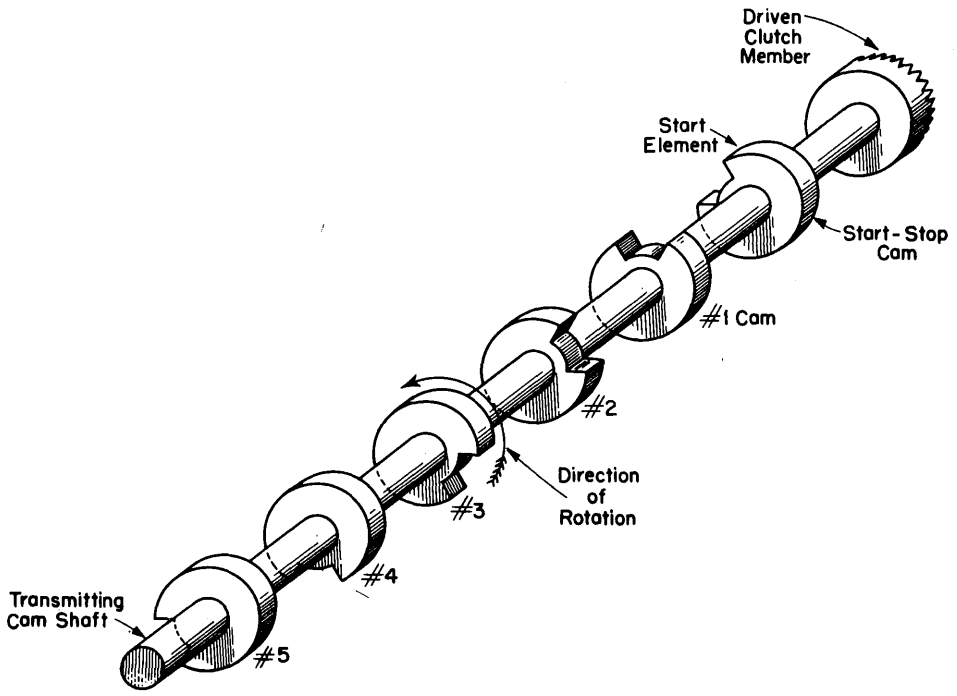


Fig. 4 - Exploded View of Keyboard Cam Sleeve Assembly

3.10 To follow the transmission of a single character "N" from the idle position to stop position, reference is made to Figs. 2, 3 and 4. In the idle condition with the power of the teletypewriter on, the motor is rotating causing the transmitting shaft and driving clutch member to rotate. The driven clutch member is disengaged from the shaft by the clutch throw-out lever making the transmitting cam assembly stationary. In this condition the indent on the start-stop cam allows the horizontal portion of the contact lever to rise up thereby releasing the hold against the spring tension of the start-stop contact and closing that contact with the stationary contact. This keeps the circuit closed. When the key lever "N" is depressed it performs the following functions:

(1) It strikes the slanting sides of the notches of the selector bars and moves bars 1, 2 and 5 to the right (space) and bars 3 and 4 to the left (mark) since the code for "N" is SSMMS. This allows 1, 2 and 5 locking levers to hold their corresponding contact levers and contact springs open. Locking levers 3 and 4 release their hold on contact levers 3 and 4 permitting them to close their contacts when 3 and 4 indent rides over the raised portion of the contact levers.

(2) It depresses the universal bar which pulls the trip-off pawl towards the keyboard to operate the intermediate pawl which in turn pushes down on the clutch throw-out lever releasing its hold on the driven clutch member allowing it to engage the driving clutch member and the sending cam sleeve assembly starts its rotation.

3.11 At the beginning of the rotation the start-stop cam (Fig. 4) opens the start-stop contact (no locking lever on start-stop contact lever). This contact remains open for the duration of the character and the line signals are now under control of the five transmitter contacts. Also at the start of rotation, the locking loop, which was lifted by the lock loop cam (Fig. 2), falls into a position with the locking levers to lock them into their selected positions so they may not be disturbed during the transmission of the signal.

3.12 After the start of rotation and the opening of the start-stop contact, the indent on cam No. 1 (Fig. 4) rides over the raised portion of its contact lever but the horizontal portion of the contact lever is prevented from raising upward because No. 1 locking lever is holding it down and for this signal interval a space is transmitted. The No. 2 cam indent begins where No. 1 cam indent ends and No. 2 contact lever is held down also keeping its contact open so that the transmitted signal is still an open. At the end of the indent on cam No. 2 the indent on cam No. 3 rides over the high spot on contact lever No. 3 and allows it to operate, causing the contacts to make. This closes the circuit and transmits a closed signal. The No. 3 locking lever had no control over the No. 3 contact lever since it was pushed away by the No. 3 selector bar. The same action takes place during the fourth selecting signal element. There is no break between these two marking signals. The circuit opens after the fourth pulse because the No. 4 cam applies pressure downwardly on the contact lever causing the No. 4 contact to open. The No. 5 contact is held open by its locking lever and a space signal is transmitted. At the end of the indent on No. 5 cam, the indent on the start-stop cam allows the start-stop contact lever to rise and close its contacts by the action of the spring tension on the back contact. The circuit now remains closed. At the completion of one revolution, the clutch throw-out lever, which is riding the periphery of the driven clutch member, comes in contact with the clutch throw-out cam, thereby disengaging the driven clutch member from the driving clutch member and stopping the revolution of the cam sleeve assembly until another key is depressed. At the completion of the one revolution the high spot on the lock loop cam raises the lock loop, permitting the locking levers to be repositioned for the next character.

3.13 The keyboard of a 15-type teletypewriter is illustrated in Fig. 5.

4. 14-TYPE RECEIVING MECHANISM

(A) Operation of Receiving Selecting Mechanism

4.01 The receiving portion of the teletypewriter consists of a selecting mechanism and a typing mechanism. The following description refers particularly to the 14-type teletypewriter which employs type bars to print on a paper tape about 3/8" wide. The 14-type teletypewriter employs either a pulling magnet or a holding magnet to receive the line signals either through a polar telegraph relay or directly from the line. The pulling magnet utilizes the current from this relay or line to attract the magnet armature which is a part of the selecting mechanism. The holding magnet type holds the armature if current is present in the magnet, after the armature has been mechanically presented to the magnet.

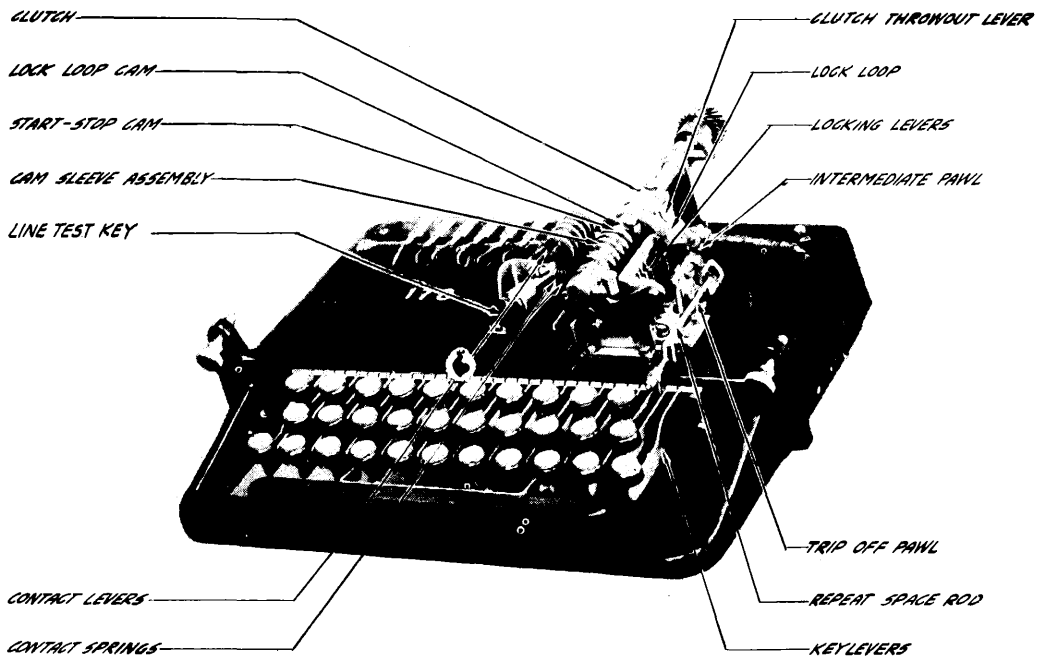


Fig. 5 - Keyboard of a 15-Type Teletypewriter

4.02 The electrical circuit in a typical teletypewriter installation employing pulling magnets with a line relay wired for neutral operation is illustrated in Fig. 6. With the proper polarity of battery applied to the line or loop the line relay line winding will have sufficient current to operate the armature to the mark (M) contact by overriding the opposite current in the bias winding which tends to operate the relay to the space contact. In this position there is a current flow through the selecting magnets to hold the selecting mechanism idle. When the line or loop circuit is opened (space) the current in the bias winding operates the relay armature to the space contact (S) deenergizing the selector magnets. Thus the selector magnet armature follows the code signals. From the operation of the magnet armature to the completion of the printing of the character the action is strictly mechanical. It will be noted that the transmitting keyboard contacts are in the line circuit and will operate the same line relay to provide "home copy," i.e., printed copy of information being transmitted.

4.03 This circuit does not include the motor circuit which must be operated to perform the mechanical functions of the machine.

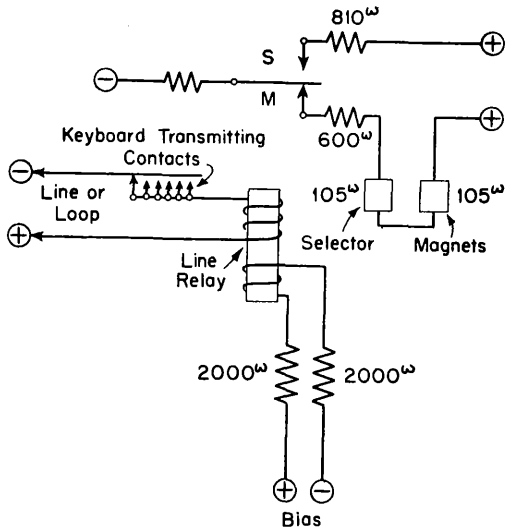


Fig. 6 - Simplified Wiring of a Teletypewriter for Neutral Operation with Line Relay

4.04 The start-stop arrangement of the selector assembly is shown in Fig. 7. Normally the selector mechanism, which is driven through a friction clutch, is held from rotating by the stop arm resting against the stop lever. When

a start (space) signal is received the magnet armature is released and the trip plunger is pushed to the left by the armature trip-off eccentric screw. The plunger bears against the intermediate bell crank lever to actuate the trip latch. When the latter is tripped the stop lever rotates slightly under the pressure of the stop arm against it, and the stop arm is released, allowing the receiving cams to rotate.

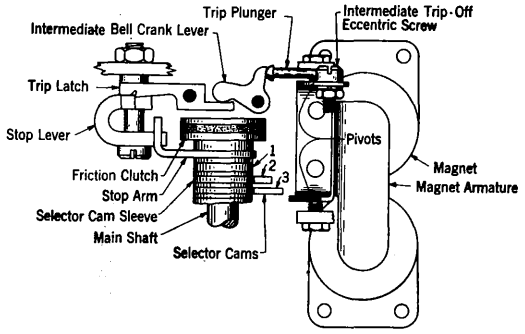


Fig. 7 - Start-Stop Arrangement of Receiving Mechanism

4.05 Fig. 8 illustrates the selecting mechanism. When the selector cam rotates sufficiently it strikes the end of a selector lever. At this time the armature is either operated or unoperated, depending upon whether the particular selecting signal element received is marking or spacing. Whichever position it occupies it is prevented from changing position during the selecting operation by a cam operated locking lever as shown in Fig. 9. Assuming the received signal element is mark, the armature and armature extension will then occupy the positions shown in Fig. 8. As the cam engages a selector lever, the latter is rotated slightly in a counterclockwise direction carrying with it the sword associated with it, the right-hand end of which will strike the right-hand end of the armature extension. The sword will be rotated clockwise about its pivot A. When the cam projection clears the selector lever, the selector lever spring will restore the selector lever to its initial position. This causes the point of the sword to move against the left end of the T lever, which will move the code bar from the position shown in Fig. 9 to the right.

4.06 In the case of a spacing signal element the magnet armature and armature extension will be in their unoperated positions. In this event a sword, when pulled back by the action of the selector cam rotating the selector lever, will strike the left end of the armature extension and be moved counterclockwise. Then the point of the sword will engage the right end of the T lever and move the code bar to the left. In this manner, each of the five code bars is made to occupy either a selected or non-selected position by the five swords and T levers as a part of the operation of printing each character.

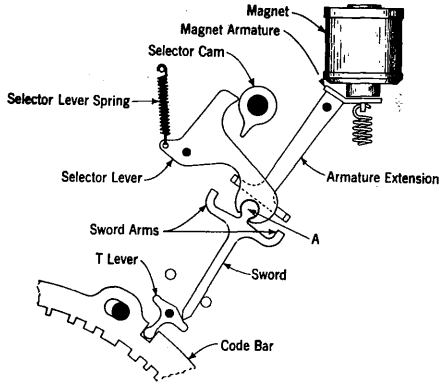


Fig. 8 - Selecting Mechanism of a Teletypewriter

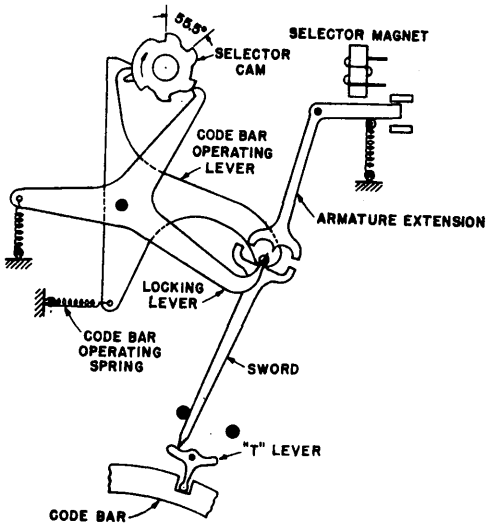


Fig. 9 - Teletypewriter Selector Mechanism Illustrating Operation of Locking Lever

4.07 The five code bars are provided with slots corresponding to the teletypewriter code and are arranged above each other as shown in Figs. 10 and 11. For each operation of the teletypewriter the pull bars corresponding to the different type bars and teletypewriter functions to be operated are permitted to move into contact with the edges of the code bars (see Fig. 10). In front of one and only one of these pull bars (the one to be operated) there will be a line-up of slots in the code bars permitting this pull bar to move into the slots. All the other pull bars will be restrained by striking an unslotted portion of one or more of the code bars. Thus, one and only one pull bar of the group will be selected. Because of the additional movement of the pull bar into the slots, the main bail in its upward travel will engage a notch in this pull bar, thus operating it. (Fig. 11.) The motion of the main bail is controlled by the main bail cam as described in the following paragraph.

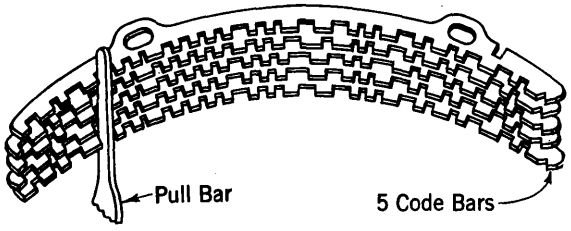


Fig. 10 - Principle of Selection by Code Bars

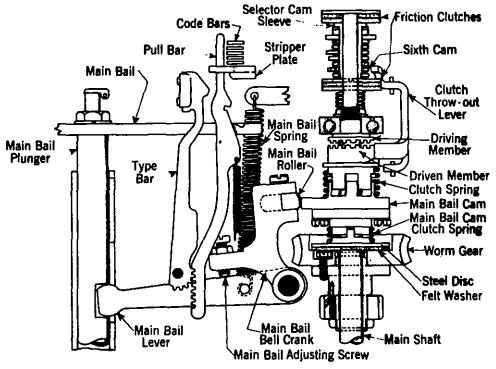


Fig. 11 - Typical Typing Mechanism

(B) Operation of Printing Mechanism

4.08 Fig. 11 shows a 14-type typing mechanism. When a selection has been made, the sixth cam trips the clutch throw-out lever, the teeth in the driven member engage those in the driving member and the main bail cam is caused to rotate. One end of the main bail bell crank rolls on the main bail cam and controls the motion of the main bail plunger and the main bail. When the cam revolves, the bell crank allows the plunger, through the action of the main bail spring, to pull the main bail upward and a pull bar with it. The type bar, through the gear at its lower end meshed with a gear arrangement on its associated pull bar, is rotated counterclockwise and the type driven toward the platen, thereby typing the letter for the combination selected. As the pull bar nears the end of its stroke the right edge of the hook engaged by the bail strikes the stripper plate just underneath the code bars, and the pull bar is forced out of engagement with the main bail and slots in the code bars and returns to its normal position under the action of a pull bar spring. During the last portion of the main bail cam cycle the cam returns the main bail to its normal position against the tension of the main bail spring. During its downward motion the main bail pushes all pull bars away from the code bars. An illustration of the 14-type machine is shown in Fig. 12.

5. 15-TYPE RECEIVING MECHANISM

(A) Typing Units Equipped with Pulling Magnets

5.01 The 15-type teletypewriter equipped with pulling magnets employs a receiving mechanism similar to the 14-type mechanism with pulling magnet. The No. 15 machine uses a page form of paper which is stationary while the type bars, contained in a carriage, are moved from left to right while printing. When the right edge of the paper is reached, special functions return the carriage to the left end of the page and raise the paper to provide a new typing line. The 15-type machine is illustrated in Fig. 13.

(B) Typing Units Equipped with Holding Magnets

5.02 The 15-type teletypewriter equipped with a holding magnet selector employs a receiving mechanism similar to the 14-type mechanism with holding magnet selector. The holding magnet typing units differ principally from the pulling magnet unit in that it is provided with a holding selector magnet which is suitable for use on either 20 or 60-mil circuits, in many cases without a line relay. For operation on 20-mil circuits the holding magnet coils are connected in series and for 60-mil circuits in parallel. The change from one connection to the other is made by operating a

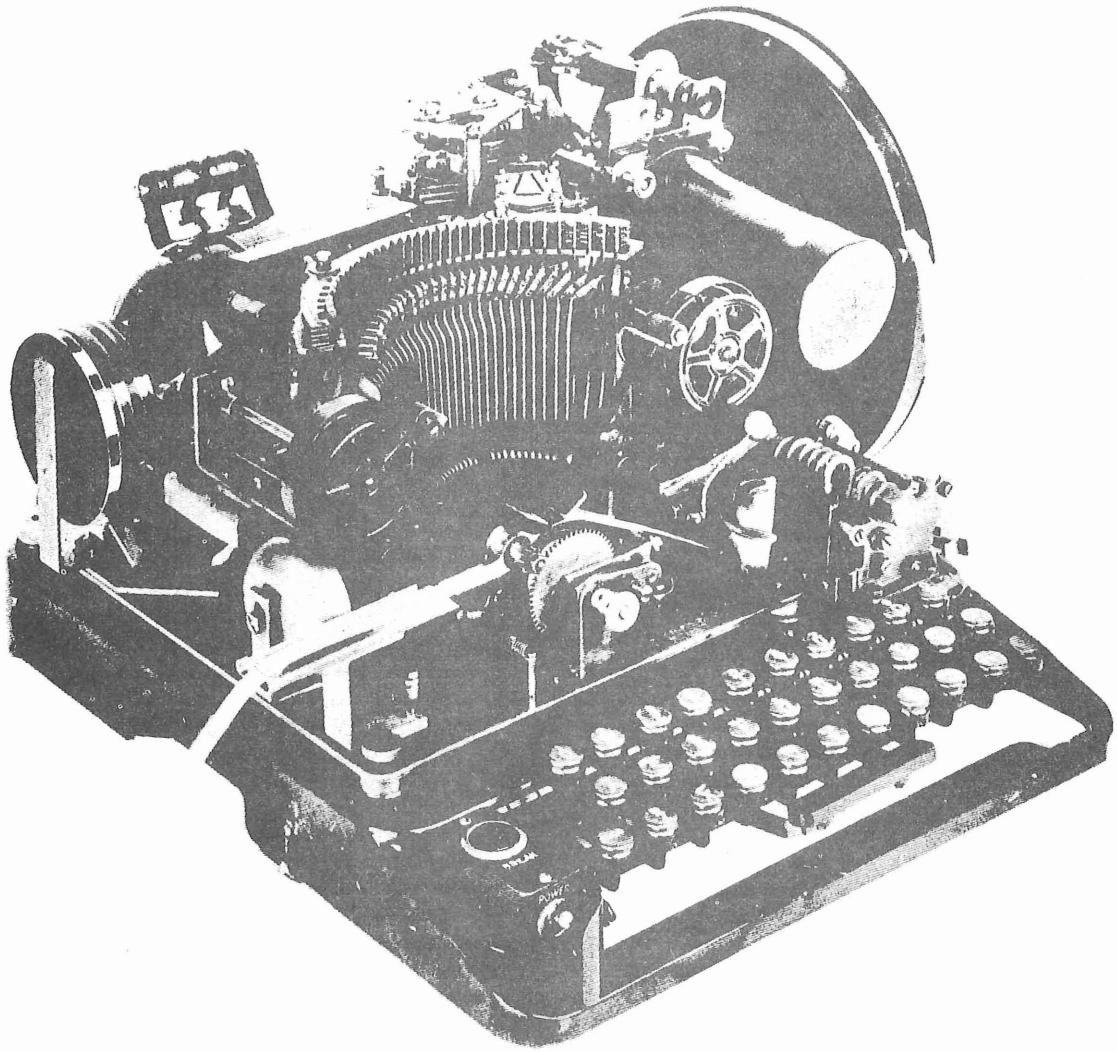


Fig. 12 - 14-Type Sending-Receiving Teletypewriter (Cover Removed)

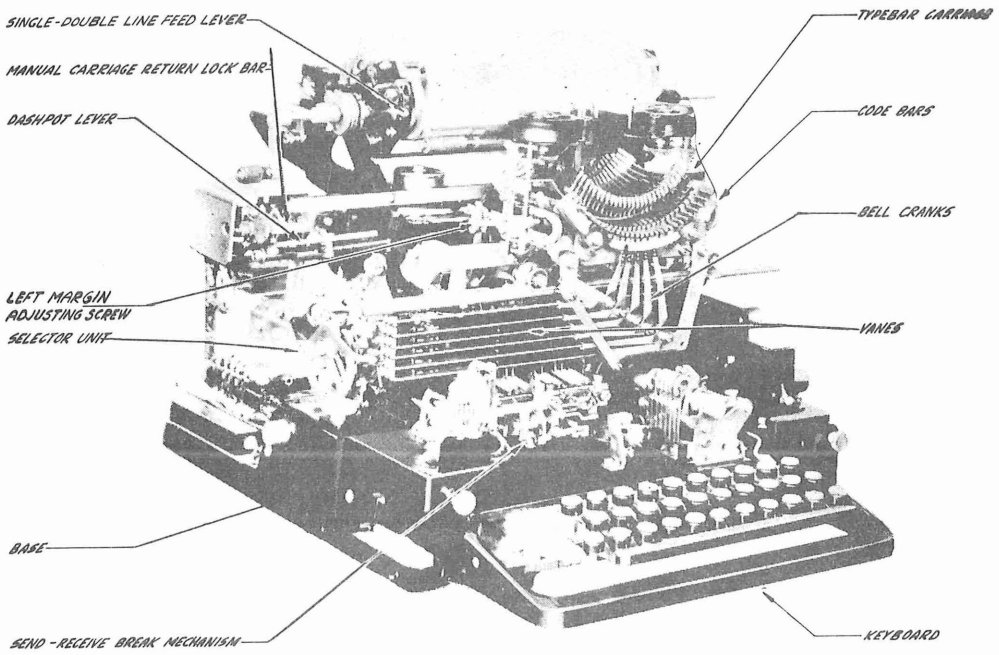


Fig. 13 - 15-Type Sending-Receiving Teletypewriter (Cover Removed)

small switch on the selector unit. When the switch is thrown for the series connection a shunt of 5000 ohms is automatically connected across the coils to reduce the voltage induced in the line circuit when the armature is pushed up by the cam.

(C) Operation of Holding Selector Magnet

5.03 The operation of the holding magnet selector mechanism is similar to that of the pulling magnet except that a "holding" type of selector magnet is provided. In this new arrangement the sensitivity is greatly increased by supplying mechanically the energy required to move the magnet armature from its released position to its operated position. A cam, known as the armature lever cam, is provided as part of the cam sleeve assembly which is rotated on a start-stop basis as in the previously described machines. The projections on this cam engage the armature lever which is coupled to the armature so that the armature is pushed up to its operated position once for each selecting pulse and stop pulse. The armature reaches its operated position and the cam releases its hold just prior to the center of each selecting impulse. Then if there is current in the magnet the armature will be held operated magnetically, while if there is no current at this time the armature will be returned to its unoperated or spacing position.

5.04 The selecting arm is pulled to marking (upward as viewed in the Fig. 14) by means of the spring connecting the armature lever extension and the selector arm and is pushed downward (to spacing) by means of the selector arm operating screw. Immediately after the disengagement of the armature lever from the cam, the lock lever moves in and locks the selector arm in the position that it occupies at this instant and the selection of the pulse is accomplished. The selecting action from here on takes place through the agency of the selector arm extension and the sword operating arms. After the sword has been positioned the lock lever unlocks the selector arm and the latter is moved to the new position of the armature on the next selecting interval.

5.05 The detent arrangement is provided to prevent the bouncing of the selector arm when it is operated from its marking to its spacing position or vice versa.

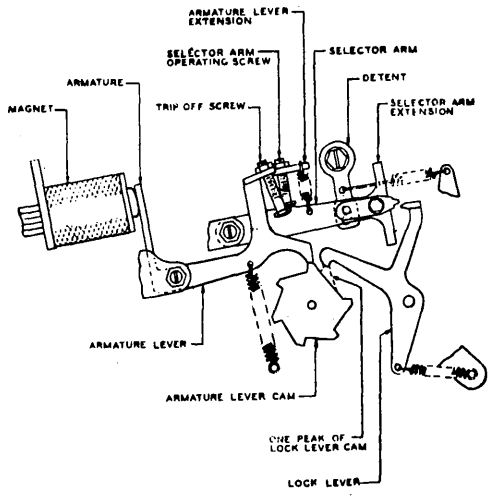


Fig. 14 - Selecting Mechanism Equipped with Holding Magnet

6. TAPE PERFORATING ARRANGEMENTS

(A) General

6.01 Instead of transmitting from a teletypewriter keyboard, it is frequently of advantage to transmit automatically from a perforated tape. With this type of transmission one or more operators may perforate tape as fast as is convenient, and the tape may be fed through an automatic transmitter at a uniform rate, thereby making use of the maximum transmitting capabilities of the teletypewriter circuit. The machine used for punching holes in such tape is known as a perforator. It may be a separate unit with a keyboard used solely to operate the perforating mechanism or it may be a unit which is attached to the keyboard of a teletypewriter and could be used to be operated simultaneously with transmission of signals from that teletypewriter. The 15-type perforator-transmitter can be used as a keyboard only, to punch only, or to simultaneously punch and transmit.

6.02 Another device for perforating tape is known as a reperforator. This arrangement utilizes teletypewriter signals, and from them operates a device for punching the proper holes in the paper tape. This permits relaying from one circuit to another. The selecting mechanism by which the received teletypewriter signals are made to select the proper combination of holes to be punched is similar to the

receiving selecting mechanism of a teletypewriter. A typing reperforator not only perforates but also types the message on the same tape.

6.03 A reperforator-transmitter combines the operations of a typing reperforator and a transmitter (described later) in a single unit, making it possible to receive signals from a circuit and retransmit these signals to another circuit without handling by an operator.

(B) Perforator Unit

6.04 A tape perforator consists of a perforating mechanism controlled by a keyboard, by means of which combinations of holes corresponding to the signals of the teletypewriter code may be punched in a paper tape approximately 11/16" wide for the 5-unit code. The perforator may be a separate unit or it may be associated with the keyboard of a 15-type teletypewriter. (Fig. 15A.) The latter unit will be described here.

6.05 The signaling code used is the start-stop 5-unit code. There is no need for perforating the start and stop pulse because these are automatically transmitted for each character. The five selecting pulses are perforated in addition to a feed-hole to move the tape. As shown in Fig. 16, a marking signal is represented by a punched hole in the tape and a spacing signal is represented by no perforation.

6.06 Attached to the left side of the keyboard casting is a bracket which mounts the perforator mechanism consisting essentially of a set of punches for perforating the tape, a punch magnet and punch operating lever for operating the punches, a set of selector fingers, selector levers and "Y" lever connecting link extensions used in selecting the punches, and a tape feed mechanism. (Fig. 15B.)

6.07 In Fig. 15B the selector fingers rest in horizontal guide slots in the punch operating lever just below the punches and in line with them. The right end of each selector finger is attached to a selector lever that pivots on a mounting bracket at its lower end. A "Y" lever connecting link extension connects the left end of each "Y" lever connecting link to the central portion of its corresponding selector lever in such a manner that each selector finger will move to the right or left in accordance with the movements of the "Y" lever connecting links. The "Y" lever connecting links are controlled by the "Y" levers which are operated by the selector bars of the keyboard mechanism. It should be noted that both the selector fingers and the locking levers respond to the code selection whenever a key of the keyboard mechanism is depressed.

6.08 The magnet armature is mounted on a centrally pivoted punch operating lever. When the right end of the punch operating lever is attracted by the magnet, the left end rises, carrying the left ends of the selector fingers upward. If a selector finger is in its left or operated position when the punch operating lever rises, the corresponding punch will be pushed through the tape. If a selector finger is in its right or unoperated position, it will clear the corresponding punch as it moves upward, and that punch will not perforate the tape.

6.09 The perforating mechanism may be removed from the control of the teletypewriter keyboard, it may be operated at the same time that the keyboard transmitting mechanism is in operation or it may be used alone without the operation of the transmitting mechanism. These methods of operation are under the control of the keyboard control operating lever. (Fig. 15C.)

6.10 The "keyboard" (top) position of the keyboard control operating lever enables sending on the line with a typed record being produced both on the transmitting teletypewriters and on the other teletypewriters connected to the line. The speed of typing is limited to the maximum speed of the machine; for example, 60 words per minute for a 60-speed service.

6.11 The "Kbd & Tape" (middle) position enables the simultaneous perforation of messages in tape for automatic transmission, sending on the line and producing a copy on the transmitting teletypewriter. When this position is used the speed of typing is also limited to the maximum speed of the service.

6.12 The "tape" (bottom) position enables the perforating of messages on tape while receiving a message from another point. The speed of typing under this condition is not limited to the speed of the service and the keyboard can be operated in excess of 100 words per minute.

6.13 The indicator on the character counter (Fig. 15C) moves each time a key is depressed when the keyboard control operating lever is in the "tape" position. The indicator

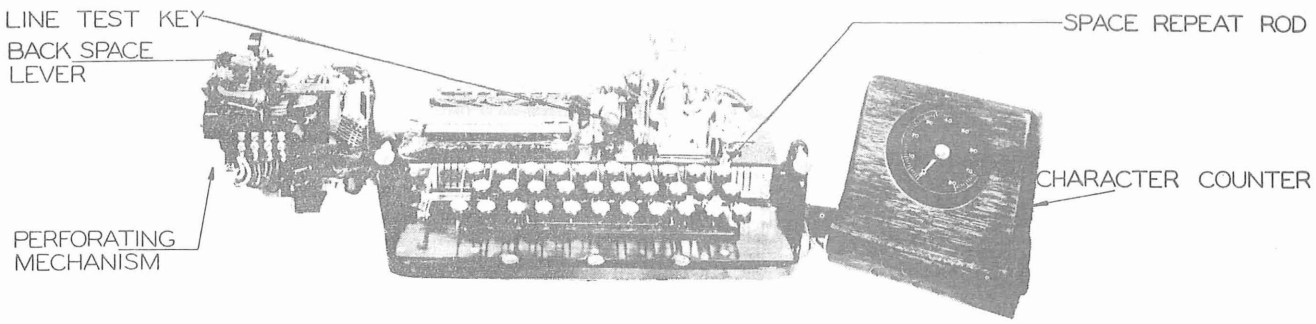


Fig. 15A - 15-Type Perforator-Transmitter

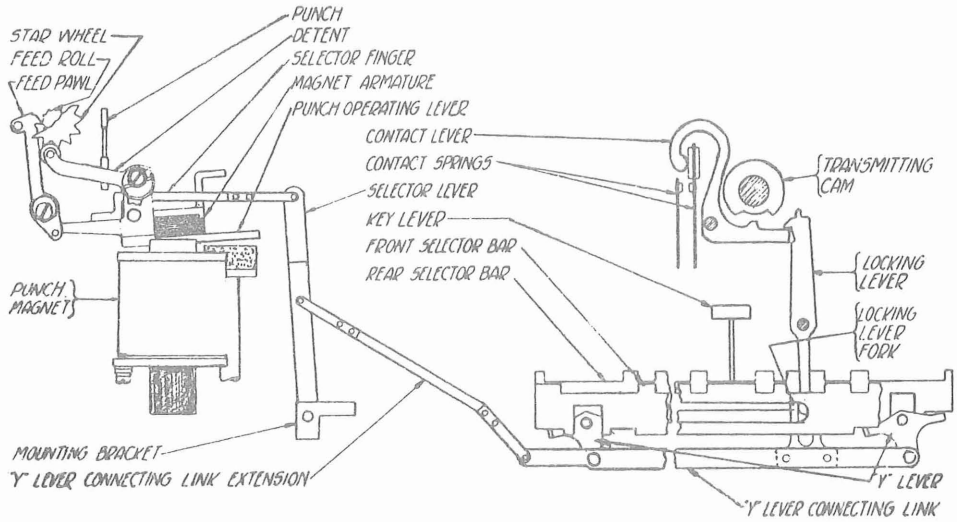


Fig. 15B - Perforator Operating Mechanism of the 15-Type Perforator-Transmitter

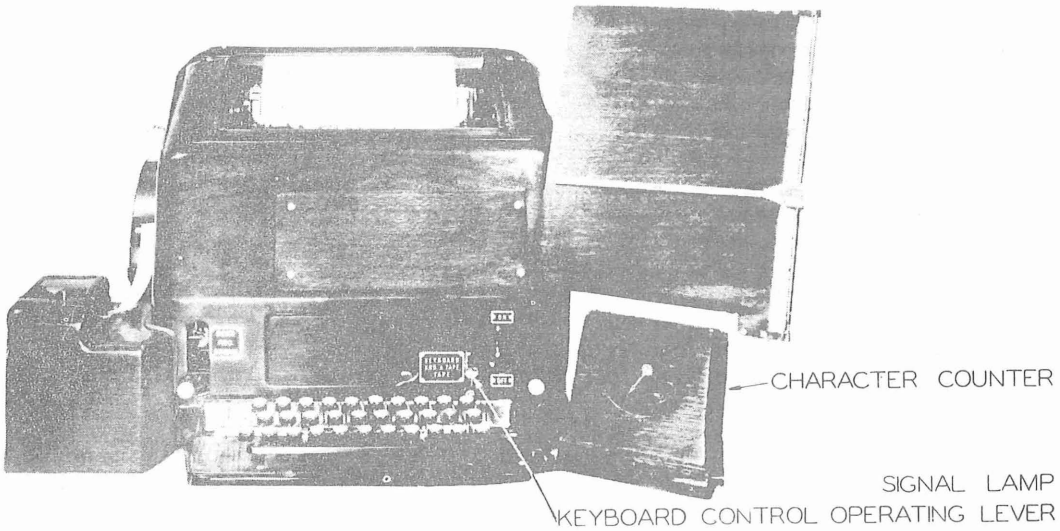


Fig. 15C - 15-Type Teletypewriter and Perforator-Transmitter Enclosed in a Single Cover

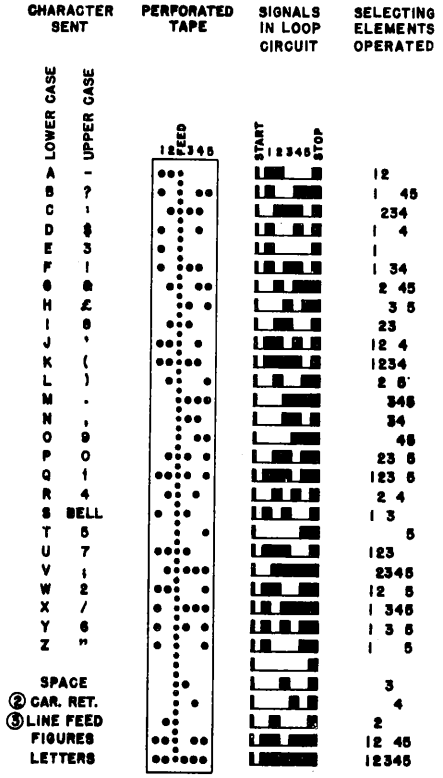


Fig. 16 - 5-Unit Teletypewriter Code and Corresponding Tape Perforations

returns to its zero position when the "carriage return" key is depressed. The counter is also provided with a red signal lamp to indicate when the end of a line is being approached.

(C) Reperforator Unit

6.14 The difference between a perforator and a reperforator is that the reperforator perforates tape from received line signals whereas the perforator is directly connected to a keyboard mechanism as explained above.

6.15 The 14-type reperforator (Fig. 17) is a motor-driven unit having a single selecting magnet and operating on the same principle as the 14-type teletypewriter. It operates from a standard 5-unit teletypewriter code and perforates the signals received in a tape approximately 11/16" wide. It is designed for 60-speed service only.

6.16 Received signals actuate a selector mechanism identical to that of the 14-type teletypewriter. This selector mechanism positions punch levers in the case of the reperforator instead of code bars as in the 14 teletypewriter. After the punch levers are positioned, a perforating blow is delivered to the punches from a cam on the main shaft of the unit. After the tape has been perforated in accordance with the positions of the punch levers, it is stepped forward under the action of a spacing pawl.

6.17 A tape reel for storing unpunched tape is located at the top of the unit and in this position is easily accessible for renewing the roll of tape. In order to take care of the punchings called "chad," a chad chute is provided which conveys the chad from the punch block to a drawer located on the base of the unit. This drawer is easily removable through a door in the cover for the purpose of emptying.

6.18 A tape feed lever, which is easily accessible from the outside of the unit, is provided to permit feeding out the tape to the tear-off point. When this lever is depressed "letters" signals are punched in the tape. This manual operation should only be performed when the reperforator is idle.

(D) Typing Reperforator Unit

6.19 A typing reperforator is a motor-driven mechanism designed to receive teletypewriter signals and to record them on tape in the form of code perforations and printed characters. Messages so recorded are particularly adaptable to services where one or more incoming lines terminate at a central point and where messages received over these lines may be sorted and retransmitted over one or more outgoing lines. In this type of service the typing reperforator provides perforated tape with messages which can be read without the necessity of deciphering code perforations.

6.20 The typing reperforator unit consists, essentially, of a motor drive, a selector mechanism, mechanisms for printing and perforating and a tape feed mechanism. The base includes a tape reel, terminal blocks, and motor switch. The cover encloses both the typing reperforator unit and the base and has a hinged top to permit easy access to the typing reperforator unit to replenish tape and to replace ribbons. A unit may or may not be equipped with a keyboard to transmit signals. A unit without the keyboard known as a "receiving only" typing reperforator is illustrated in Fig. 18. A unit with a keyboard known as a "sending and receiving" typing reperforator is shown in Fig. 19.

6.21 The typing reperforator uses standard perforator tape approximately 11/16" wide. A method of tape perforating known as chadless perforating is used to permit both

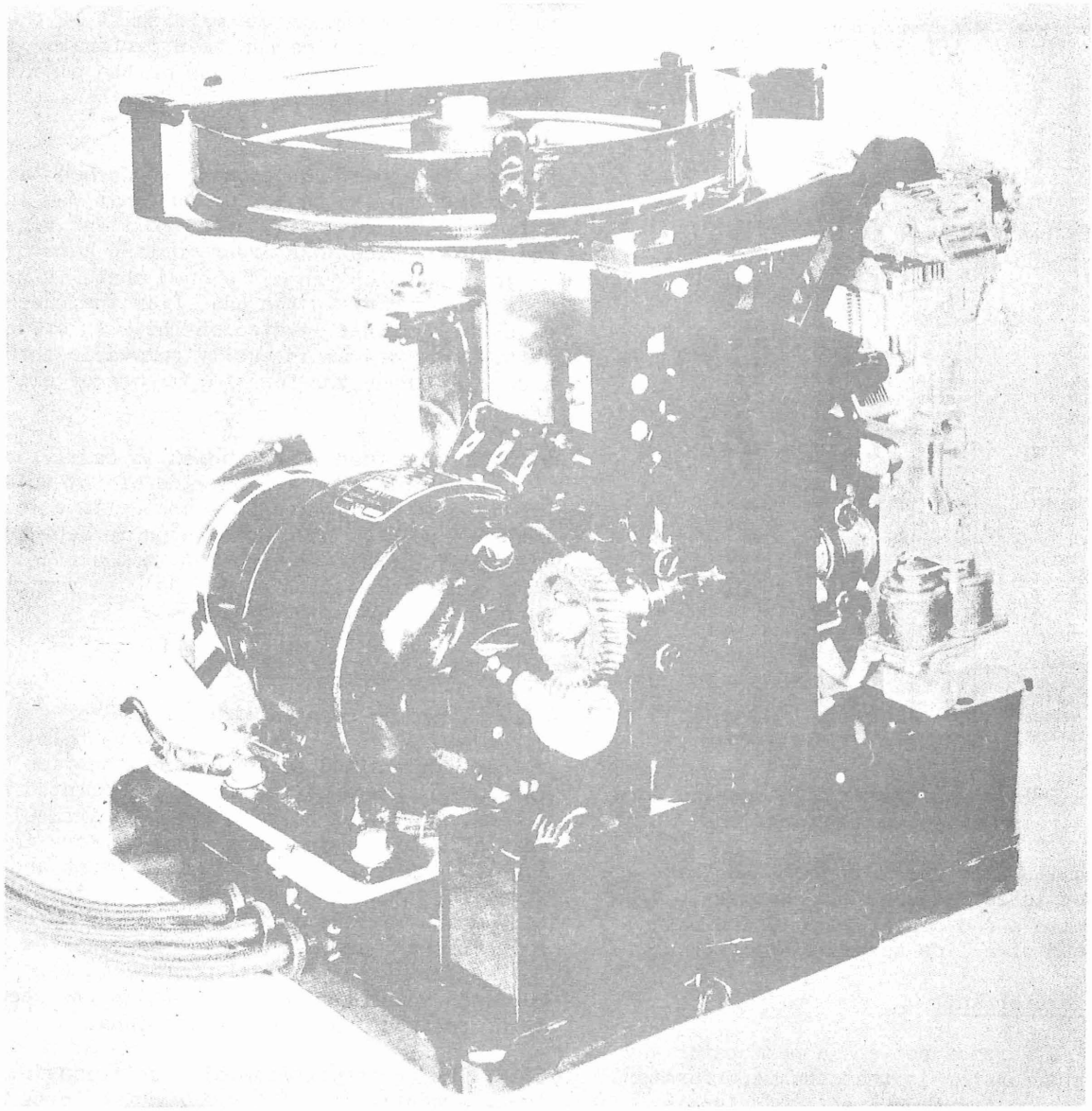


Fig. 17 - 14-Type Reperforator (Cover Removed)

printed and perforated characters to occupy the same portion of the tape. The punchings, or chads, are not completely severed from the tape but remain attached to it at their leading edges so as to form lids. The printed characters are legible because the perforating does not eliminate any portion of the tape. Typing and perforating occurs simultaneously, but due to the fact that the platen is to the right of the perforator die block, characters are typed six spaces to the right of their respective perforations.

6.22 The selecting and printing mechanism translates the signals into mechanical motion in essentially the same manner as the tape-type teletypewriter. The code bars are locked in position after each selection by the code bar locking lever located in the extreme right-hand slot of the pull bar guide. (Fig. 20.) The locking-lever is brought into engagement with "V" shaped notches in the code bars by a spring during the early part of the upward stroke of the main bail. It is disengaged from the notches by the main bail as the

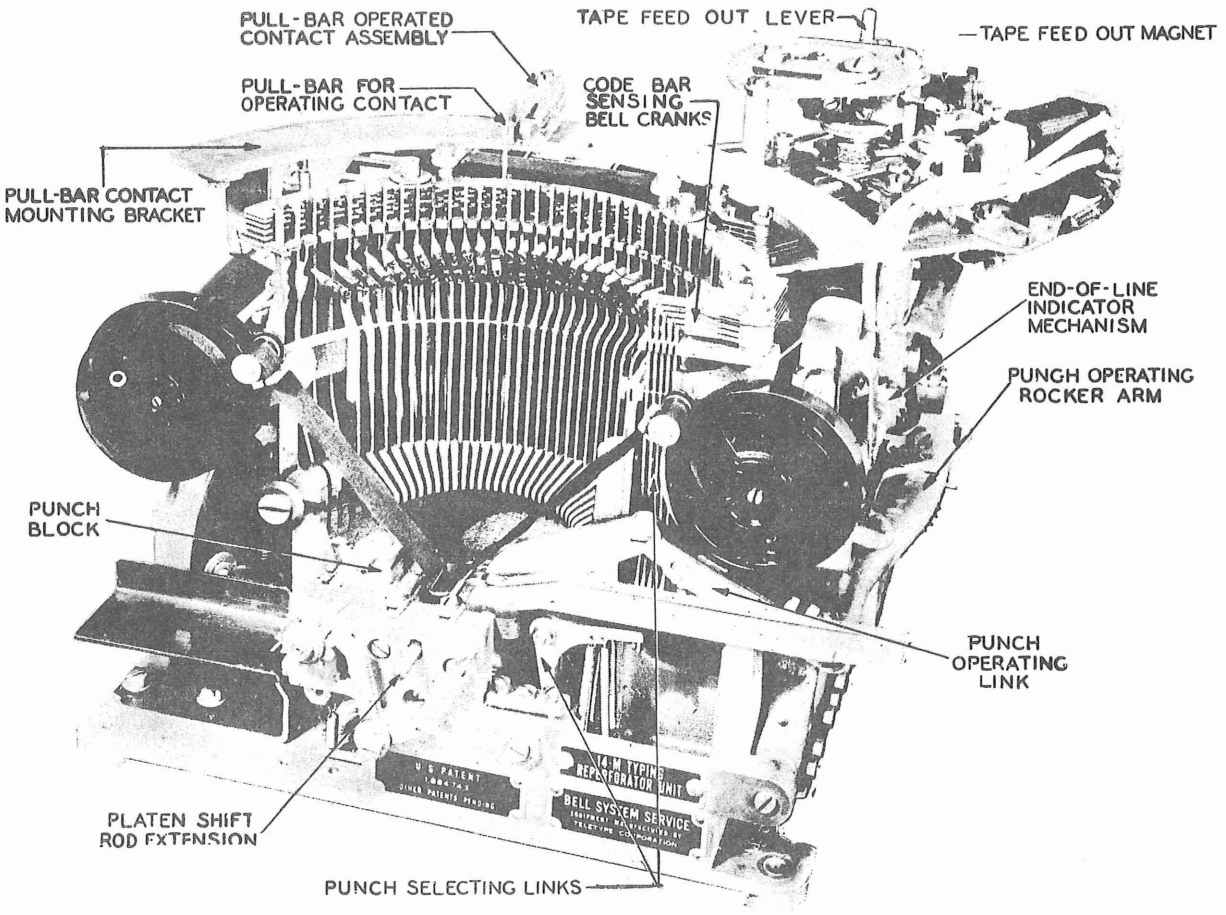


Fig. 18 - No. 14 Typing Reperforator Unit (Receiving Only - Cover Removed)

main bail nears the end of its downward stroke. When the code bars are not engaged by the locking lever, they are free to be positioned by the selector swords and "T" levers.

6.23 Power for perforating tape is derived from the punch arm cam on the main shaft which actuates the punches by means of the punch bail through the medium of the punch arm casting, punch bail link and punch selector fingers. (Fig. 21.) The punch selector fingers are positioned by the punch bell crank springs so that the selection set up in the code bars will be perforated in the tape. (Fig. 21.) The positioning of the punch selector fingers takes place early in the upward stroke of the main bail. The motion of the code bar locking lever is utilized to operate sensing bell cranks which move toward the code bars with the locking lever. (Fig. 20.) If a code bar has been positioned to the right, the motion of the associated sensing bell crank will be blocked by the code bar as the code bar locking lever moves toward the code bars, and the punch selector finger will remain in position to engage the punch as shown in Fig. 21. If the code bar has been positioned to the left, the sensing bell crank will be free to follow the code bar locking lever, and the train of linkage between the sensing bell crank and the punch bell crank will allow the punch bell crank spring to rotate the punch bell crank clockwise, thus moving the punch selector finger to the left so its recess will be under the punch.

6.24 Shortly after the punch selector fingers have been positioned, the punch arm cam rotates the punch bail through the medium of

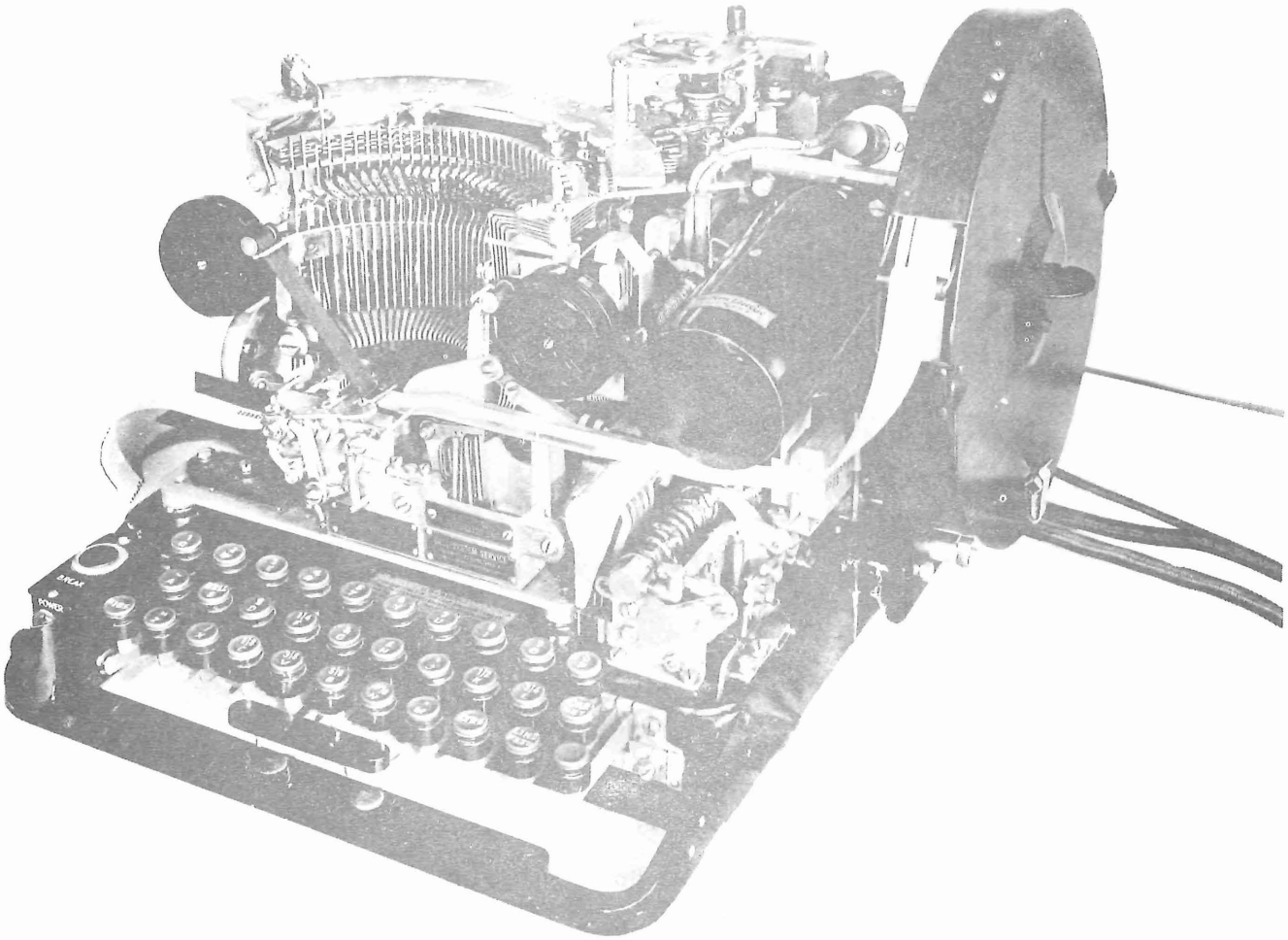


Fig. 19 - Sending-Receiving Typing Reperforator (Cover Removed)

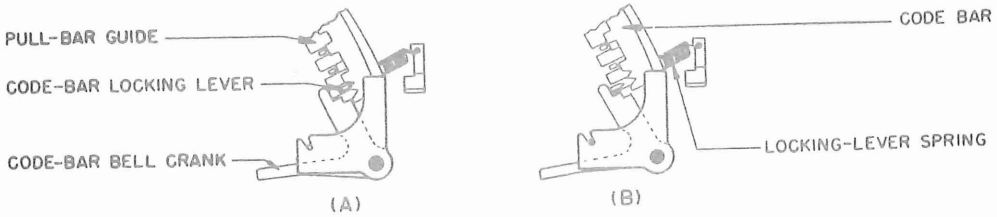


Fig. 20 - Code Bar Locking Lever

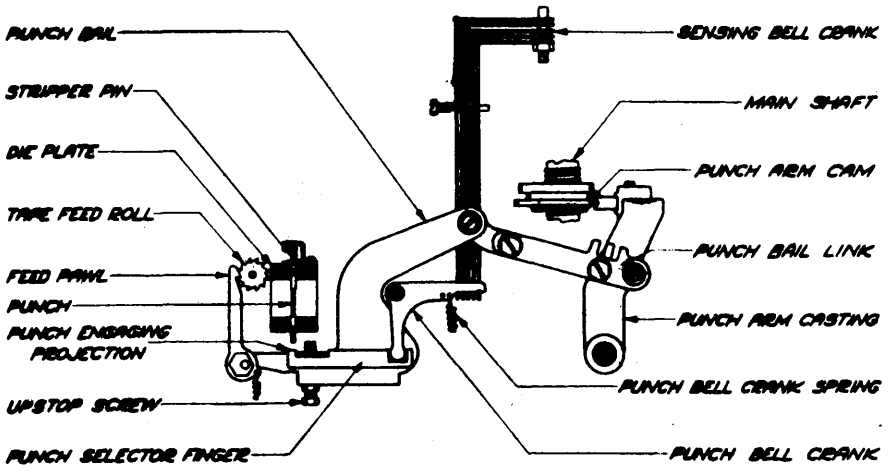


Fig. 21 - Tape Reperforating Mechanism

the punch arm casting and the punch bail link. As the punch bail rotates, it engages projections of the selector fingers which are in line with the punches, raises the punches to perforate the tape. A projection on the punch bail engages the feed punch during every operation. An upstop screw in the punch bail limits overtravel of the punches to prevent mutilation of the tape.

7. AUTOMATIC TRANSMITTING ARRANGEMENTS

(A) General

7.01 A machine used for automatically transmitting teletypewriter signals by means of perforated tape is known as a transmitter-distributor. This machine is a motor-driven combination tape transmitter and distributor. Its purpose is to translate the code combination, perforated in the tape, into electrical signals and transmit these to the receiving station.

7.02 A transmitting device known as a multiple transmitter-distributor consists of three transmitter-distributor units with a common motor drive. This mechanism, when used in combination with a group of typing reperforators, provides combined sending and receiving facilities for tape message relaying.

(B) Transmitter-Distributor - 14 Type

7.03 The 14-type transmitter-distributor is made up of two principal units; a tape transmitter and a commutator-distributor. The tape transmitter, utilizing the perforated tape, sets up the code combinations to be transmitted. The commutator-distributor sends the code combinations out over the line as marking and spacing signals, in proper sequence and at a predetermined speed. Both units are driven by the same motor.

Commutator-Distributor

7.04 The commutator (Fig. 22) is made up of two concentric conducting segment rings attached to an insulating disc. The outer commutator ring is composed of seven segments. Five of these segments correspond to the five intervals of the code. Immediately preceding the No. 1 segment is the "start" segment, while the segment following No. 5 is the "stop" segment. (Fig. 23.) When the brushes pass over the start segment, a spacing signal is transmitted, whereas a marking signal results when they pass over the stop segment. These two signals cause the receiving mechanism to operate in unison with the distributor brush arm. The inner commutator ring is solid and is connected to the line. As the distributor brush arm revolves, it connects the segments of the outer ring successively to the line.

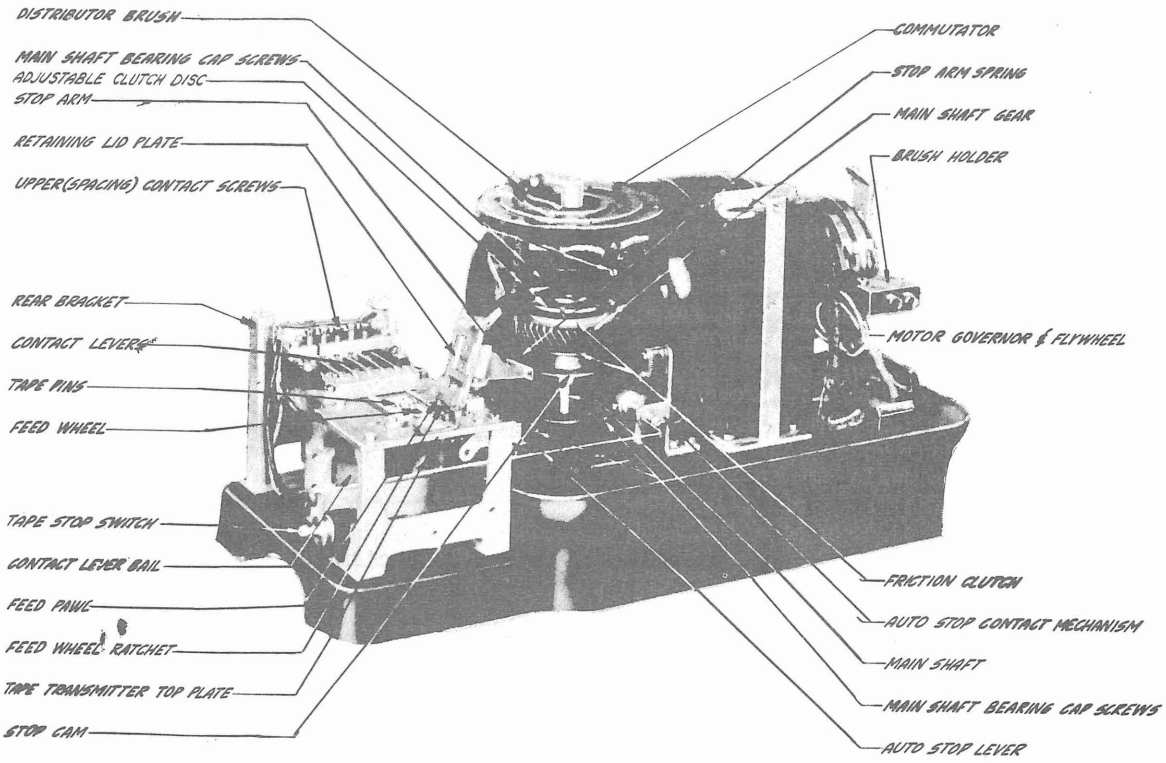


Fig. 22 - Transmitter-Distributor (Cover Removed)

Transmission

7.05 As indicated by the wiring diagram (Fig. 23) the five tongues on the tape transmitter move between upper and lower contacts, called the "spacing" and "marking" contacts, respectively. The perforations in the tape determine which contact tongues will be on spacing and which on the marking contacts.

7.06 When the distributor brush is resting on the stop segment, the line circuit is closed. At such a time the selector at the

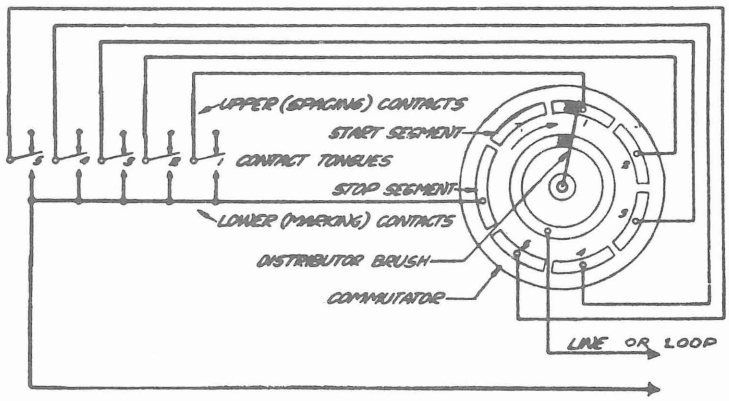


Fig. 23 - Wiring of Transmitter-Distributor Commutator and Contacts

receiving terminal will be held at rest. To transmit a combination of impulses, the distributor brush revolves in the direction indicated. It will first pass over the start segment, sending a spacing signal to the line. This signal starts the receiving mechanism. Each of the five code segments of the distributor is connected by a contact tongue to either an upper (spacing) or lower (marking) contact, depending on the character of the signal to be sent. As the brush revolves, it will successively connect the five code segments to the line, each in turn sending out a marking or a spacing signal. Finally the brush reaches the stop segment again and sends out the stop signal which stops the receiving mechanism. This start-stop system keeps the receiver in synchronism with the distributor.

7.07 A machine wired to transmit neutral (open and close) signals is shown in Fig. 23 where the battery is supplied by the central office and the transmitter-distributor is in series with the loop circuit.

The Tape Transmitter

7.08 As previously stated, the five contact tongues on the tape transmitter move between two sets of contacts. These five contact tongues are mechanically connected to the ends of five irregularly shaped levers, known as contact levers, shown in Fig. 24. It will be seen that each of these levers has three extensions, A, B and C and that they are pivoted on a shaft, S. When a contact lever is in its normal position, extensions A and C are approximately horizontal. Extension B is normally in a vertical position. The extension C is turned up at the end, and set into it is a small tape pin projecting vertically upward. The distance between the upward projecting tape pins is the same as the distance between the holes in the tape.

7.09 Mounted just to the right of the B extension of the five contact levers is a pivoted contact lever bail. When the contact lever bail is actuated by the operating lever, it moves the B extensions of the contact levers to the left. This movement draws the tape pin in the ends of the C extensions of the levers below the surface of the tape guide over which the perforated tape passes and also causes the outer ends of the A extensions to move upward.

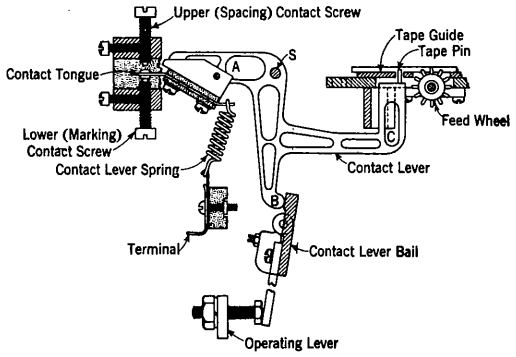


Fig. 24 - Contact Mechanism of Transmitter-Distributor

The contact tongues will also move upward and will be pressed against the upper (spacing) contact screws. The contact tongues are so attached to the A extensions of the levers that after the tongues have touched the upper contacts, any further travel of the lever extensions is absorbed by the springs attached to the contact tongues.

7.10 A feed-wheel is shown to the right of the tape pins. This feed-wheel and the tape pins project through the tape guide. Besides the five code perforations in the tape, there is also a smaller feed-hole which is engaged by one of the pins on the feed-wheel. As the feed-wheel rotates, its pins engage these small feed-holes, one after another, moving the tape from right to left over the tape pins.

7.11 When the contact lever bail is in its unoperated position (as shown in Fig. 24) the contact lever springs attached to the contact tongues exert a downward pull on the A extensions of the contact levers. This causes the C extensions to move upward and the tape pins are pressed against the tape. If any holes have been perforated in the tape, the pins corresponding to these holes will pass through the tape. The additional upward movement of a contact lever, when its pin passes through a hole, moves the contact tongue attached to the extension of this lever from its upper (spacing) contact screw to its lower (marking) contact screw. Where there is no hole in the tape, the pin will be blocked and the corresponding contact tongue will remain against the upper (spacing) contact screw.

7.12 It is readily seen from the foregoing that where there is a hole in the tape the corresponding contact tongue is moved against its lower (marking) contact screw. The commutator segment to which the tongue is connected will, therefore, send a marking signal to the line. Where a pin is blocked by the tape, the corresponding tongue rests against the upper (spacing) contact screw, and the commutator segment to which this tongue is connected will send a spacing signal to the line.

7.13 The position of the main shaft of the transmitter-distributor is shown in Fig. 22. The distributor brush and the operating cam which controls the contact lever bail are mounted on the main shaft. The position of the contact lever bail bears a certain relation to the position of the distributor brush. Hence, the tape transmitter and the commutator-distributor always operate in unison.

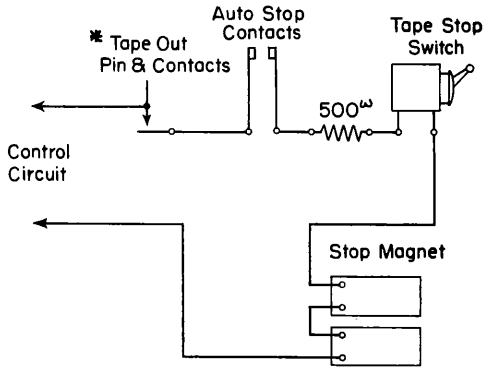
7.14 The operating cam actuates the operating lever which in turn moves the contact lever bail. The position of the cam with respect to the distributor brush is set so that the bail starts to move just as the brush comes in contact with the stop segment, causing the B extensions of the contact levers to move the contact tongues away from their lower (marking) contact screws.

Stop Magnet Control

7.15 The stop cam is pinned to the main shaft. The main shaft gear drives this cam by means of the friction between the gear surface, a felt friction washer, and the hub of the stop cam. The necessary pressure is supplied by a flat spring, bearing on the upper side of the gear against a steel disc and felt washer. (Fig. 22.)

7.16 The stop cam controls the starting and stopping of the transmitter-distributor. When the stop magnet is not energized the stop arm prevents the rotation of the stop cam and hence, the rotation of the distributor.

7.17 The stop magnet circuit is shown in Fig. 25. To energize the magnet it is necessary to close the auto stop contacts and operate the tape stop watch to "on." In a transmitter-distributor equipped with a "tape-out" contact it is also necessary to have the sixth pin or "tape-out" contacts closed. (Description to follow.)



* Only used when required on special services

Fig. 25 - Wiring Schematic of Stop Magnet Circuit of a Transmitter-Distributor

7.18 The automatic stop or taut tape lever (Fig. 22) controls the auto stop contacts. When the lever is in an up or vertical position the auto stop contacts are opened and when in the down or horizontal position the contacts are closed. This lever, which may be a straight rod or hook shaped, is mounted so that tape to the transmitter-distributor is passed under it if the straight type or through it if the hooked type. When the transmitter is operating at a greater speed than the perforator or when the tape becomes tangled, the tape will be pulled taut, raising the auto stop lever, opening the auto stop contacts, and stopping the transmitter. As the perforator continues to operate or the tape untangles, the tape will become slack and the auto stop contacts will close, allowing the transmitter-distributor to operate again. (Fig. 26.)

7.19 Tne mechanical operations of stopping and starting the transmitter-distributor are performed as follows:

Opening of the auto stop contacts opens the control circuit. The stop magnet which is in this circuit is therefore demagnetized, releasing the stop arm. The stop arm, actuated by the spring, engages the lug on the stop cam. The stop cam, and hence the main shaft, will then be held stationary, stopping both distributor and transmitter. The position of the distributor brush is fixed with respect to the stop cam lug position so that the distributor brush will always be stopped

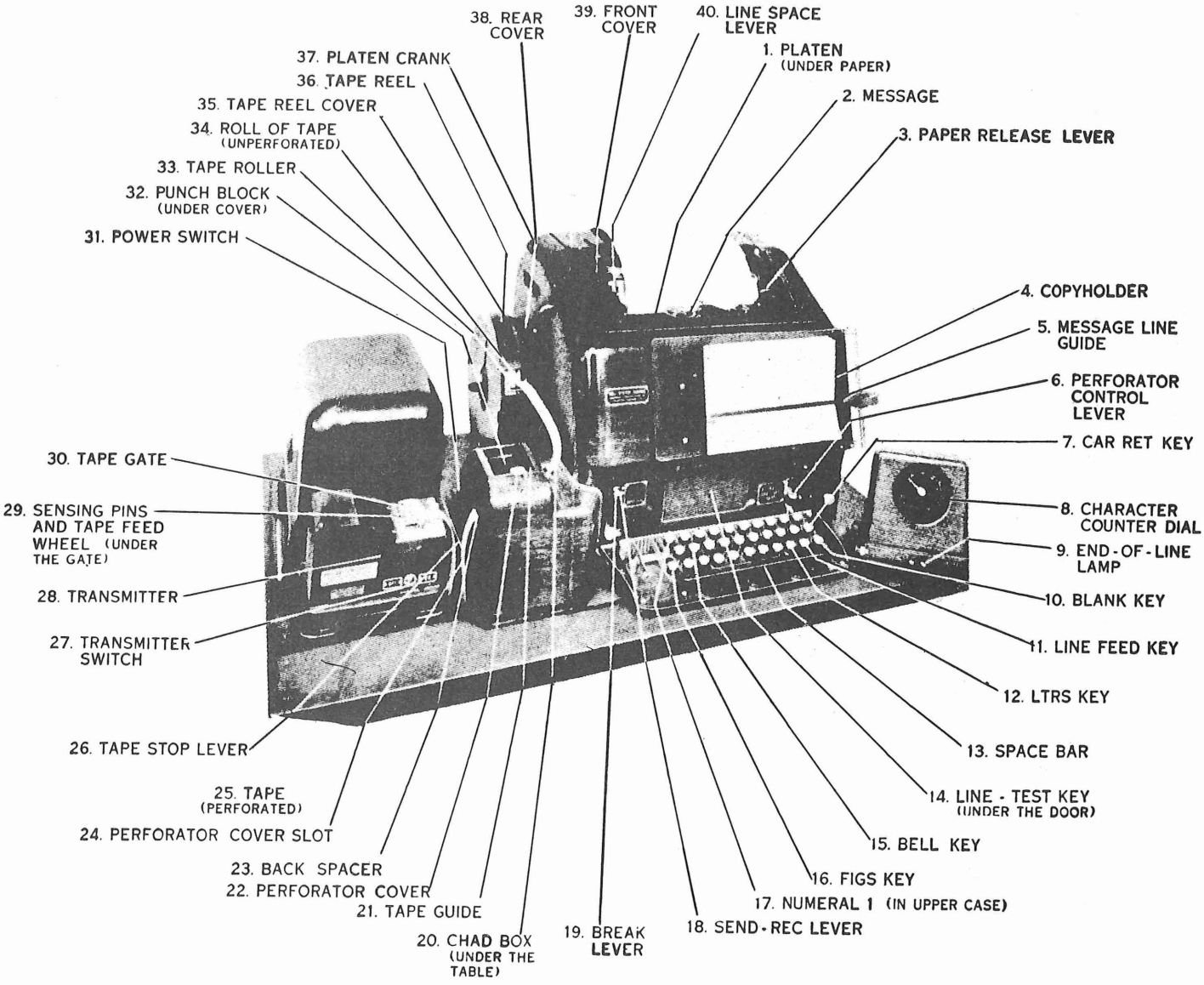


Fig. 26 - The No. 19 Teletypewriter Set

on the stop segment. The transmitter will be in its stopped position with sensing pin retracted.

When the auto stop contacts are again closed, the stop magnet will pull its arm away from the stop cam, releasing the main shaft and transmission will be resumed.

7.20 The tape stop switch also opens and closes the magnet circuit. It is used by the operator to start and stop the transmitter-distributor. The tape stop switch does not control the operation of the driving motor.

Sixth Pin or Tape Out Contacts

7.21 In some services the transmitter is equipped with a sixth pin which controls a set of contacts normally in series with the magnet circuit. The purpose of this pin is to stop the transmitter when the end of the tape has been reached.

7.22 The tape out contacts are wired in series with the tape stop contacts and switch in the stop magnet control circuit. The contacts are operated by a pin on the transmitter located approximately .6" ahead of the five sensing

pins. This pin is situated near the edge of the tape guide in such a manner that the edge of the tape, which is not perforated, rides over and holds this pin down against a slight pressure. Due to the fact that the tape out pin is about 3/4" ahead of the sensing pins, it is necessary to have at least seven "letters" characters punched in the tape after the end of the message to allow the last character in the message to be printed before the end of the tape passes over the sixth pin thereby releasing it and allowing the transmitter to be stopped.

No. 19 Teletypewriter Set

7.23 A combination of a No. 15 page teletypewriter with perforator-transmitter attached and a transmitter-distributor on the same table is known as a No. 19 teletypewriter set. (Fig. 26.)

(C) Multiple Transmitter-Distributor

7.24 A multiple transmitter-distributor set is a mechanism which, when used in combination with reperforators, provides combined sending and receiving facilities for tape message relaying. A complete set consists of three multiple transmitter-distributor units and a motor unit mounted on a base which is equipped with cross shaft, gears and terminal strips. (Fig. 27.) These units are equipped to handle either perforated or chadless tape.

7.25 The transmitter consists essentially of a "start-stop" 5-unit code transmitting cam sleeve assembly with associated transmitting contacts, similar to the keyboard transmitting cam sleeve assembly as described for a teletypewriter keyboard, and a tape feed and tape sensing mechanism somewhat similar to the transmitter-distributor.

7.26 The operation of the transmitting contacts is under the control of the sensing pins instead of the keyboard mechanism as in the case of the teletypewriter. The locking levers are positioned by operation of the sensing pins. If a sensing pin finds a perforation in the tape it will advance through it allowing the locking lever to clear the contact so that it is free to close the transmitting contact when the indent of the cam rides over the contact lever.

7.27 The transmitting cam cylinder rotates continuously as long as the clutch magnets are energized. An interruption of the clutch magnet circuit causes the clutch throw-out lever to engage the cammed surface of the driven member of the clutch due to the action of the clutch throw-out lever spring and, as the transmitter shaft rotates, the driven clutch member is cammed out of mesh with the driving member in the stop position.

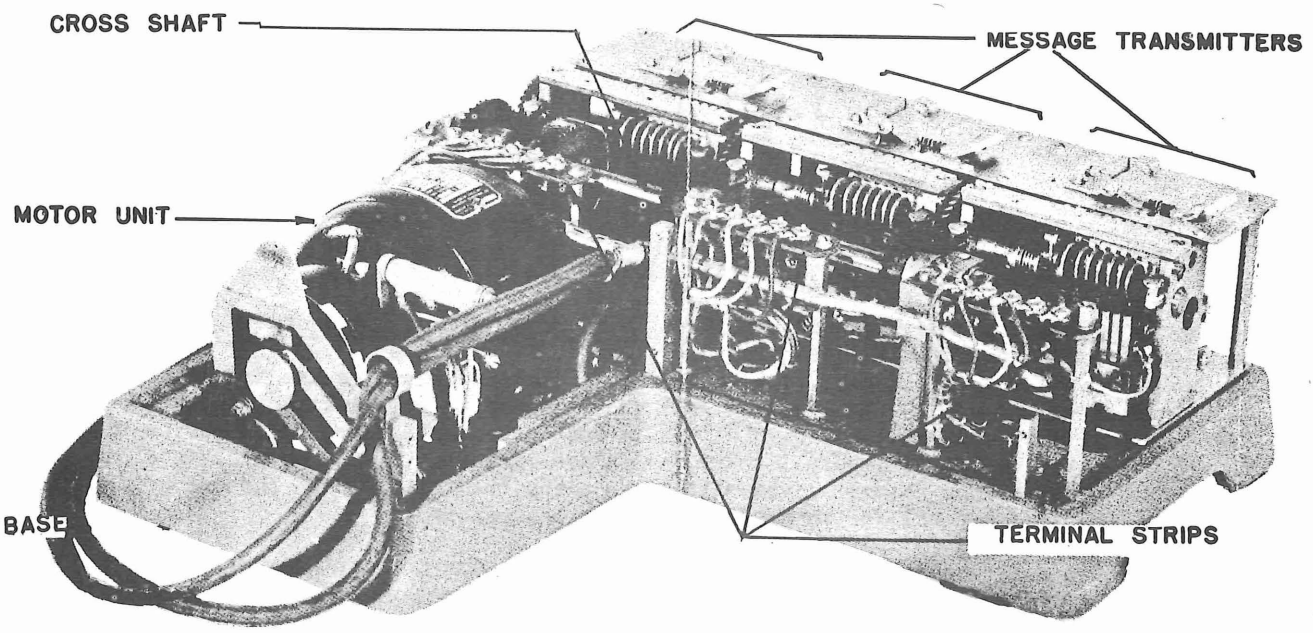


Fig. 27 - Multiple Transmitter (Cover Removed)

7.28 Within the unit there are two provisions for interrupting the clutch magnet circuit; the automatically operated tape out contacts and a manually operated release bar. (Fig. 28.)

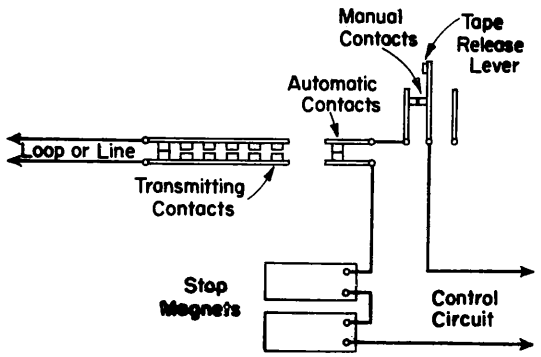


Fig. 28 - Wiring Schematic of One Multiple Transmitter Stop-Magnet Control Circuit

7.29 The automatically operated tape out contact is equivalent to the same contact described in the operation of the 14-type transmitter-distributor except in this case the pin which operates these contacts is in line with the five sensing pins allowing the last character in the tape to be transmitted.

7.30 The manually operated tape stop contacts are controlled by depressing the release bar. This is equivalent to the tape stop switch on a 14-type transmitter. It is used by the operator to start and stop the unit. The bar may be depressed momentarily or it may be latched in the depressed position with a slight forward pressure. Operation of the release bar accomplishes three functions: opening of the manual contacts to stop the transmitter, unlatching of the tape out contact lever thereby closing the tape out contact, and the disengaging of the feed-wheel detent and the feed-pawl which permits the feed-wheel to spin freely to aid in the insertion or alignment of tape over the feed-pins.

7.31 A power switch for the motor which drives the three units is installed on the right-hand unit.

7.32 The multiple transmitter is used principally in the semiautomatic tape relay systems in teletypewriter networks requiring a considerable amount of message relaying but not sufficient enough to warrant a fully automatic arrangement.

8. REPERFORATOR-TRANSMITTER

(A) General

8.01 A reperforator-transmitter distributor is a motor-driven mechanism which combines in a single unit the functions of a typing reperforator and a tape transmitter-distributor.

8.02 The unit provides a fully automatic mechanism in which the perforated tape may be stored in the form of a loop to accommodate a delay in transmission, or in which all the combinations in the tape up to and including the last character perforated may be immediately transmitted. This is accomplished by means of a pivoted tape transmitter which moves along the tape as it becomes taut until it reaches a position one character space (0.1") away from the point at which code perforation takes place. Standard 11/16" wide perforator tape is used. (Fig. 29.)

8.03 The reperforator-transmitter receives and retransmits signal combinations of the start-stop 5-unit code.

(B) Typing and Reperforating Mechanism

8.04 The method of tape perforating known as chadless perforating is used to permit both printed and perforated characters to occupy the same portion of the tape. The punchings, or chads, are not completely severed from the tape but remain attached to it at their leading edges so as to form lids over the holes. The printed characters are legible because the perforating does not eliminate any portion of the tape. This method differs from previously described services in that the feed-holes are punched by a separate perforating mechanism.

8.05 Typing and perforating occur simultaneously, but due to the fact that the platen is to the right of the perforator die block, characters are typed at the right of their respective perforations. The separation between the printed character and its associated perforation is six character spaces. This separation must be taken into account when tearing message tapes from the unit or in cutting the tape. When the tape is to be used for transmission by means of a separate transmitter-distributor, the end of the tape should include all of the printed characters in the message and the first printed character of the message must be preceded by at least six sets of code perforations in order to transmit the entire message.

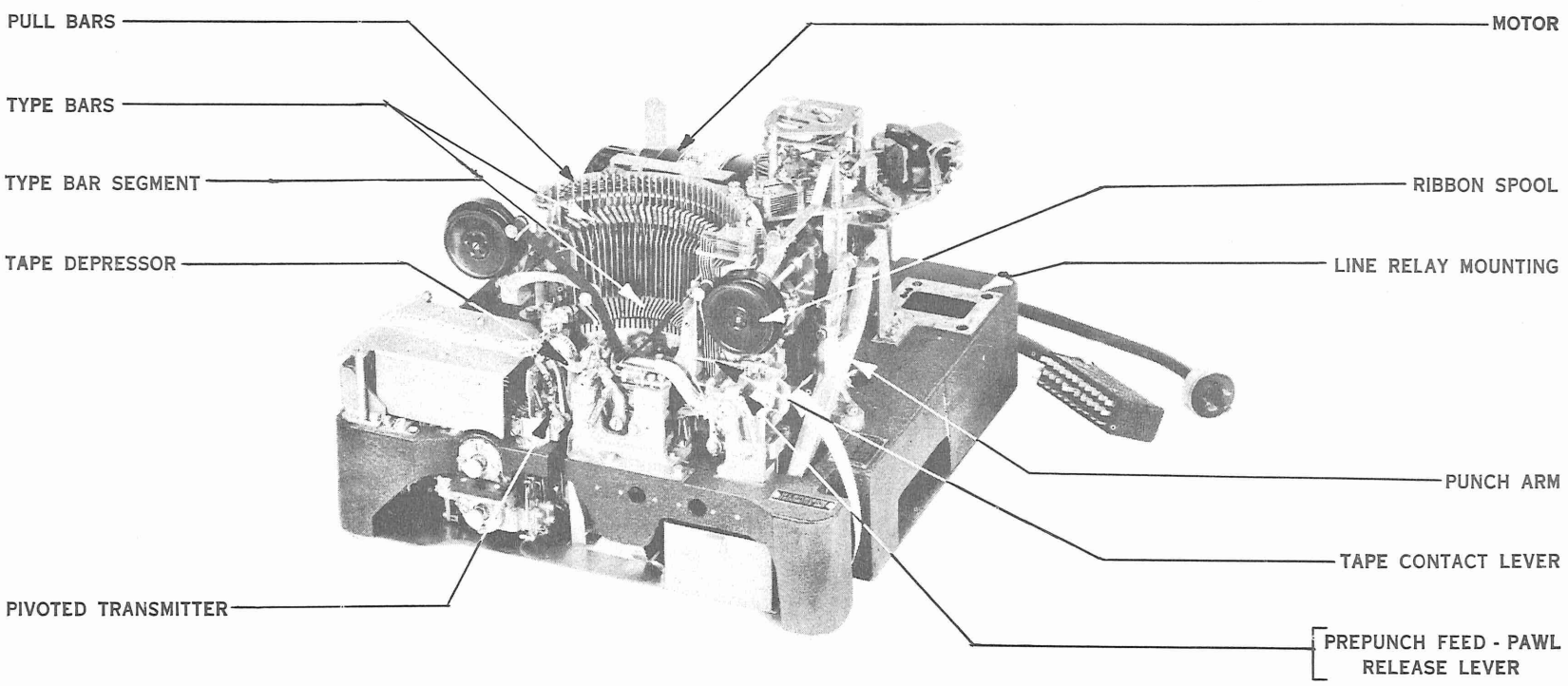


Fig. 29 - Reperforator-Transmitter Distributor

8.06 When a message tape is inserted in the tape guide of a separate transmitter-distributor and when the printed symbol of the character to be transmitted is positioned opposite the tape locating mark impressed in the tape guide, the code perforation for that character will be over the tape sensing pins in position for transmission.

8.07 The operation of the typing and reperforating mechanisms is similar to that of the typing reperforator. The reperforator-transmitter selector is equipped with a holding magnet.

(C) Feed-Hole Prepunch Mechanism

8.08 In order to permit the last character combination perforated in the tape to be sensed at a point one space from the code punches, the feed-holes are perforated in the tape before it reaches the code punches. This is accomplished by means of a prepunch mechanism. This mechanism consists of a lower bail, an upper bail, a feed-pawl, a feed-roll assembly, a tape tension lever, a feed-hole punch, and a detent lever with a roller. (Fig. 30.) The mechanism is operated with each revolution of the punch-arm cam through the medium of the punch arm and the punch-arm link. The parts are so assembled and adjusted that when the lower extension of the lower bail is moved to the left by the punch-arm link, the left end of the upper bail moves downward and drives the feed-hole punch through the tape in the die block. At the time this motion takes place the feed-pawl moves upward and engages a higher tooth in the feed-roll ratchet. When the lower extension of the lower bail moves to the right, the reverse motion of the upper bail and the feed-pawl takes place. The feed-hole punch withdraws from the tape just before the feed-pawl steps the feed-roll by engaging a tooth on its ratchet during its downward movement. Simultaneously with the above action, the detent roller rides over a tooth on the star wheel of the feed-roll assembly to insure even spacing of the feed-hole perforations. Since the feed-hole punch is located several feed-hole spaces to the right of the feed-roll it is necessary to assist the mechanism manually, when inserting tape, until properly spaced feed-holes reach the feed-roll. This is done by applying a slight pressure to the tape tension lever so that the feed-roll grips the tape.

(D) Tape Transmitter and Distributor Mechanism

General

8.09 The tape transmitter and distributor mechanism consists essentially of a pivoted tape sensing and tape feeding mechanism, a transfer mechanism, a set of transmitting

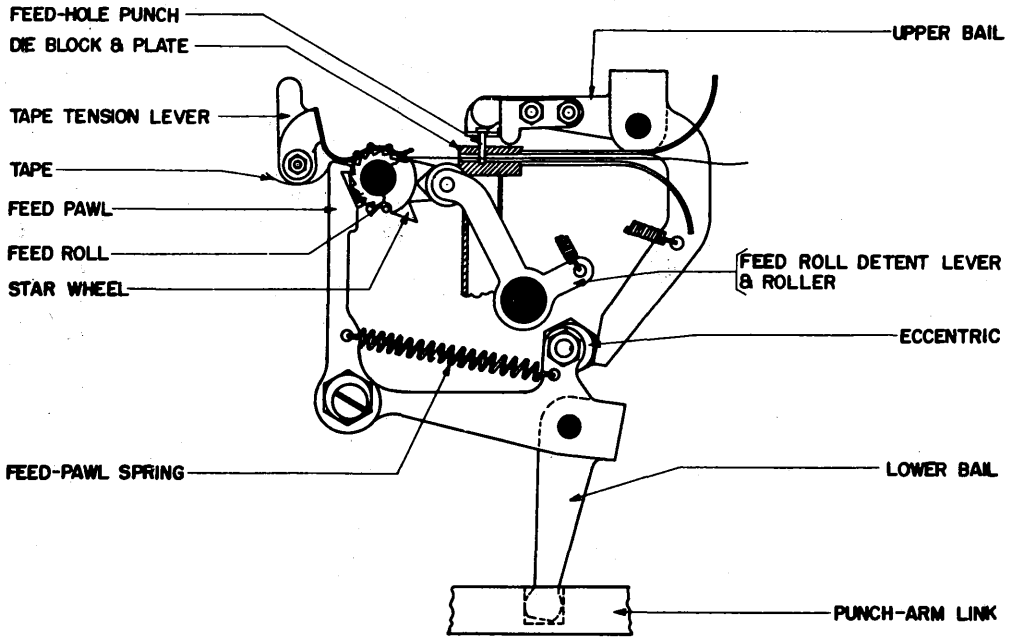


Fig. 30 - Feed-Hole Prepunch Mechanism

contacts, a set of distributor contacts, a sensing cam shaft assembly and a distributor can shaft assembly. Each of these shafts obtain its power from the motor through the medium of the main shaft and the subshaft assembly.

Pivoted Transmitter Yoke

8.10 The tape sensing and tape feeding mechanisms are arranged so that the portions of these mechanisms that feed and sense the tape perforations are mounted on a pivoted transmitter yoke. This yoke is moved toward the perforator punch block by the tape feeding mechanism which pulls it along the tape so that the tape perforations can be sensed up to and including the last combination perforated. Also this yoke can be moved away from the perforator die block by the perforated tape (until it rests against its backstop) to permit the tape to move downward into a storage compartment or form a loop between the perforator die block and the yoke.

Sensing-Shaft Magnet Contact

8.11 This contact is located directly under the rear of the perforating punch block and is operated by the pivoting motion of an extension on the rear of the transmitter yoke. Its function is to make and break a circuit to the sensing-shaft magnet. As the tape is advanced out of the perforator punch block, the pivoted transmitter yoke moves to the left away from the die block and the transmitter yoke extension permits the contact to close. A circuit is then completed through the sensing-shaft magnet which attracts its armature and pulls the sensing-shaft clutch lever (attached to it) out of engagement with its clutch member. This frees the sensing-shaft cam sleeve to rotate with the sensing shaft and operate the tape feeding and tape sensing mechanisms.

8.12 After perforation is stopped, the pivoted sensing mechanism is pulled to the right along the tape, by means of the tape feeding mechanism, until the extension at the rear of the transmitter yoke opens the contact and breaks the circuit to the sensing-shaft magnet. When the sensing-shaft clutch lever is released, it is pulled by its spring into engagement with the cam surface of the clutch driven member where it disengages the clutch teeth and stops the tape feeding and tape sensing mechanisms. The contact is adjusted in such a manner that it opens just as the sensing fingers sense the last character perforation in the tape and the pivoted mechanism comes to rest against the punch block.

(E) Tape Depressor

8.13 A tape depressor is provided to start the tape moving downward into the storage compartment when transmission is stopped or does not keep up with the tape as it is being perforated. As soon as a loop of tape forms, an arm of the tape depressor engages the pivoted yoke to prevent its movement when the tape is being pulled from the storage compartment after transmission is again resumed. When the stored tape feeds through the sensing mechanism until the loop shortens, it lifts the tape depressor out of the way and frees the sensing mechanism for movement along the tape until it reaches the perforator punch block.

(F) Signal Retransmitter

8.14 Associated with the sensing mechanism is a distributing mechanism which consists of a magnet controlled cam shaft assembly and a set of distributor contacts. This mechanism is located directly under the sensing mechanism. Its function is to transmit the signal elements of a code combination, which is set up on the five distributor contacts, by means of electrical circuits from the switching control contacts, and transmit them in the proper sequence. The contacts on the right side of the distributor contact assembly are wired individually and terminate in the 33-point multiple plug. The start-stop, 1, 2, 3, 4 and 5 contacts on the left side of the distributor contact assembly are wired together (Fig. 31) and terminate in the same 33-point multiple plug.

8.15 The distributor contacts are mechanically operated from the cam shaft through the medium of contact levers and close with each revolution of the cam assembly (Fig. 32). The cams are arranged on their assembly in such a manner that the contacts are made to close and open in timed relation to each other during each revolution of the cam shaft assembly. Marking and spacing signal elements are sent to the line in the order in which they are set up electrically on the distributor contacts. Assume that the letter "E" code combination is set up mechanically on the switching-control contacts, and these contacts are connected directly to the distributor contacts instead of passing through the external apparatus. Under this condition the No. 1 switching-control contact pileup is operated and connects current to the No. 1 distributor contact, while the Nos. 2, 3, 4 and 5 transfer contacts are open so no current is connected to the Nos. 2, 3, 4 and 5 distributor contacts. When operating locally the distributing shaft cam sleeve assembly is

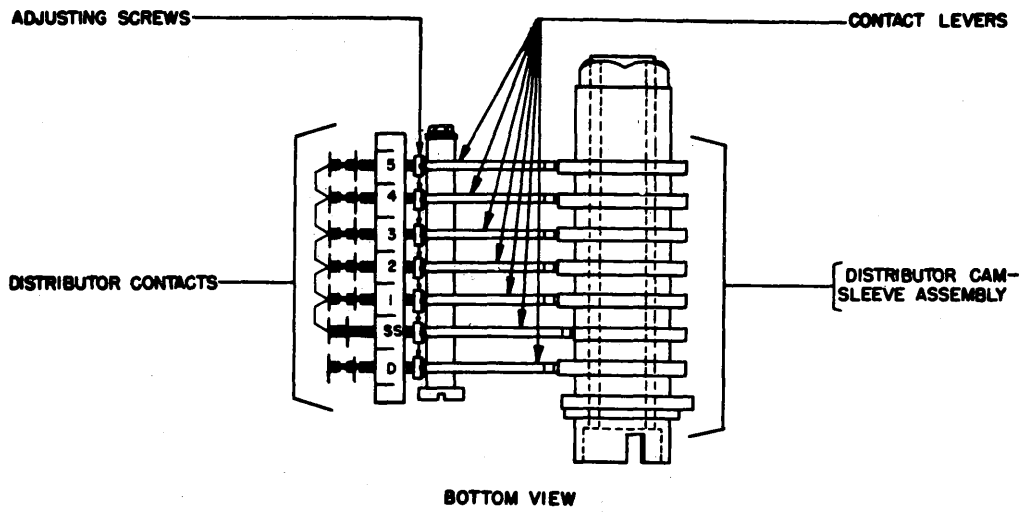


Fig. 31 - Distributor Contact Assembly - Reperforator-Transmitter

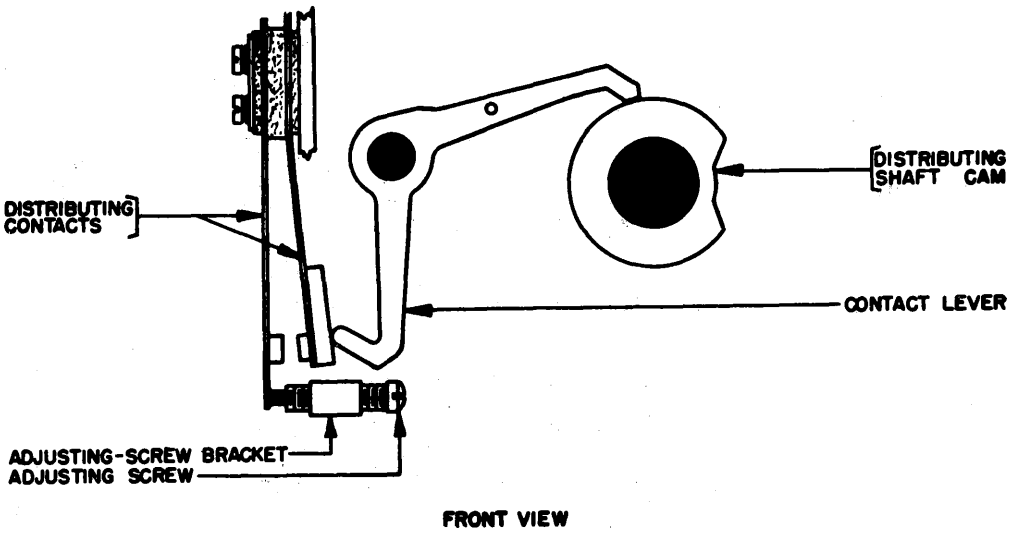


Fig. 32 - Distributor Cam Assembly - Reperforator-Transmitter

set in motion when a contact, operated from the sensing shaft through the medium of a contact lever, closes and completes a circuit to the distributor magnet which becomes energized. Energization of the magnet attracts the magnet armature and causes the throw-out lever (which is attached to the armature) to free the distributor cam sleeve assembly so that it may rotate. While the cam sleeve assembly rotates, the distributor start-stop contact opens and sends a start signal to the line. This contact remains open until the Nos. 1, 2, 3, 4 and 5 distributor contacts all close and open in sequence. Since No. 1 distributor contact is closed, and Nos. 2, 3, 4 and 5 distributor contacts are open, a marking signal followed by four spacing signals is transmitted. The start-stop contact then closes to send a stop (marking) signal to the line. This completes the cycle. Thus a code combination for the letter E which was set up on the switching control contacts of separate electrical circuits is transmitted through the distributor contacts.

9. 26-TYPE TELETYPEWRITER

(A) General

9.01 A No. 26 teletypewriter is a page-type machine having a moving paper carriage. The typing is done by means of small movable type pallets carried by a type wheel and individually driven forward for typing by a striker

arm so that the advantages of type bar printing are obtained. The type wheel rises for the printing of each character providing visible typing.

9.02 The selecting code is the same as that used with No. 14 or No. 15 teletypewriters and the No. 26 teletypewriter may be used on the same circuits with these machines. However, the No. 26 machine is designed for 60 words per minute service only.

9.03 The appearance of the No. 26 sending and receiving machine with cover removed is shown in Fig. 33.

(B) Operation of Keyboard Transmitting Mechanism

9.04 The keyboard transmitting mechanism is similar in operation to the keyboard mechanism employed in the No. 14-type teletypewriter and is equipped with the "repeat space" feature. This feature allows the space signal to be sent repeatedly as long as the space bar is operated.

(C) Operation of Selecting Mechanism

9.05 The operation of this mechanism is similar to that of the selecting mechanism of the 14 type equipped with a holding magnet selector except that the levers corresponding to the T levers in the selector serve to control code discs rather than code bars.

9.06 The holding magnet for controlling the selector is near the top of the unit. It is similar to the holding magnet used in the No. 15 teletypewriter and differs from the pulling magnet in that its armature is mechanically moved against the magnet cores periodically by a cam, and then released by the cam just prior to the time of a selecting operation. If at the time of the selecting operation the magnet is energized, the armature will be held operated and a marking signal selection will be received. However, if the magnet is not energized, the armature will not be held up and a spacing signal selection will be received. Since less energy is required to hold the armature than to pull it up, the use of this holding magnet principle requires only a small amount of energy from the magnet and permits it

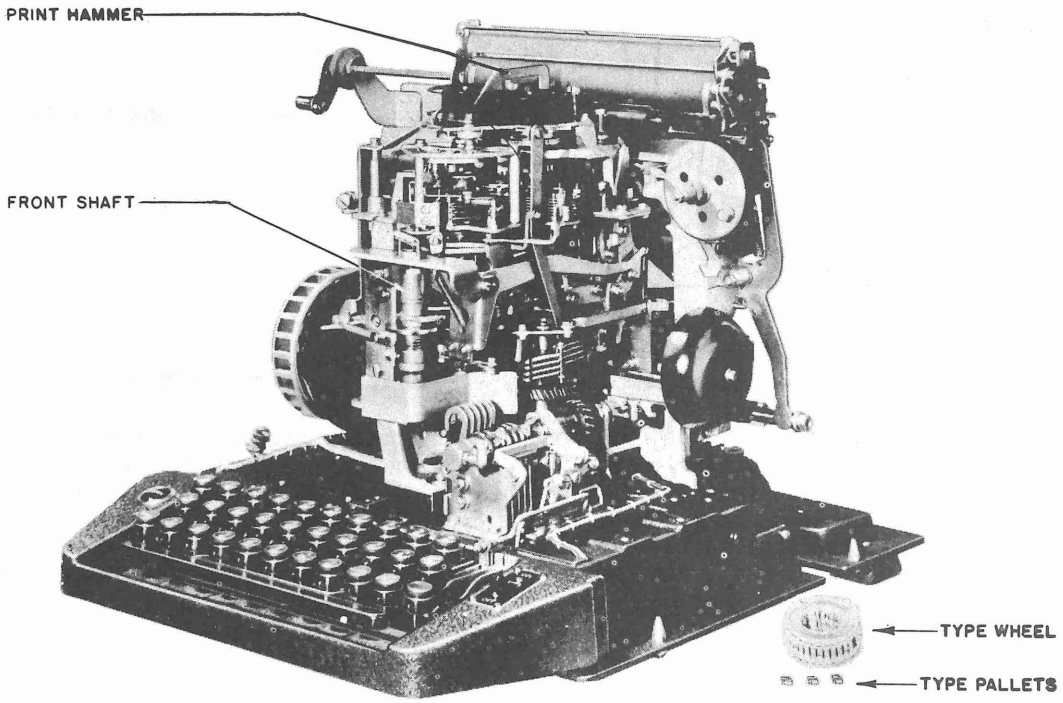


Fig. 33 - No. 26-Type Teletypewriter (Cover Removed)

to be designed for use directly in line or loop circuits in many cases without the use of a line relay. The selecting operation is described in more detail below.

9.07 As the signals are received the selector swords are positioned in sequence by the selecting cams in the same manner as in the No. 15-type machine. Each sword engages a transfer lever which is provided with two extension arms (Fig. 34). One arm engages its selector disc and the other is arranged so as to be engaged by a locking bail which locks the transfer lever in either the marking or the spacing position. The transfer levers are not operated by the swords at the time the selections are received because of the locking action of the locking bail and because the selector discs are difficult to move with the stop pin of the previous selection in the notches of the discs. Immediately after the five selecting elements have been received, however, a cam on the selector cam assembly operates a lever which releases the clutch of the front shaft (located at the front of the machine) allowing this to rotate. This shaft carries a cam which in rotating operates a transfer bail provided with a locking knife edge to unlock the transfer levers and with five U-shaped transfer springs to provide the force required to reposition the transfer levers by pressing on the sword operating selector levers. The transfer levers immediately position the code discs to their new position (Fig. 35).

9.08 The type pallets of the typing unit are guided in grooves in the type wheel so that the selected type pallet may be moved mechanically toward the platen. The type pallet

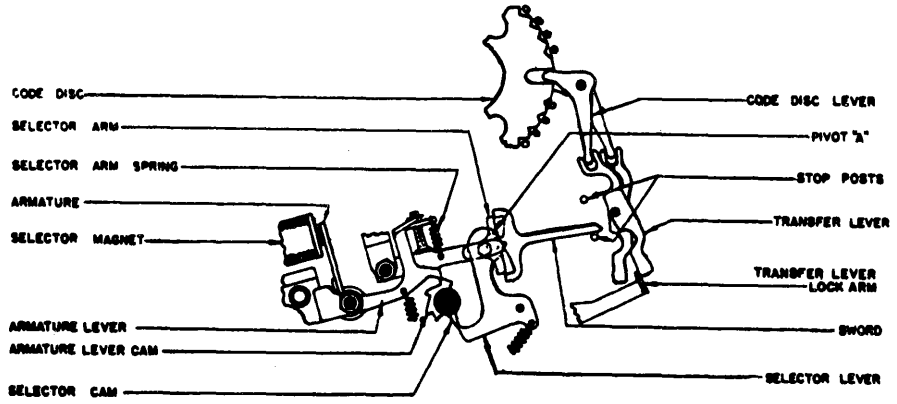


Fig. 34

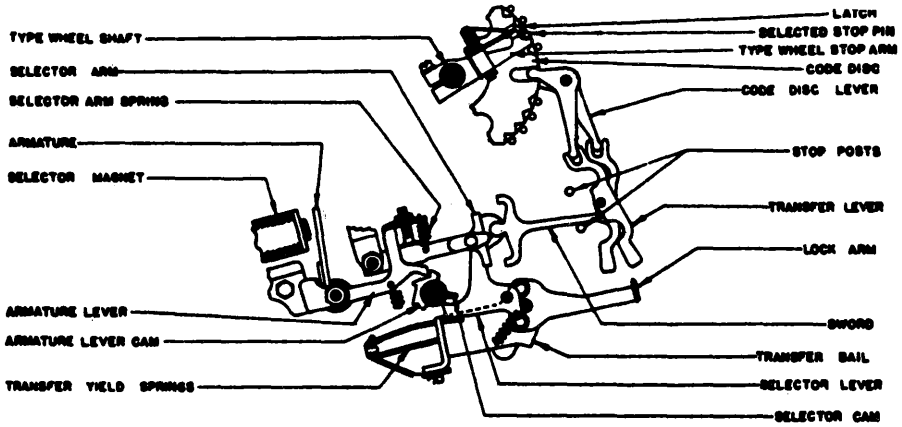


Fig. 35

to be selected is determined by the setting of five code discs, which are actuated by the signal elements through the medium of the selector mechanism. The code discs are so arranged that notches on their outer edges will be lined up, permitting a selected stop pin to move into the path of the stop arm located on the type wheel shaft. Thus, the type wheel will be stopped so that the selected type pallet will be positioned opposite the printing hammer which moves the pallet toward the platen. The various functions (line feed, space, carriage return, figure shift, letter shift, etc.) are also accomplished mechanically. A motor drives the type wheel shaft, main shaft, and front shaft, which supply power to all mechanically operated parts.

(D) Features Available with the 15-Type Teletypewriter but Not with the 26-Type Teletypewriter

9.09 The more important features available with the 15-type teletypewriter but not available with the 26-type are listed below:

(1) Sprocket feed arrangement for typing on forms and making carbon copies.

(2) Automatic tabulating device.

(3) Provision for operation at speed other than 60 words per minute.

(4) Local test key whereby the machine may be switched from the line to a local circuit for testing purposes.

(5) Adaptability for various widths of paper and various lengths of typed line.

(6) Built-in remote motor control device.