28 KEYBOARD, BASE, COVER, AND MOTOR FOR COMPACT KSR AND RO TELETYPEWRITER SETS

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. INTRODUCTION

1.01 This section is issued to describe the keyboard, base, cover, and motor units used on the 28 Compact Keyboard Send-Receive (KSR) and Receive-Only (RO) Teletypewriter sets.

1.02 The keyboard and base units are designed to support the basic send-receive and receive-only functions. The mechanisms installed on each unit reflect these requirements. The text which follows covers a brief description of the units (less typing unit) which make up the KSR and RO sets.

1.03 When reference is made to the location of parts, mechanisms, or units, the viewer is facing the unit with the keyboard or control hood toward the front.

2. GENERAL DESCRIPTION

KEYBOARD UNIT

2.01 The keyboard unit provides transmission facilities for originating coded characters, and a base for mounting the motor unit, typing unit, and cover. The keyboard unit is used with the 28 Compact Keyboard Send-Receive Set.

2.02 The keyboard unit consists of a mounting base, keyboard transmitter, distributor, 3-speed gear shift assembly, local function mechanisms, margin indicator switch, and electrical cable assemblies (Figure 1). The margin indicator switch (not visible in the photo) is attached to the mounting base behind the keyboard transmitter, and is operated by the typing unit. When operated, it illuminates a neon indicator lamp on the cover. The local function mechanisms respond to the deflection of their keys on the keyboard transmitter. The keys mechanically control line feed and carriage return on the typing unit.

2.03 The mounting base includes the inner base and outer base pan. The inner base is isolated from the outer base pan by four, vertically positioned, vibration mounts. The outer base pan provides mounting facilities for the keyboard transmitter and cover unit.

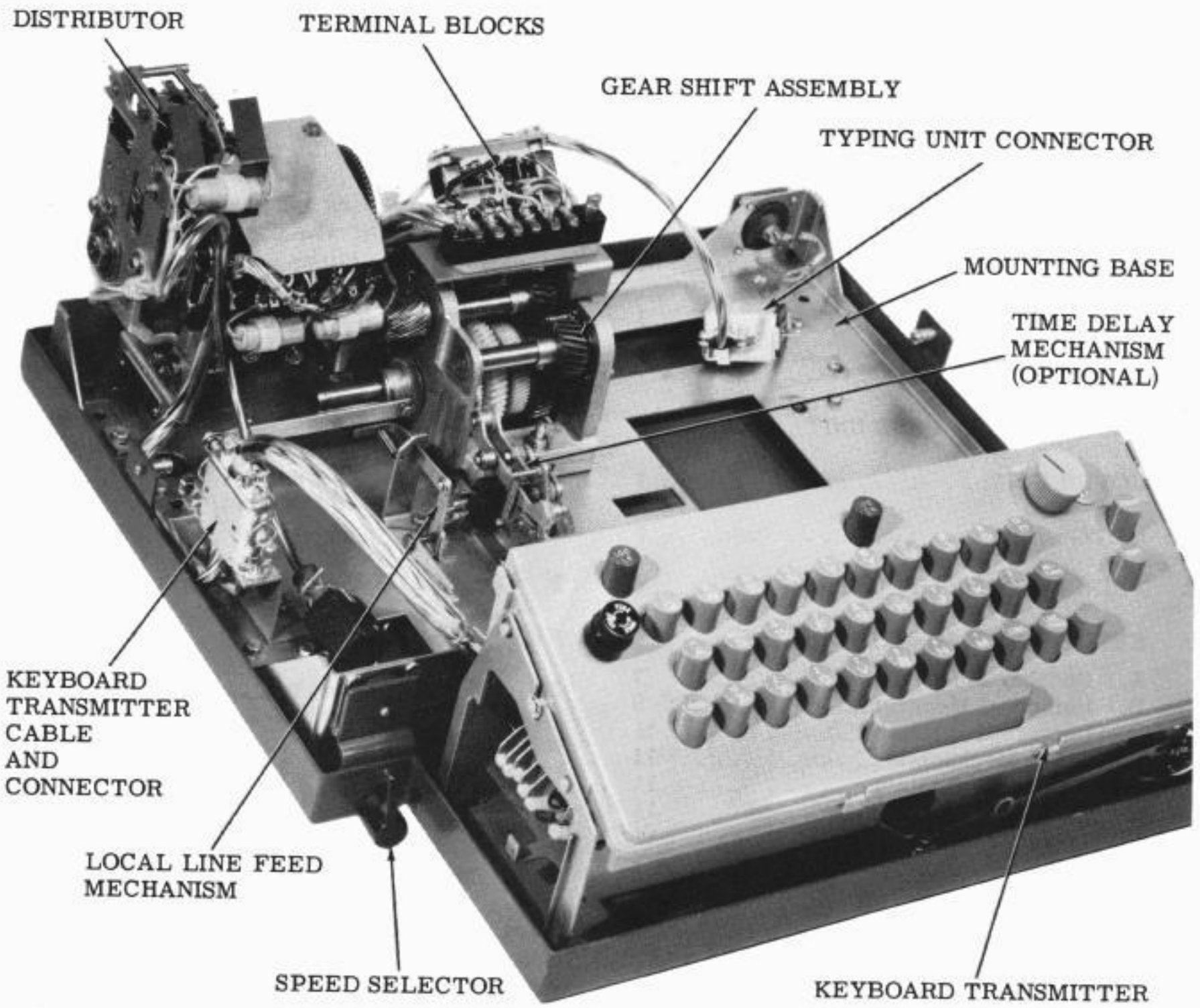

Figure 1 — Keyboard Unit with Time Delay Mechanism

2.04 The keys on the keyboard transmitter (Figure 2) are arranged in a conventional manner with numerals, punctuation marks, and special symbols in upper case positions. Standard keys for local line feed and local carriage return are located above the character keytops. Line break and repeat keys are located to the right of the character keys. Power to the electrical components in the set is initially routed through the switch in the upper right corner and through the fuse in the upper left corner.

2.05 When a character key is depressed, the wire contacts on the right side of the keyboard transmitter are simultaneously positioned in marking and/or spacing conditions, and the universal lever is released. The universal lever is reset by a solenoid reset mechanism. The solenoid is attached to the rear of the keyboard transmitter. With the exception of local function mechanisms, all functional connections between the keyboard transmitter and the rest of the set are made through the cable and connector.

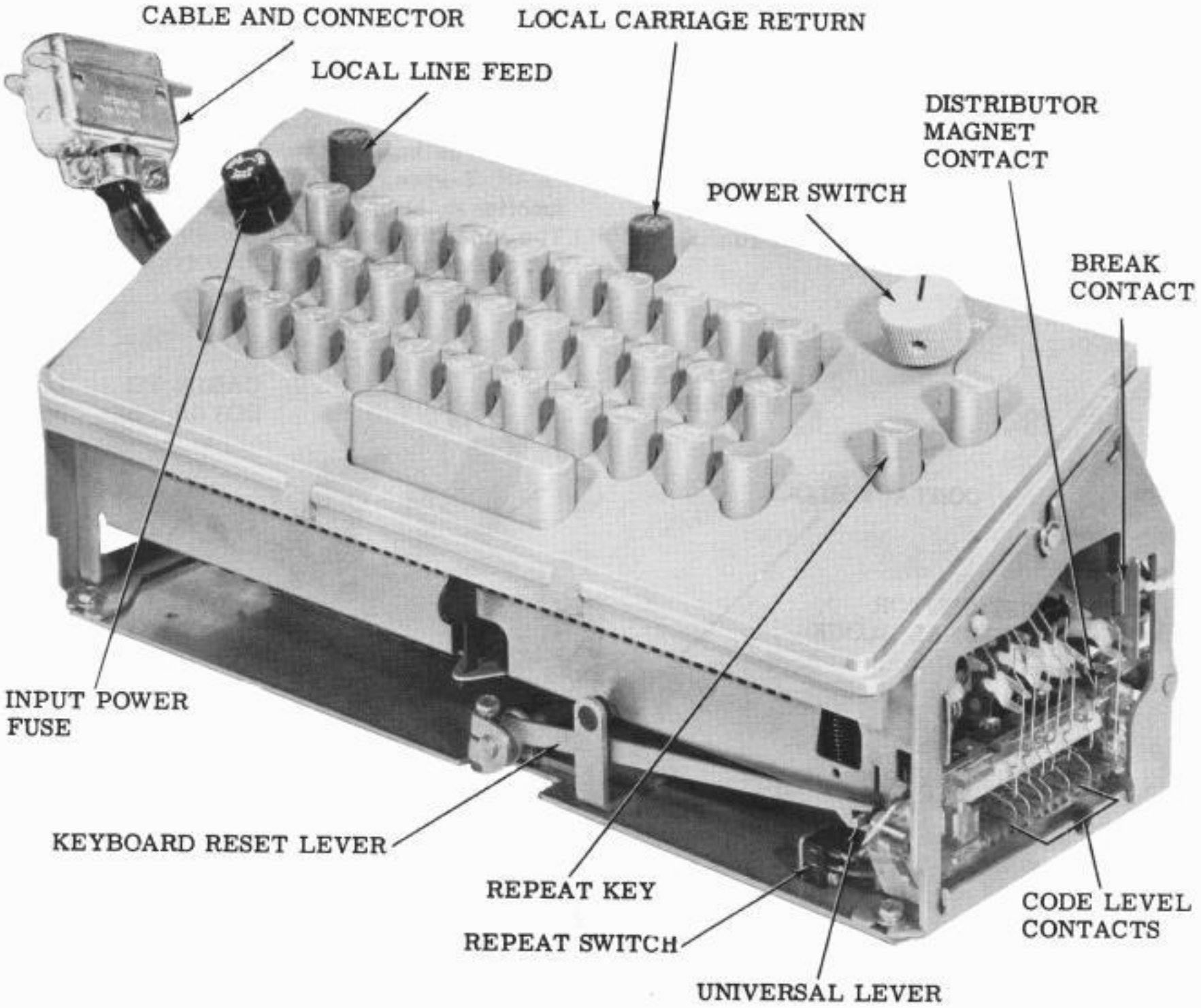

Figure 2 — Keyboard Transmitter

2.06 The repeat key when depressed operates a miniaturized switch to maintain current in the distributor magnet and open the solenoid reset circuit.

Note: To prevent loss of character during repeat operation, the repeat key should be depressed in conjunction with the character key. However, if the keyboard transmitter is inadvertently reset while the repeat key is depressed, a series of blanks will be transmitted.

The break key simply opens the signal line circuit by pushing the break contact wire away from the terminal strip.

2.07 The distributor (Figure 3) is located in the left rear corner of the keyboard unit. The distributor consists of a trip magnet assembly, cam-clutch assembly, contact block, and mounting frame. The electrical cable from the keyboard transmitter merges with the distributor wiring harness through a 24-point connector.

2.08 The 3-speed gear shift assembly is located in the rear center of the keyboard unit (Figure 4). The speed selector is located in the front left corner of the base pan. The speed selector and gear shift assembly are mechanically linked between the front and rear of the base. Each position of the selector will engage one of three gears with the variable speed shaft of the gear assembly. The operating speed may be changed with the motor unit in the running or idle condition.

RECEIVE-ONLY BASE UNIT

2.09 The receive-only base provides mounting facilities for the motor unit, typing unit, and cover, and is used with Receive-Only Sets.

2.10 The base unit consists of a mounting base, 3-speed gear shift assembly (2.08), local function mechanisms, and signal line break key. The mounting base includes an inner base and outer base pan. The inner and outer base elements

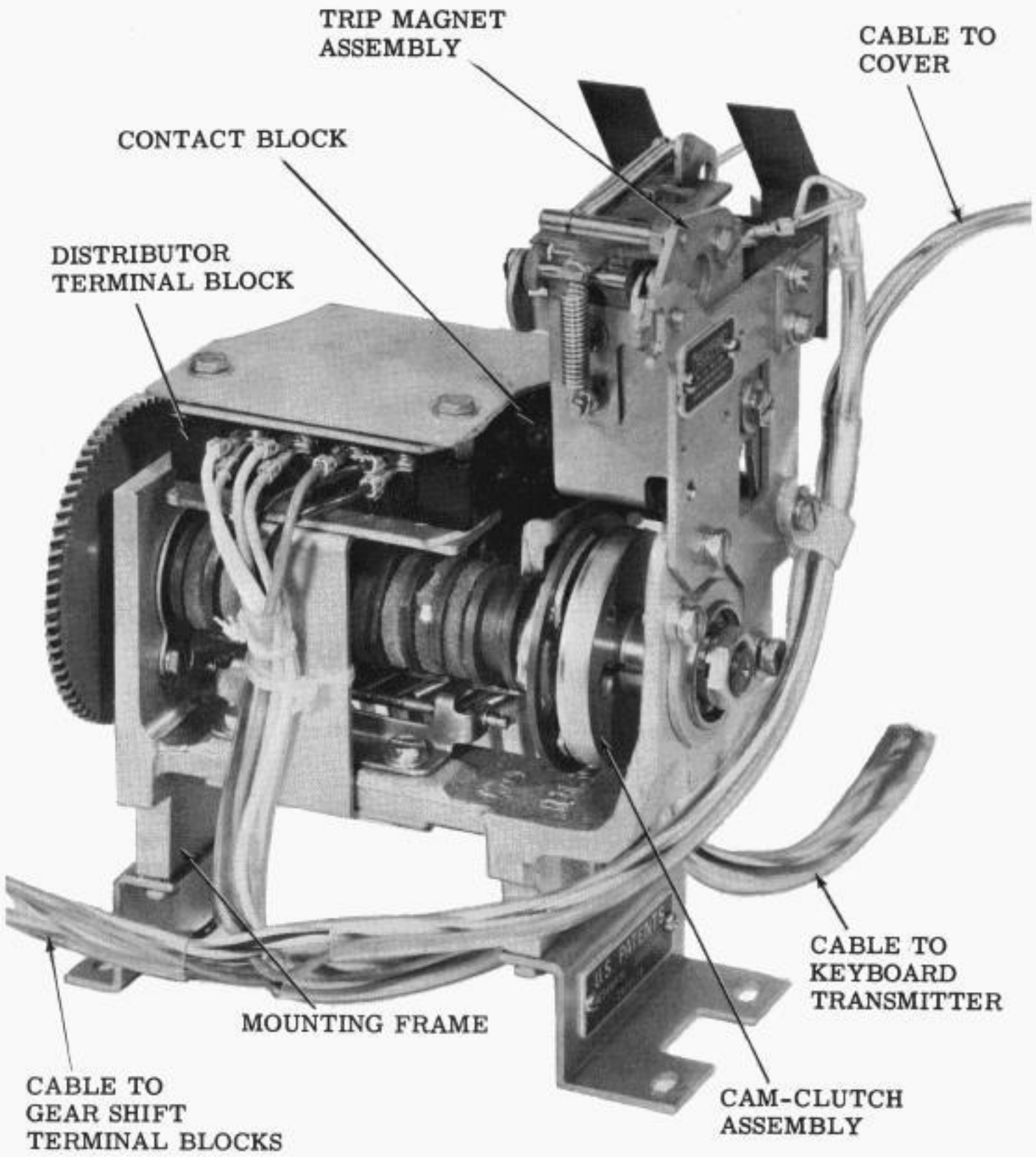

Figure 3 — Distributor (Rear View)

are isolated from each other by four, vertically mounted, vibration mounts.

2.11 The local line feed, local carriage return, signal line break, and ON-OFF power switch are attached to the base unit, and extend through the control hood on the cover (Figure 5). When turned ON, the power switch illuminates an indicator lamp on the cover. Power to the electrical components in the set is initially routed through the switch and through a fuse in the left rear corner of the base.

COVER UNIT

2.12 The KSR cover unit includes a keyboard hood, margin indicator lamp, line guide, copylights, and access doors. The cover unit is secured to the keyboard unit with two latches. Ac power is extended to the cover through a receptacle on the left side. A transformer mounted in the cover reduces line voltage for the copylights.

2.13 The RO cover includes a base hood, power indicator lamp, copylights, and access doors. Two latches secure the cover to the base unit. A transformer mounted in the cover reduces line voltage for the copylights.

MOTOR UNIT

2.14 Mechanical motion for driving the typing unit and distributor (KSR Only) through the gear shift assembly is provided by a 1/20 horsepower, two pole, single phase, synchronous

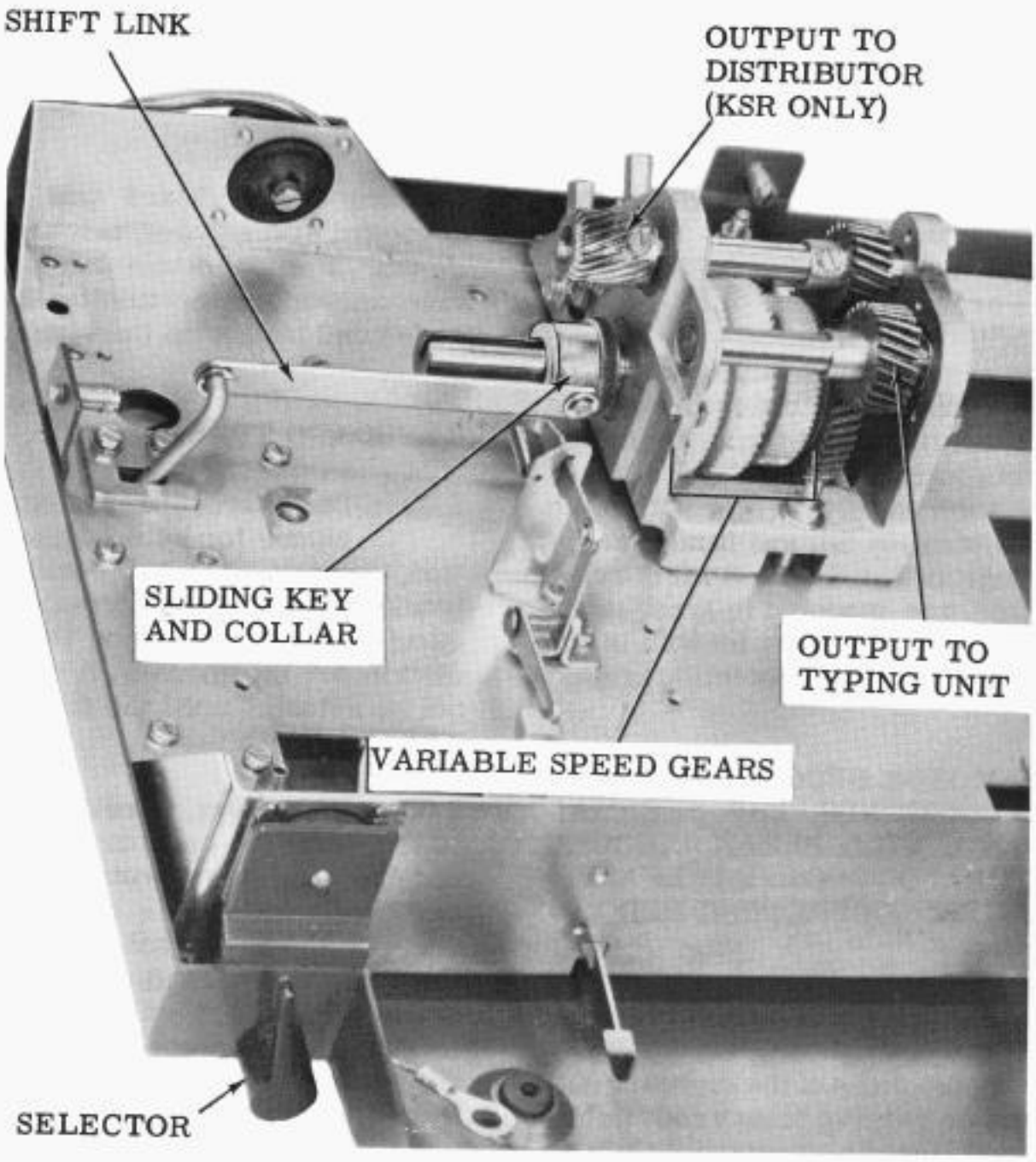

Figure 4 — 3-Speed Gear Shift Assembly

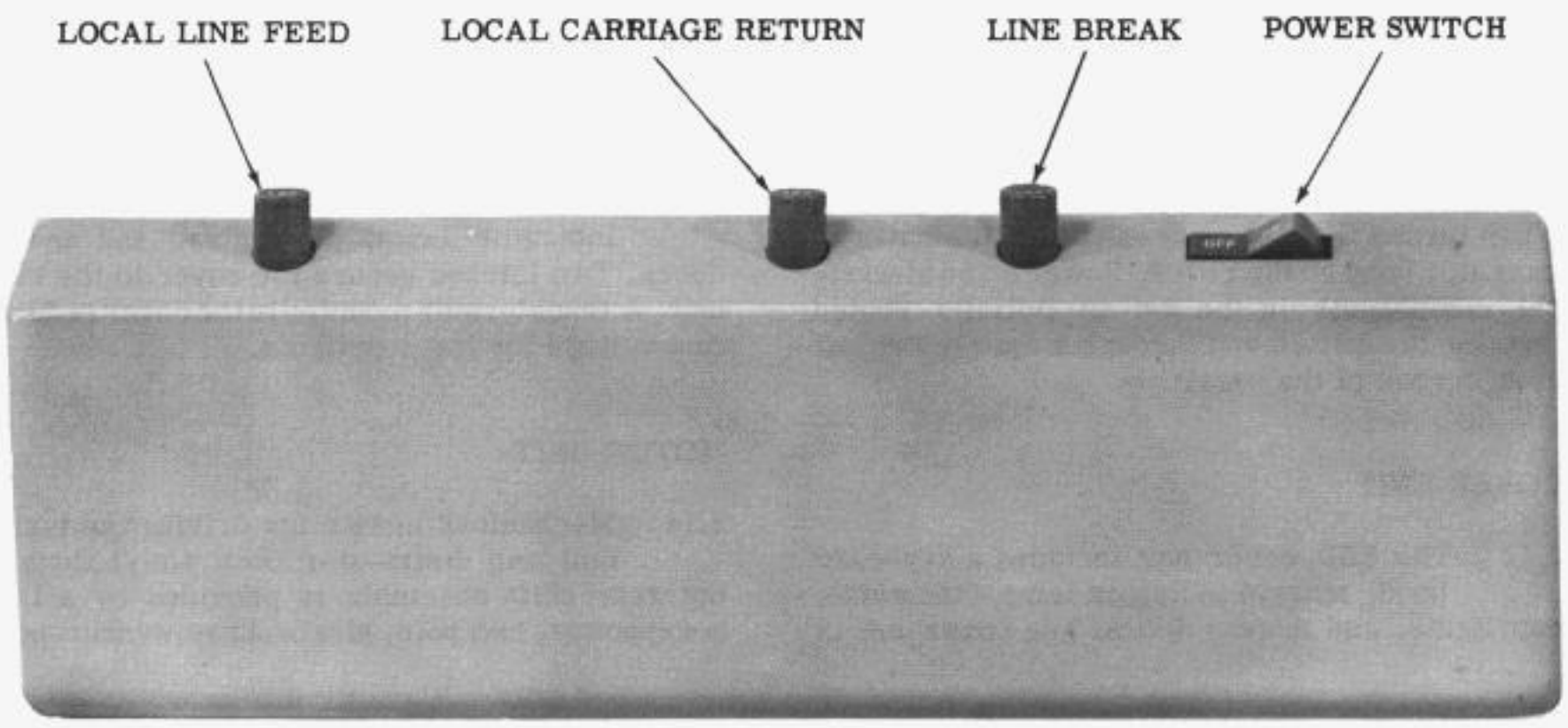

Figure 5 — Receive-Only Control Hood

motor unit (Figure 6). The motor unit operates from a 115 ± 10% volt ac source. Both 50 ± 0.75% cycle, 3000 rpm or 60 ± 0.75% cycle, 3600 rpm motors are available.

2.15 The motor rests in the cradle of a mounting bracket and is held in place by a strap at each end. The cradle is isolated from the motor by resilient mounts to reduce vibration. A small fan is mounted at each end of the rotor within the housing, and a combination fan and handwheel is mounted on the rear of the shaft. A start relay and start capacitor are mounted in front at the motor. A thermal cutout switch is located in the rear of the motor and provides protection against overload.

CAUTION: IF MOTOR BECOMES BLOCKED FOR SEVERAL SECONDS, THE THERMAL CUTOUT SWITCH WILL BREAK CIRCUIT. ALLOW MOTOR TO COOL AT LEAST 5 MINUTES BEFORE DEPRESSING RED RESET BUTTON.

3. PRINCIPLES OF OPERATION

3.01 The primary functions of the keyboard unit are to send or receive binary code information on the signal line. The receive-only base unit, having no sending facilities, receives binary code information, only. To perform the sending function the keyboard unit is equipped with a keyboard transmitter mechanism for manually setting a code combination, and a distributor mechanism for automatically distributing the code combination on the signal line.

KEYBOARD TRANSMITTER

3.02 The keyboard transmitter provides a means for selecting a character or function, presetting local contacts, and initiating transmission. The selected character is then sequentially distributed on the signal line by the distributor mechanism. A second character cannot be selected until the first character has been distributed.

3.03 A keylever, when depressed, initially contacts the codebar mechanism to start the codebar T-levers rotating clockwise and/or counterclockwise. As the keylever descends, it engages the universal codebar which, through a tie link, releases the universal lever. As the universal lever rises, the codebar T-levers are locked, and the contact bail is rotated to release the contact wires. When the contact bail is released, a power contact wire touches its terminal to initiate transmission through the distributor. At the end of the distributor cycle, the reset mechanism drives the universal lever downward

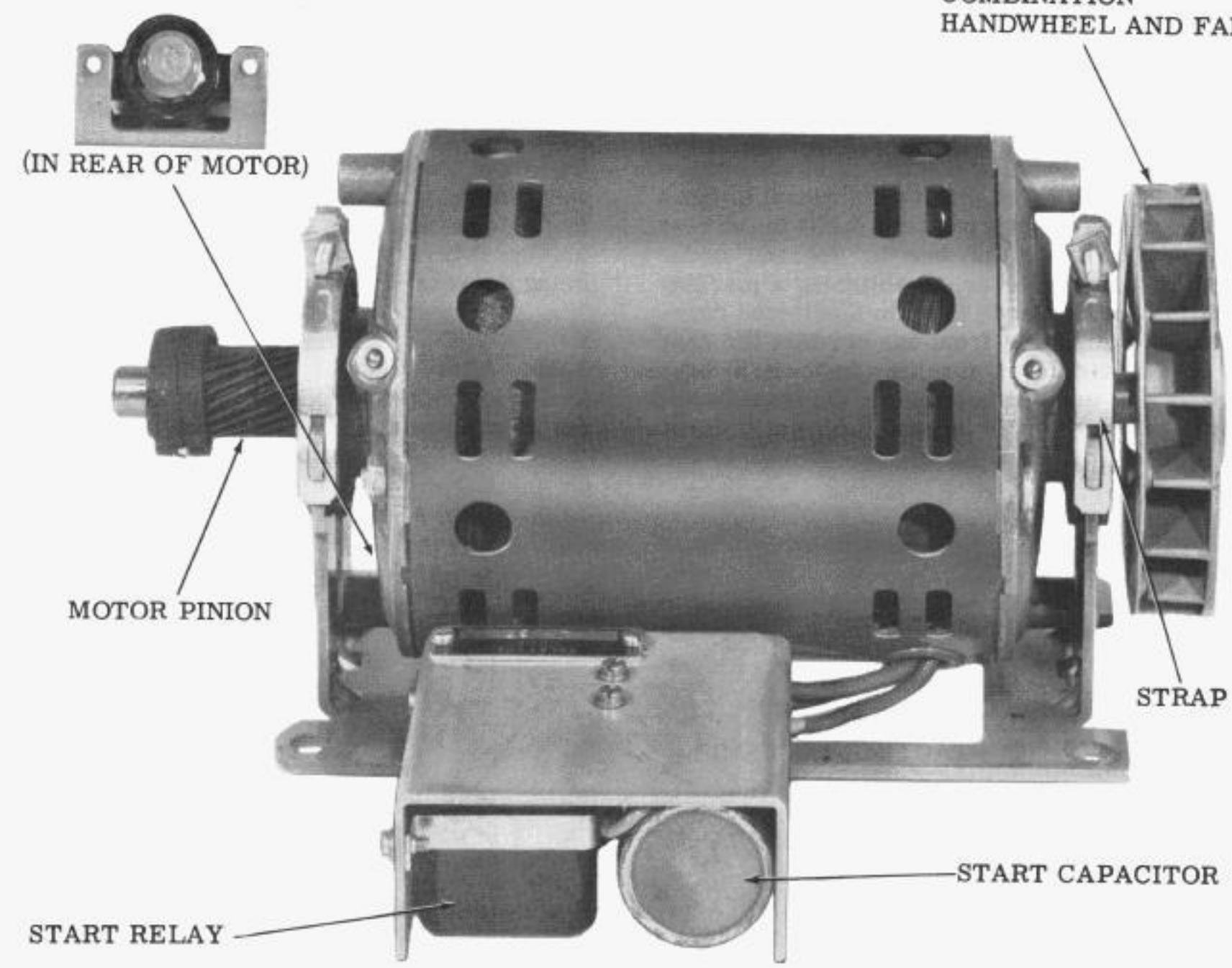

Figure 6 — Motor Unit

to the latched position. As the universal lever descends, the contact bail is returned to its unoperated position, and the codebar T-levers become unblocked. Another character can then be selected.

3.04 The operation of the keyboard transmitter is discussed in the order in which the mechanisms respond. The active mechanisms are:

(1) Codebar mechanism
(2) Universal mechanism
(3) Contact mechanism
(4) Reset mechanism

The support mechanisms are:

(1) Repeat mechanism
(2) Line break mechanism
(3) Local function keys

A. Codebar Mechanism

3.05 For each code level, there is a corresponding codebar submechanism consisting of a front bar, rear bar, tie link, and two T-levers (Figure 7). Collectively, the codebar submechanisms make up the codebar mechanism. The submechanisms, numbering one through five from the rear to the front, correspond to the five

code levels. The single bar nearest the front (illustrated in Figure 8) is the universal codebar and is related to the universal mechanism.

3.06 The front and rear bars in each codebar submechanism, have slots in their top edges and are complimentary coded; i.e., for each keylever location one bar is slotted where the other bar is solid. Each submechanism has a marking and a spacing position. A slot in the rear bar permits the front bar to descend under pressure of a keylever, establishing a marking condition for that code level in a selected character. A slot in the front bar permits the rear bar to descend for a spacing condition. Therefore, in the marking condition, the front bar is down; the rear bar is up; and the right T-lever is clockwise. The spacing condition is the opposite: front bar up, rear bar down, and right T-lever in the counterclockwise position.

3.07 When the T-levers are rotated to either clockwise (marking) or counterclockwise (spacing) positions, their associated contact wires are against (marking) or held away (spacing) from the signal terminal strip in the contact mechanism. The extensions on the right T-levers are held to either the left or right by the released universal lever. This prevents another key from being depressed until the universal lever is reset.

3.08 After a key is depressed, it is returned immediately to its original up position by a leaf spring attached to the frame. However, the

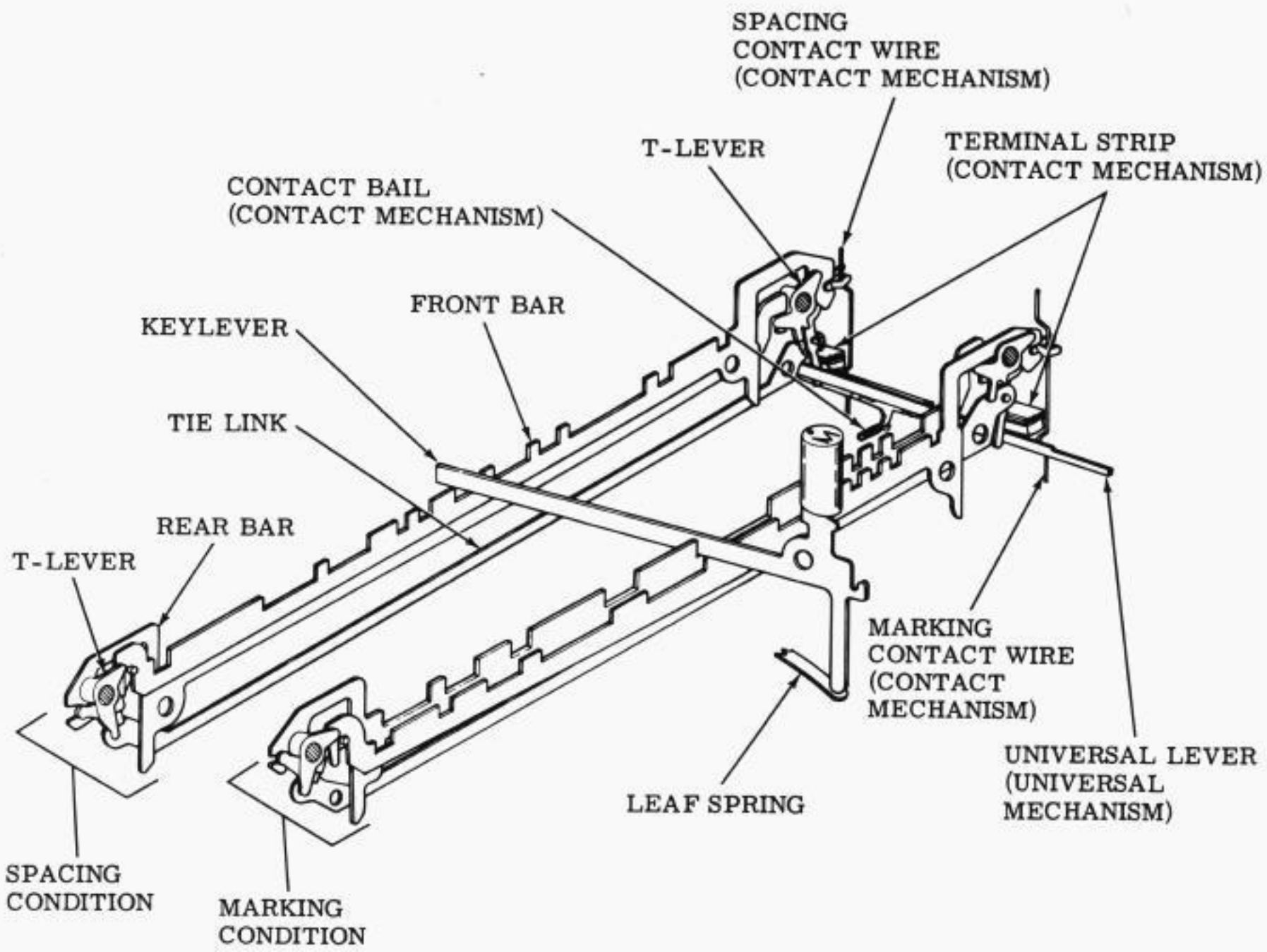

Figure 7 — Codebar Mechanism

code combination, representing the key's character, remains in the codebar mechanism. When a new key is depressed, only the submechanisms whose code levels differed from the preceding combination, are operated. As a keylever is driven towards the bottom of its travel, it engages the universal codebar to trip the universal mechanism.

B. Universal Mechanism

3.09 The universal mechanism releases the contact bail on the contact mechanism, and locks the codebar submechanisms. The universal codebar, when depressed by a keylever, causes its associated T-lever and tie link to rotate clockwise (Figure 8). The tie link extension in contact with the tab on the nonrepeat lever, causes the latchlever to pivot towards the left to unblock the universal lever. The universal lever is released and moves up, under spring tension, to lift the nonrepeat lever tab. The spring force raising the universal lever causes the universal lever to drive the tab above the tie link extension. When the tab rises above the tie link extension, the nonrepeat lever and latchlever return to the right. With the universal lever up, the nonrepeat lever is up and the latchlever leans against the universal lever.

3.10 In the released position, the universal lever locks the codebar submechanisms, and permits the contact bail (on the contact mechanism) to pivot clockwise. The code level contact wires and power contact wire are released. When the power contact wire touches the ac terminal strip, a current path to the distributor clutch magnet is established. The distributor clutch magnet is subsequently de-energized when a set of timing contacts at the distributor, is opened. As the distributor cycle ends, an additional set of contacts at the distributor is closed to energize the reset solenoid on the keyboard transmitter. The universal lever is driven back to its down position where it is latched by the latchlever.

3.11 Should a keylever remain depressed beyond the end of the distributor cycle, the tie link extension prevents the nonrepeat lever

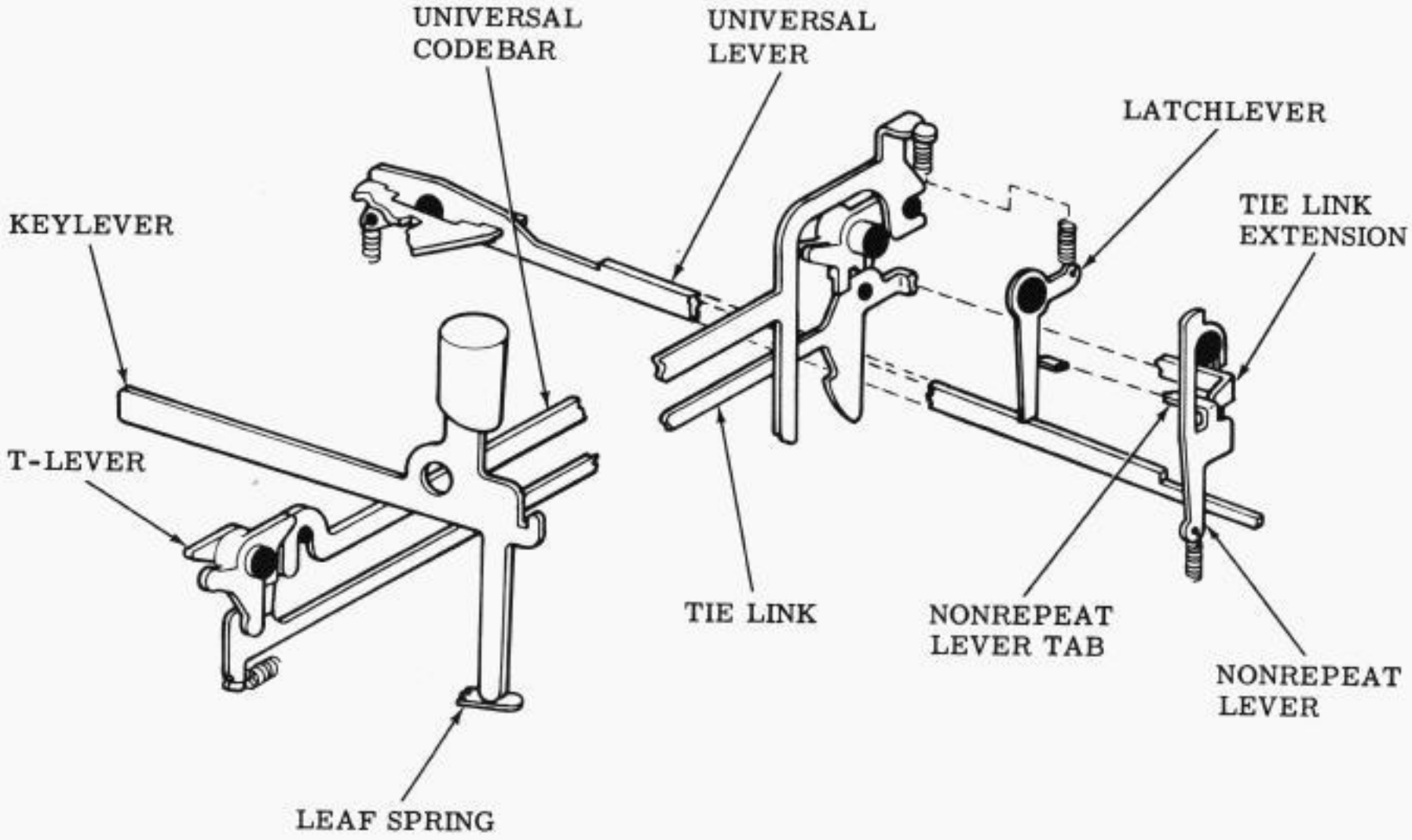

Figure 8 – Universal Mechanism

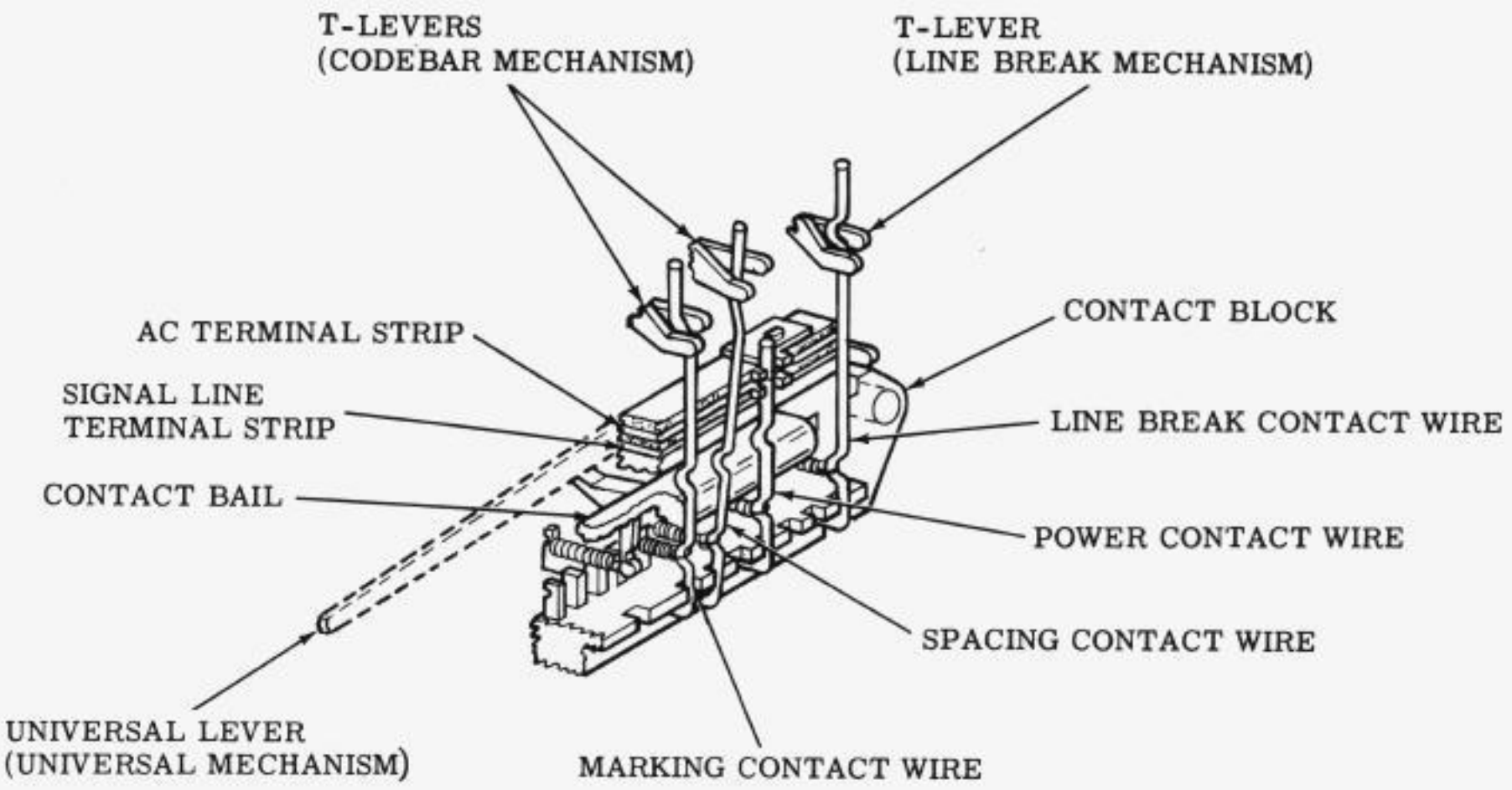

Figure 9 – Contact Mechanism

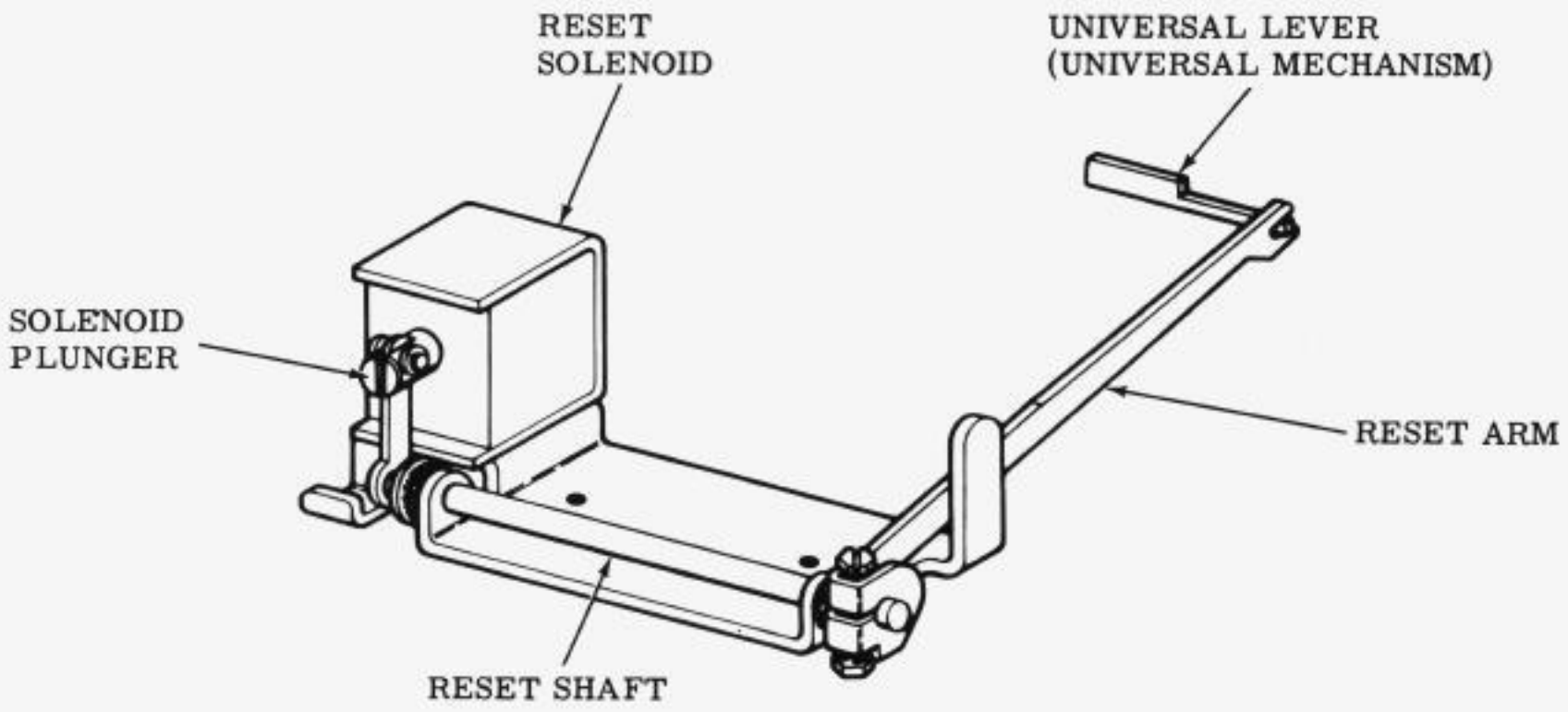

Figure 10 – Reset Mechanism

from returning to its reset condition. The nonrepeat lever tab hangs on top of the tie link extension as the unaffected latchlever holds the universal lever down. When the keylever is released, the tie link extension moves back to the right, and the nonrepeat lever shifts downward allowing the tab to fall between the latchlever and the tie link extension.

C. Contact Mechanism

3.12 The contact mechanism (Figure 9) responds to inputs from the codebar, universal, and reset mechanisms. The codebar mechanism operates a set of T-levers into marking and/or spacing positions, and the universal mechanism releases the contact wires in the contact mechanism. A contact wire is associated with each codebar submechanism. Subsequent to code selection, the universal mechanism is tripped to release the contact bail and lock the code selection. The contact bail releases the five code level contact wires and one power contact wire.

3.13 In the reset condition of the keyboard transmitter, the contact bail holds the contact wires away from their respective T-levers. When the universal lever is released, the contact bail rotates clockwise to release all contact wires against either the terminal strip for marking conditions or individual T-levers for spacing conditions. When the contact bail rotates, the power contact wire is always marking against the ac terminal strip. The contact bail is returned to its reset position when the universal lever is returned by the reset mechanism.

D. Reset Mechanism

3.14 A solenoid mounted on the rear of the keyboard transmitter, is used to reset the universal lever. The reset mechanism (Figure 10) includes a solenoid, reset shaft, and reset arm, and is operated by an electrical pulse received from the distributor. The pulse originates from a set of contacts that are closed during the final segment of the distributor cycle. When energized, the solenoid plunger rotates the reset shaft and reset arm to drive the universal lever down.

E. Repeat Mechanism

3.15 The repeat mechanism (Figure 11) consists of a repeat keylever and miniature switch. When operated, the repeat keylever depresses the switch to (1) close the distributor

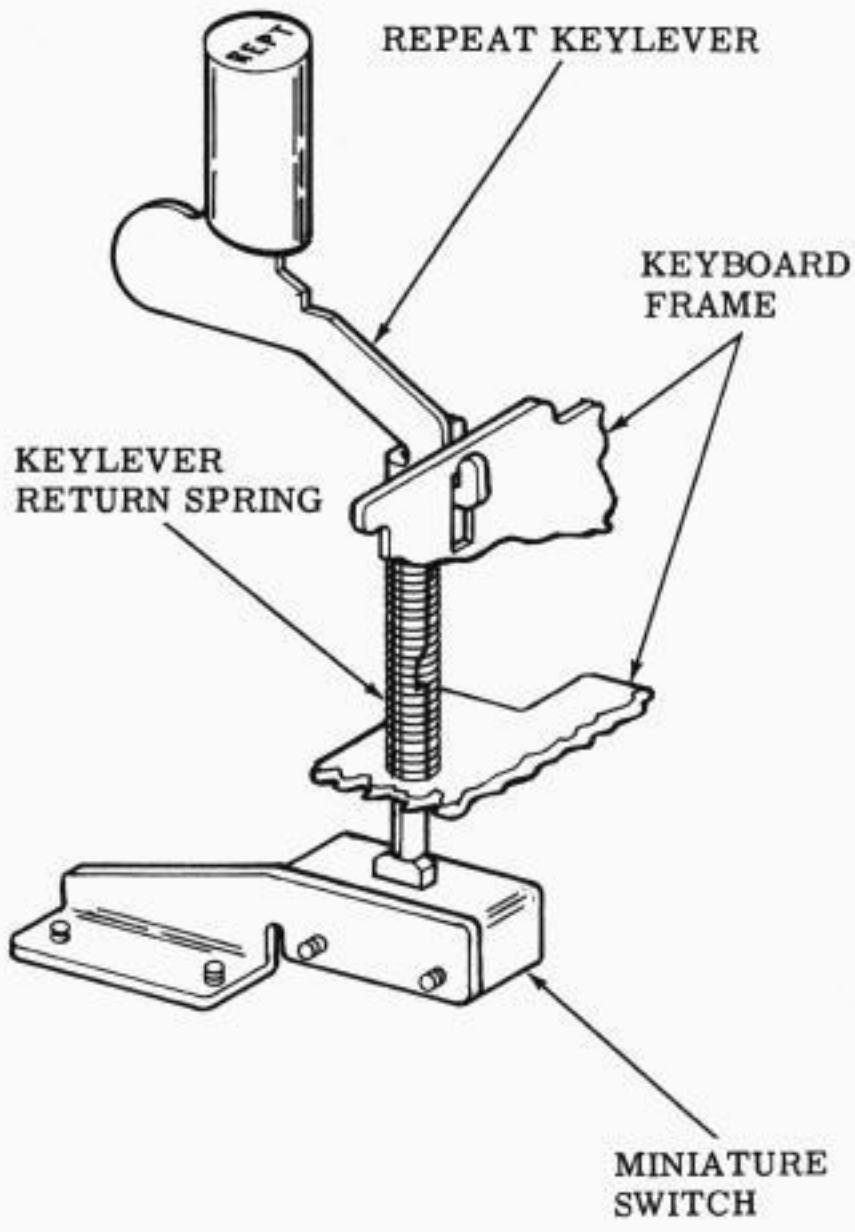

Figure 11 — Repeat Mechanism

clutch magnet circuit and (2) open the reset solenoid circuit. The distributor continues to operate and permits repeated transmission of the character as long as the REPT key is depressed. To avoid loss of the character, the character keylever and repeat keylever should be held down simultaneously.

F. Line Break Mechanism

3.16 The line break mechanism consists of a break keylever, T-lever, and contact wire. The signal line current is interrupted when the BREAK key is depressed. The signal line remains open until the key is released. The contact wire is a serial link in the signal line.

G. Local Function Keys

3.17 In addition to the normal signal line keys, the keyboard transmitter is equipped with a local line feed key and a local carriage return key. The local function keytops are in red to

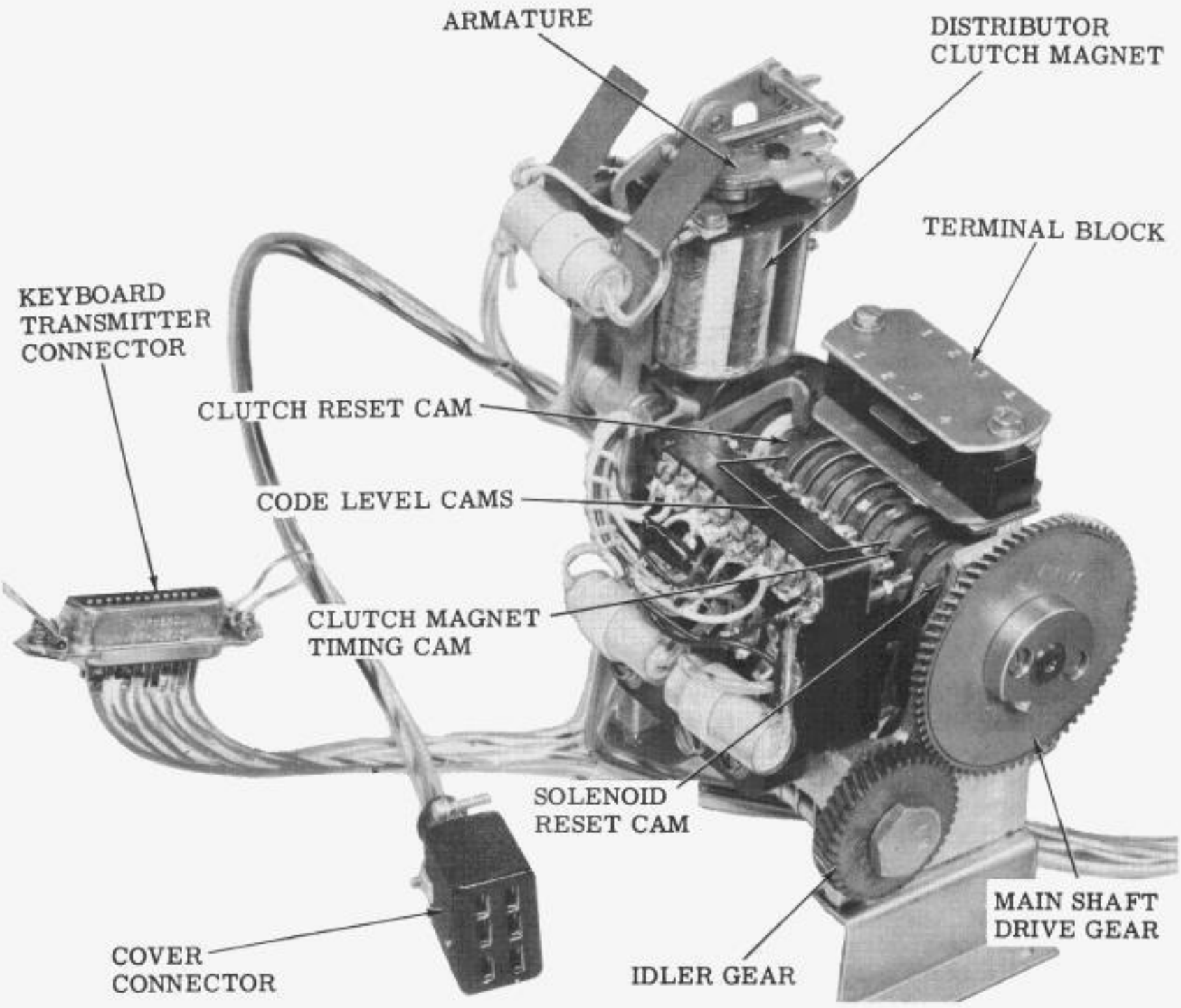

Figure 12 — Distributor Mechanism

readily distinguish them from the signal line function keys. The keys operate local function mechanisms which are attached to the base and mechanically linked with the typing unit.

DISTRIBUTOR

3.18 The distributor mechanism (Figure 12) sequentially applies signal line current to the keyboard transmitter mechanism, and controls the electrical power circuits which operate the distributor clutch magnet and keyboard transmitter reset solenoid. The timing functions are initiated when a keytop at the keyboard transmitter is depressed. The keytop presets the code level contact wires and closes a power contact wire to allow current to flow to the distributor clutch magnet.

3.19 When energized, the distributor clutch magnet attracts an armature to release the clutch trip lever. When the clutch shoe lever is released, the clutch shoes engage the cam sleeve with the main shaft. A cam on the rotating cam sleeve opens a set of timing contacts to de-energize the distributor clutch magnet. (The pulse for the distributor clutch magnet is initiated by the keyboard transmitter and terminated by the distributor.) The clutch magnet armature is mechanically reset as the high part of the clutch reset cam rotates the reset lever away from the

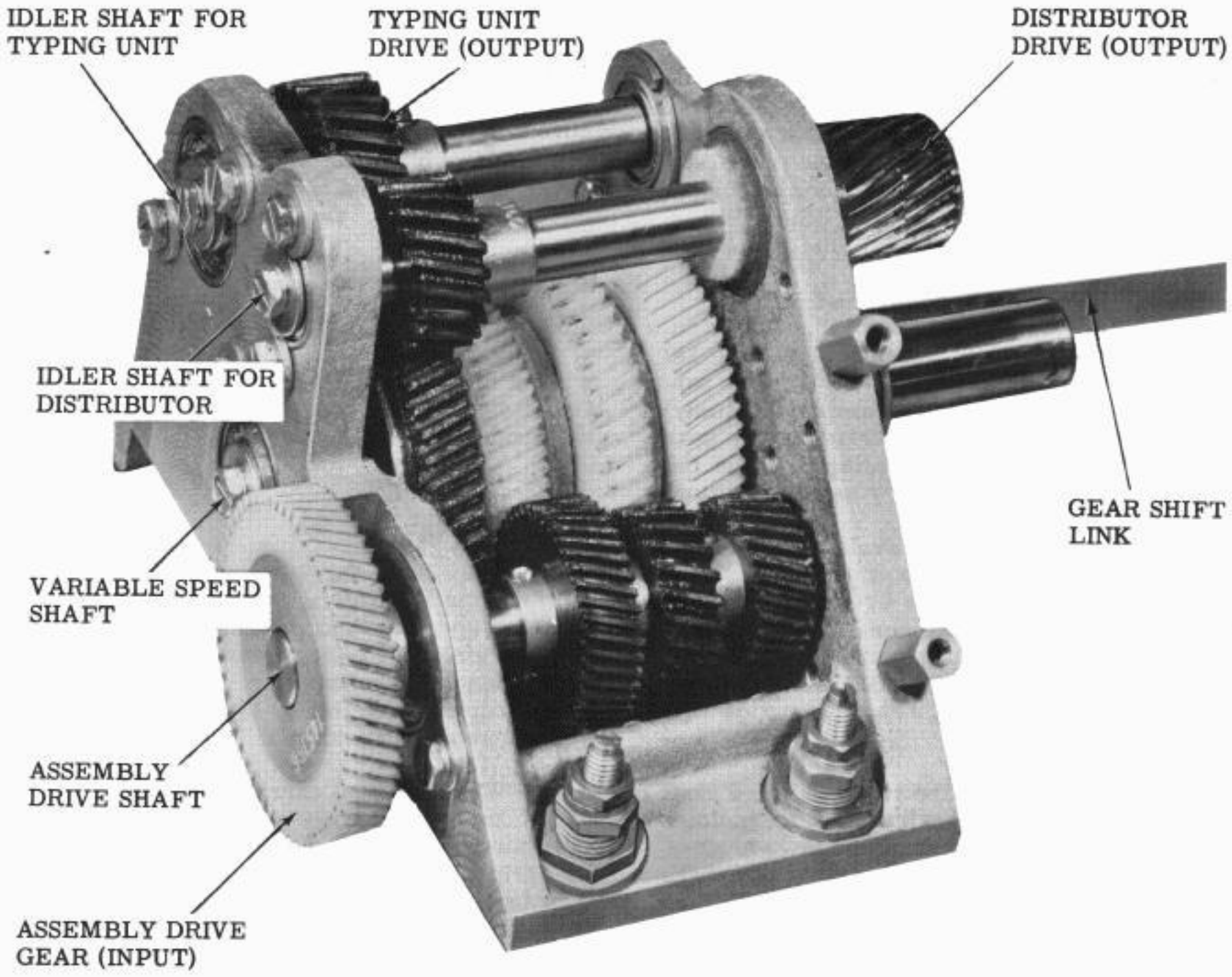

Figure 13 — Gear Shift Assembly (Rear View)

armature. The armature, under spring tension, rises to lock the trip lever. The signal line, before and during the brief start interval (for the distributor) remains closed by the stop cam and contacts at the distributor.

3.20 The keyboard transmitter contacts are linked in parallel with the distributor contacts, and are sensed as current is applied sequentially. There are six cams on the distributor cam sleeve to actuate the five code level and stop contacts in the distributor contact block. A flat on each cam causes the follower to close the contacts.

3.21 Initially, before current is admitted to the code level contacts, the stop contact is opened for one unit of time. Then, in succession while the stop contact remains opened, signal line current is directed through each set of code level contacts as their respective follower arms are operated. After the fifth set of code level contacts is opened, the stop contact is closed to re-establish constant current on the signal line.

3.22 The duration of each code pulse is controlled by the dwell period of the cams. For a 7.42 unit code, the dimensionless time

length for the start and each code level pulse is one unit, and for the stop pulse is 1.42 units. For a 7.00 unit code, the start, code level and stop pulses are all one unit in length.

3.23 During transmission of the fifth code pulse, the solenoid reset contacts are closed to reset the keyboard transmitter mechanism. The pulse terminates or the reset contacts are opened before the distributor completes its rotational cycle.

3-SPEED GEAR SHIFT ASSEMBLY

3.24 The gear shift assembly (Figure 13) transfers rotational motion from the motor unit to the distributor mechanism (KSR only) and the typing unit. The output speed of the gear assembly can be manually selected while the motor unit is in the idle or running condition.

3.25 The assembly drive shaft, driven by the motor pinion, rotates at a constant speed. Three variable sized gears are attached to the assembly drive shaft, with pins. The gears mesh with three, free wheeling gears on the variable speed shaft. A sliding key attached to the shift linkage engages one of three gear ratios with the variable speed shaft.

3.26 A spur gear on the variable speed shaft transfers rotational motion to an idler shaft which drives the gear on the main shaft of the typing unit. A second output is taken from the spur gear on the variable speed shaft to turn another idler shaft. The output from this idler shaft is transferred to the distributor idler gear which conveys rotational motion to the gear on the distributor main shaft. Neither the typing unit nor the distributor will operate unless their respective clutches engage associated cam sleeves with their main shafts.

3.27 The selector on the front edge of the set operates a shift link in the rear to select one of three Bauds. The shift link positions the collar and sliding key to engage a single gear ratio with the variable speed shaft.

MOUNTING BASE

3.28 The mounting base provides facilities for securing the mechanisms to the keyboard or base units. There are two locating studs on the base to properly align the typing unit when securing it to the base.

A. Margin Indicator Switch

3.29 The margin indicator switch is mounted on the keyboard unit and is opened by the carriage pulley on the typing unit. The switch lever is held against the switch button by a spring. When the switch is closed, a neon bulb on the cover is illuminated. Electrical connections exist between the indicator switch, terminal blocks, cover connector, and neon bulb.

B. Local Functions

3.30 The local functions are intended to provide local control of certain functions without disturbing the signal loop. The local function keytops are in red to distinguish them from the signal line function keytops.

Local Carriage Return

3.31 The local carriage return mechanism trips the carriage return function to return the type box and printing hammer to the left margin of the typing unit. Since the function is performed mechanically, the signal line is uninterrupted, and other typing units on the signal line are undisturbed.

3.32 When the local carriage return (LOC CR) keylever is depressed, the associated bail is rotated toward the rear of the base (Figure 14). The trip link, pinned to the local carriage return bail, slides under the guide bracket to trip the carriage return lever on the typing unit. The same carriage return lever is tripped internally when the coded function for carriage return is received by the typing unit.

Local Line Feed

3.33 The local line feed mechanism performs the function of advancing the platen without disturbing other typing units on the signal line. The mechanism trips the line feed clutch trip lever on the typing unit.

3.34 When the local line feed keylever (LOC LF) is depressed, the rear of the local line feed bail is raised against the line feed lever (Figure 15). The lever is rotated toward the rear to cause the line feed trip link to slide to the rear. The line feed clutch trip lever releases the clutch shoe lever on the typing unit. The line feed mechanism on the typing unit advances the platen.

VARIABLE FEATURES

A. Time Delay Mechanism

3.35 A time delay mechanism (Figure 16) is available to close a set of contacts after a number of idle revolutions of the typing unit main shaft. The mechanism provides an electrical pulse to operate a stop magnet assembly (in a separate service unit) which opens the power circuit and shunts the signal line.

Note: The stop magnet assembly is not installed in the 28 Compact Teletypewriter Set, but is available for installation in a separate electrical service unit.

When combined with the time delay mechanism, the stop magnet assembly completes the requirements for developing the time delay motor stop circuits. A break in the signal line current is necessary to reactivate an RO or KSR set after a time delay motor stop mechanism has interrupted continuous-but idle-operation.

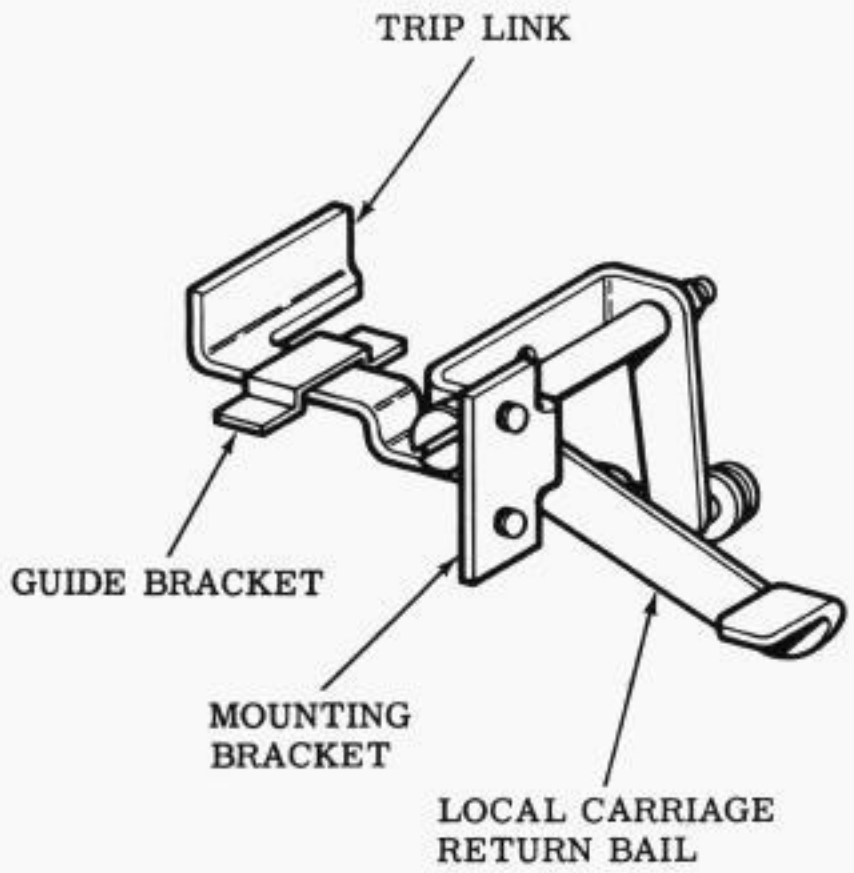

Figure 14 — Local Carriage Return Mechanism

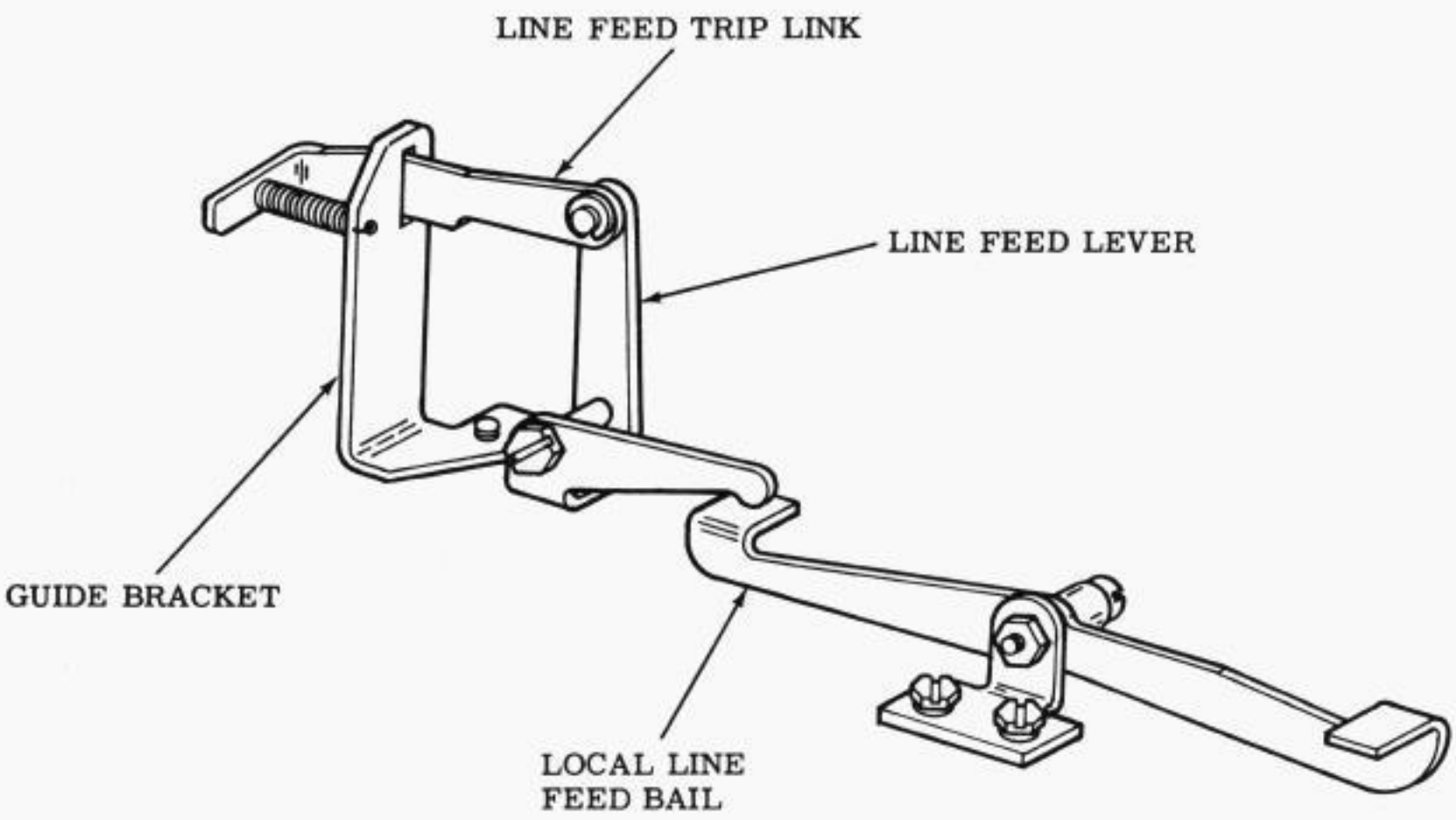

Figure 15 — Local Line Feed Mechanism

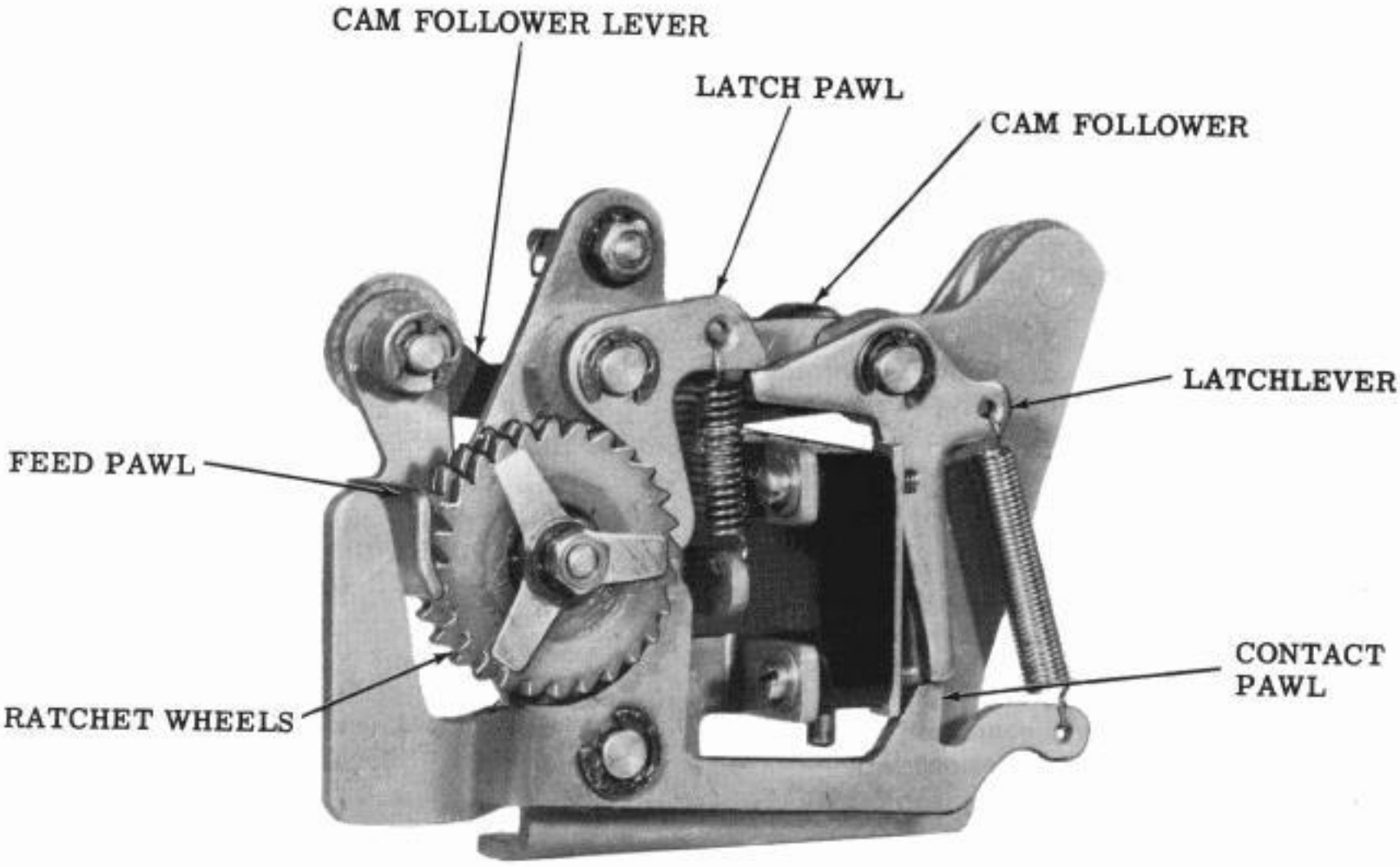

Figure 16 — Time Delay Mechanism

3.36 The time delay mechanism is mounted on the base and is located under the typing unit main shaft. A cam on the typing unit main shaft provides motion to operate the cam follower lever on the time delay mechanism. The motion imparted to the feed pawl, advances a pair of ratchet wheels.

3.37 One ratchet wheel has 27 teeth, and the other has 28 teeth. A single feed pawl, attached to the cam follower lever, advances the pair of ratchet wheels one notch with each revolution of the typing unit main shaft. As the pair advances, one wheel turns a little faster than the other. The ratchet wheel with the 27 teeth advances 1/756 revolution more than the wheel with 28 teeth. It requires 756 ratchet advances to align adjacent points on the two wheels.

3.38 The latch pawl rides on the inside flanges of the ratchet wheels. Each flange has a semi-circular hole in its camming surface. Both holes must be aligned to permit the latch pawl to snap into the indentation. After 756 revolutions of the typing unit main shaft, the holes on the ratchet wheel flanges are adjacent for nearly one revolution of the ratchet wheels. When the adjacent holes pass under the latch pawl, the latch pawl, under spring tension, snaps into the indentation, briefly.

3.39 When deflected, the latch pawl rotates the latchlever out of engagement with the contact pawl. The contact pawl is released to bear against the inside flanges of the ratchet wheels.

3.40 One of two conditions may exist on the signal line during the next 756 revolutions of the typing unit main shaft. Should a line break occur — character transmission or physical break — to activate the typing unit mechanisms, the rocker shaft bail on the typing unit will engage the end of the contact pawl and cause the pawl to be relatched by the latchlever. If no line break occurs, the typing unit mechanisms, other than the main shaft, remain idle; the holes in the flanges reach alignment; and the contact pawl snaps into the indentation. The contact pawl, upon snapping into the indentation, depresses the plunger on the time delay switch.

3.41 In operation, the delay will vary within a given time range for each Baud. The approximate values for the time delay ranges are given in Table 1.

Baud	Time Delay	
	Minimum (Minutes)	Maximum (Minutes)
45.5	1.8	3.6
50.0	1.6	3.3
74.2	1.1	2.2
75.0	1.1	2.2

Table 1 — Time De'ay Range