IBM ELECTRIC TYPEWRITERS

CUSTOMER ENGINEERING

INSTRUCTION MANUAL

MODEL B-1

IBM

ELECTRIC TYPEWRITERS

CUSTOMER ENGINEERING INSTRUCTION MANUAL

MODEL B1

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MOTOR AND DRIVE

Motor

The AC and the DC motor used in the Model B, IBM Electric Typewriter is rated at 1/40 HP. It is equipped with self-aligning bronze bearings which are surrounded with saturated oil wicks and oil return cups.

The AC motor operates on the induction principle and runs at a speed of approximately 1625 R.P.M. No governor brushes or starting contacts are required, thus assuring quiet operation (Fig. 1). A two mfd capacitor, in the starting winding circuit, provides the means to start the motor and control the direction of rotation. The capacitor also remains in the circuit while the motor is running and is used to minimize operating vibrations (Fig. 2).

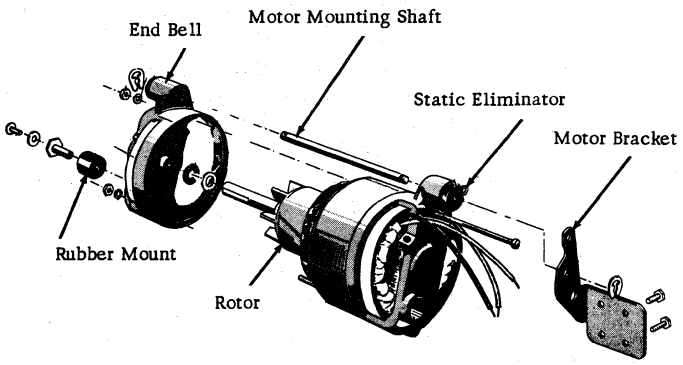

Figure 1. AC Motor And Mounting

The capacitor is wrapped in insulating material and mounted to the rear frame by the capacitor mounting bracket.

The switch is mounted on the right side frame. It is operated by a switch lever and link. The switch lever has a white portion for the "ON" position to attract attention. It moves the key lever locking bar to the left and to the front when the switch is turned "OFF" (Fig. 27). This locks all keylevers except the shift key lever. The shift key lever is not affected because in the locked down upper case position, it would obstruct the action of the key locking bar.

The DC motor is a shunt wound brush motor, in which speed is dependent on stable line voltage (Fig. 3). This motor is characterized by a low starting torque and a stable speed under load. Advantages of this motor are that it requires no governor or governor contacts and requires only a simple switch circuit and a fuse. Changing machine specifications from one

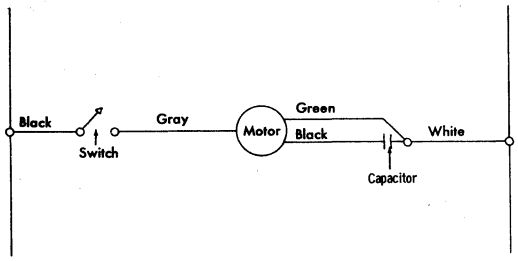

Figure 2. AC Wiring Diagram

current to another is simple and fast, because the same mounting parts are used for both AC and DC motors. However, when changing a machine from AC to DC, a nonmagnetic governor pawl assembly must be installed. The standard governor pawl can become magnetized by a DC motor and magnetically attach itself to the friction governor plate and cause faulty tabulation and escapement.

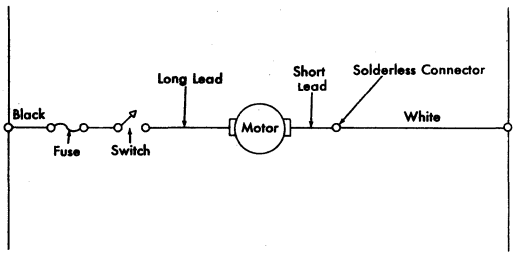

Figure 3. DC Wiring Diagram

The AC and DC motor is suspended from a shaft that is supported by the left side frame and a motor mounting bracket on the rear frame. This shaft is held in place by C-clips. Rubber grommets, held in cup like recesses of the motor end bells, insulate the motor vibrations from the shaft. A lower grommet insulates the motor from the nut and screw that positions the motor on the left side frame (Fig. 1). The latest rubber motor mounts or grommets incorporate a "finned" design to reduce motor noise (Fig. 4).

To further reduce vibration and harmonic noise transmitted through the motor mounts, a ring mount is now used on 115V and 230V 60 cycles AC motors (Fig. 5). The three mounting holes in the frames used for the previous motor, are also used by the ring mount. In addition, a ring mount bracket support has been added to eliminate any left or right motion of the right ring mount bracket.

Every motor mounting includes a static eliminator, which grounds the motor to the frame of the typewriter. A small piece of copper wire is formed in a "U" around one of the grommets or rings to prevent the build-up of a static charge.

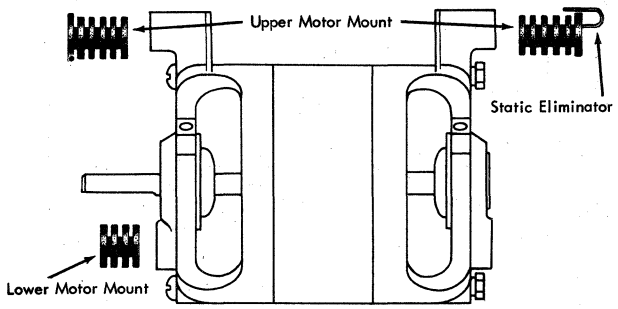

Figure 4. "Finned" Motor Mounts

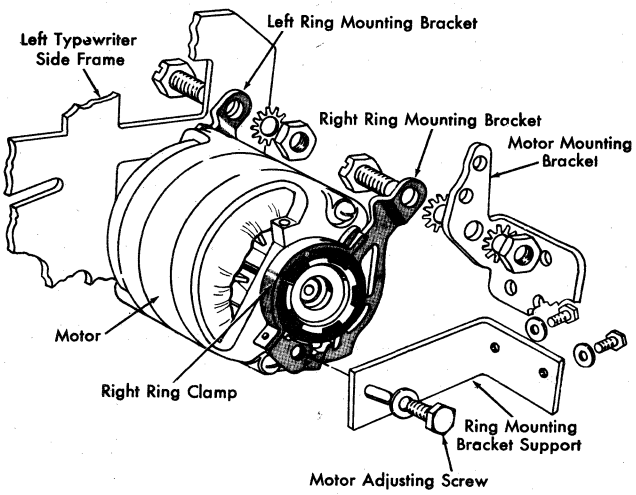

Figure 5. Ring Mounted Motor

Two bakelite shields, formerly used, have been eliminated on all motors. This allows a greater flow of air through the motor thereby reducing its operating temperature.

Drive

The positive drive mechanism consists of toothed belts and pulleys to transfer the rotation of the motor to the power roll (Fig. 6). speed reduction from the motor to the power roll is approximately 6:1. This reduction is accomplished by using a combination of 3 pulleys and 2 belts. A drive belt transfers the rotation from the motor pulley to the large side of the intermediate pulley. A belt from the small side of the intermediate pulley, known as the driven belt, transfers the rotation of the intermediate pulley to the power roll pulley. The power roll pulley is attached directly to the end of the power roll shaft by two bristo set screws.

The intermediate pulley is mounted to the left side frame by means of an intermediate shaft, a retaining plate and a nut. The retaining plate acts as a locking device for the nut. The shaft and nut have a left-hand thread so that the rotation of the pulley prevents loosening of the shaft.

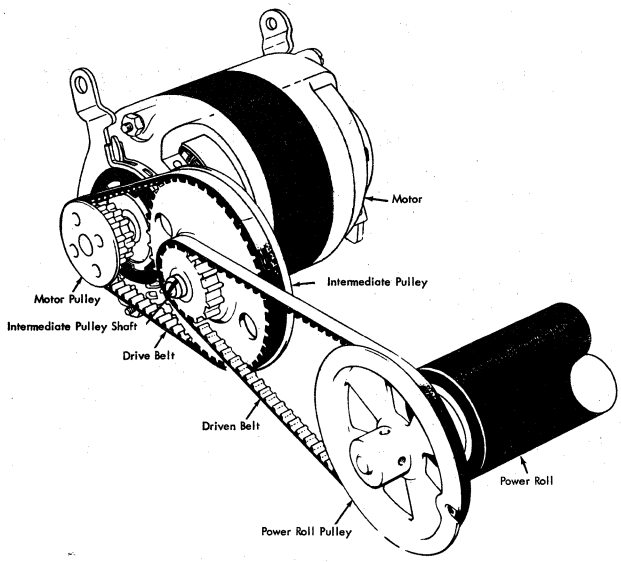

Figure 6. Positive Drive Mechanism

The pitch of the machine is the number of typed characters or spaces to the inch. Machine pitch usually is determined by the size of the type used. Type style and size also indicate the power roll speed needed for best impression results. The speed of the power roll is varied by using motor pulleys of different diameters. The diameter of the motor pulley determines the number of teeth on the pulley, and these numbers are molded on the pulley.

The drive belts vary in diameter to compensate for motor pulley sizes. This facilitates belt adjustments on shaft mounted motors. Strips of yellow or green paint on the drive belts indicate the small and large belts, respectively.

The following chart provides recommendations for the proper motor pulley, drive belt and power roll speed on most machines of a given pitch.

Pitch	Power Roll Speed FPM	RPM	No. of Teeth on Mtr. Pulley	Drive Belt
12 and 14	95	242	14	Yellow
6 2/5, 8, 9, and 10	103	261	15	Green

The ring mounted motor must be kept toward the rear to prevent interference with the lower line lock bell crank. It is, therefore, necessary to use the longer green belt with all ring mounted motors, regardless of the motor pulley used.

Earlier model positive belt drives had motor pulley combinations of 13 - 15 teeth and 14 - 16 teeth. Power roll speeds of 95 and 103 feet per minute are the only ones currently specified, therefore a 14 - 15 tooth motor pulley has replaced two previous pulleys.

The purpose of the power roll is to supply motion for all cam operated mechanisms. It consists of a hollow metal cylinder to which a rubber tube is glued (Fig. 7). Two end plugs,

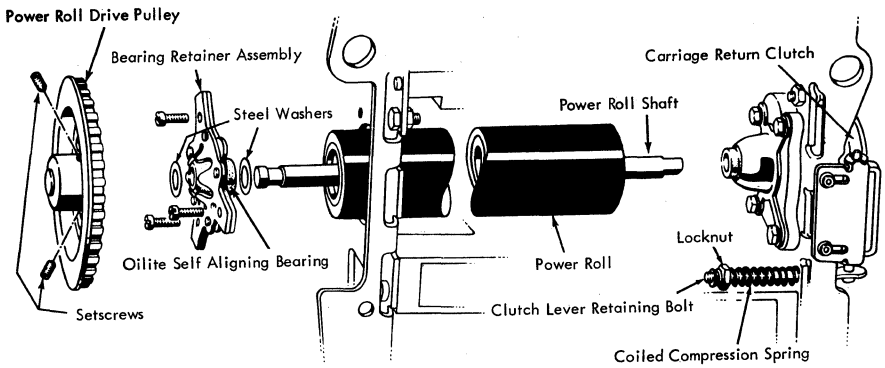

Figure 7. Power Roll Mechanism

containing a solid power roll shaft, are pressed into the ends of the cylinder. This shaft mounts the power roll to the machine by passing through self-aligning porous bronze bearings that are held in retainers on both side frames. The left end of the shaft is the mounting for the power roll pulley. The right end of the shaft is rectangular and extends through a rectangular hole in the clutch friction disc.

KEY LEVERS, LETTER CAMS AND TYPE BARS

Letter Key Levers

The rear ends of the keylevers are mounted in slots in the key lever bearing support and are held by a fulcrum wire which passes through a hole in each key lever (Fig. 8). This wire serves as the fulcrum point for all key levers. The left to right motion of the front ends of the key levers is limited by slots in the front key lever guide comb (Fig. 9). Key lever springs hold the key levers in the raised, or rest position. The springs are located between the front ends of the key levers and the spring lugs on the top of the front guide comb (Fig. 15) The travel of each key lever is limited by strips of rubber mounted across the top and bottom of the slots in the front guide comb. The rubber strips prevent metal to metal contact and are a noise reduction feature. A sponge rubber keyboard stabilizer reduces key button vibration during machine operation (Fig. 15). It is located between the adjusting lugs on the top of the key levers and the key lever bearing support. The adjusting lugs make it possible to raise or lower individual key levers.

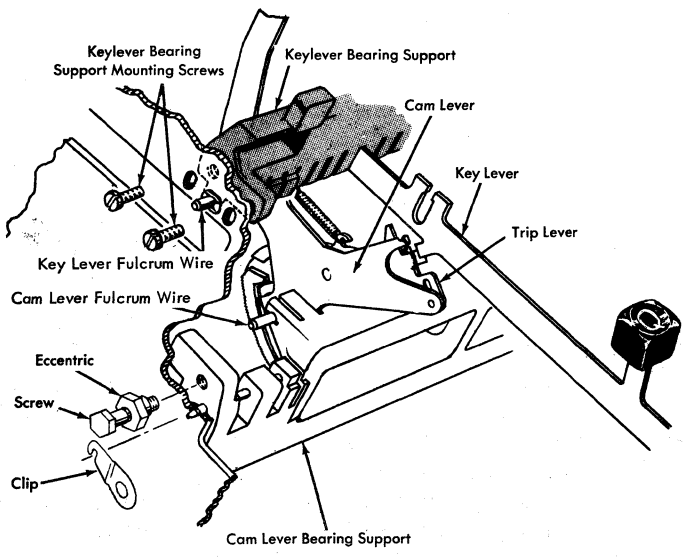

Figure 8. Key Lever and Cam Mounting

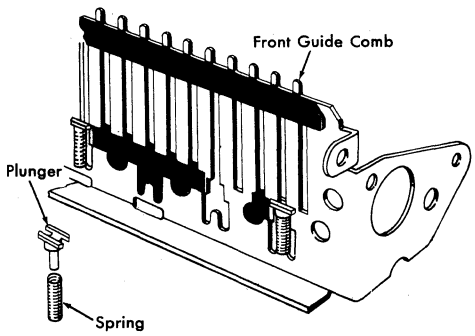

Figure 9. Key Lever Guide Comb

Letter Cams

Cam lever assemblies are mounted in slots in the cam bearing support and are held by a fulcrum wire which passes through a hole in each cam lever (Fig. 8). A type bar link is hooked through a hole in the long arm or extension of the cam lever. The other end of this link hooks into the bottom of the type bar. The rest position of the type bar, against the type rest, determines the rest position of the cam lever. When the type bar is fully actuated or against the platen, the cam lever is also rotated to its full actuated position. Each cam lever assembly is made up of three main parts; the cam lever, the

cam, and the trip lever (Fig. 15).

The cam consists of a steel body with nylon molded at the bearing point, the tail, and the shoe that contacts the power roll. The cam is mounted to the cam lever by means of a shoulder rivet. It is free to rotate about the rivet, but the amount of rotation is limited in one direction by a steel stop which projects from the cam. The stop contacts the side of the cam lever and determines the rest position of the cam (Fig. 15). A cam spring extends between a hook on the cam lever and a hook on the cam and holds the cam in its rest position. The heel of the nylon shoe contacts the cam lever when the cam is fully rotated and limits rotation in this direction. Earlier steel bodied cams did not have steel stops. The nylon heel of the cam was larger and served as a cam stop in both directions of cam rotation. The steel stop was incorporated to minimize cam bounce when the cam returned to its rest position.

The trip lever is mounted to the cam lever by a shoulder rivet (Fig. 15). An elongated slot in the trip lever allows it to slide front to rear to rotate around the rivet. A hook on the trip lever mounts a sprint that extends to a hook on the cam lever. The tril lever springs holds the trip lever up and to the rear in its rest position. The trip lever has two formed lugs. The top lug is positioned directly under the lug on the key lever. The bottom lug is directly above the cam.

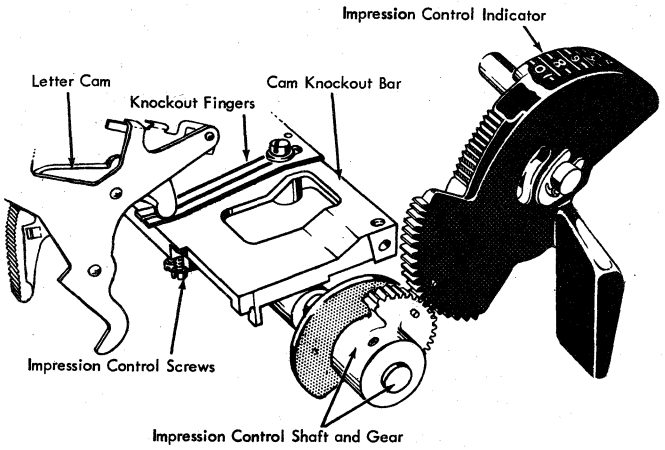

Figure 10. Cam Knockout Bar Assembly

The cam knockout bar assembly is an aluminum casting to which two sets of flat knockout spring fingers are secured (Fig. 10). There is one knockout finger for each cam lever assembly. The height of each knockout finger, is controlled by individual impression control screws which are located in the knockout bar below the fingers. The knockout bar assembly pivots between the left and right side frames on two pins that are secured by set screws. An impression control eccentric shaft is positioned beneath the rear of the knockout bar and pivots in two bronze bearings which are mounted to the left and right side frames (Fig. 10). A plastic gear is pinned to the left end of the shaft and meshes with the teeth on the impression control indicator. The impression control indicator pivots on a stud on the left side frame. The rear of the knockout bar is held down against the impression control eccentric shaft by two springs.

Type Bars

Type bars are mounted in a slotted segment and are held by a curved type bar fulcrum wire (Fig. 11). The lower end of the type bar extends below the segment and has a hole in it for the type bar link. Above the segment is the body of the bar, identified by the reinforcing rib, and the type head which includes the type slug and the wider section of the bar (Fig. 12). The part referred to as the throat extends from the top of the reinforcing rib to the bottom of the head. A type mark, used to identify the type style, is located between the upper and lower case type faces on the type slug. An anticlash lug prevents damage to the type face if one type bar follows another to the platen before the first bar has gotten out of the way. The type face is curved to the same arc as the platen so that all parts of the type face will strike evenly. A hole is provided in the type head to facilitate forming of the head during type alignment. A locater lug found on some type styles is used at the factory to facilitate soldering of the type slug to the bar.

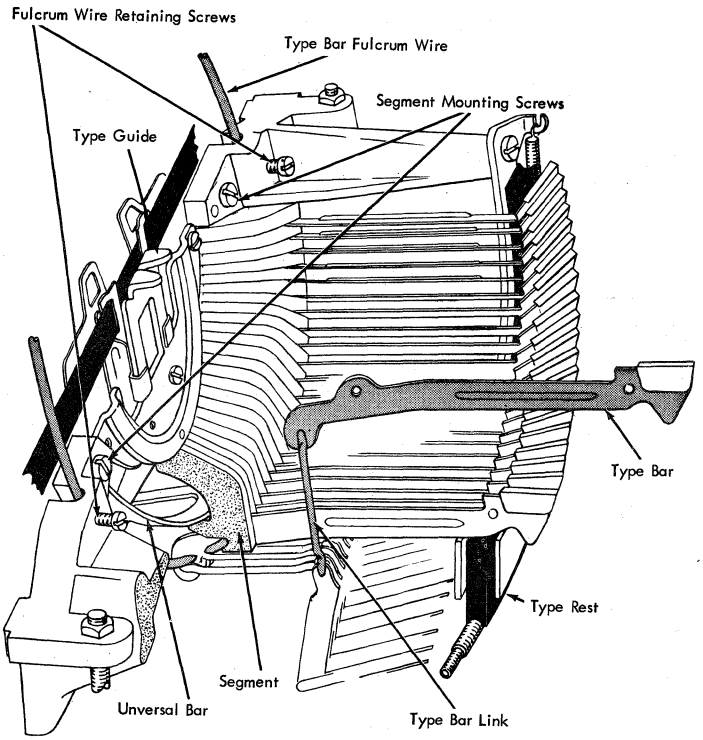

Figure 11. Type Bar Mounting

Changable type bars are available to permit the operator to interchange type bars in specified positions, thus providing a greater number of special characters (Fig. 13). This feature is available only for positions 0, 32, 36, 39, 40, 41, 42, 43, and the standard numerical type bar positions. Changeable type bars are not porvided for alphabetic positions or position #38. A special type bar link incorporating a spring clip is used with changable type bars. This link will not drop off the cam lever when the operator removes a type bar and drops the link.

Each changable type bar is designated for one type bar position only and is to be aligned to the typewriter for which it

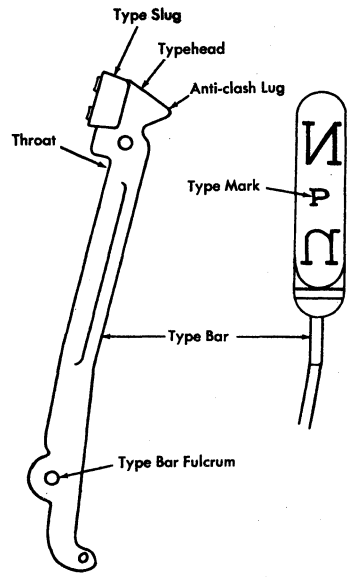

Figure 12. Type Bar Identification

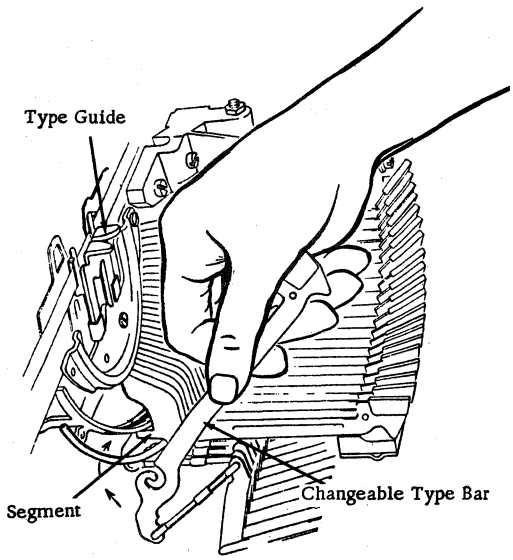

Figure 13. Changeable Type Bars

is to be used.

The typebar segment is a semi-circular carbon steel casting with slots cut into it to mount and guide the type bars (Fig. 11). The segment also provides the mounting for the universal bar, and the type guide. The rear of the segment is hollowed out to allow dirt and erasures to be pushed through the slots by the typebars during their travel to the platen. Two screws and two pins mount the segment to the segment support.

The type guide is a formed part of heavy metal and is attached to the segment by four screws and a dowel pin (Fig. 11). The four screws pass through oversize holes in the type guide, so the guide may be positioned by pivoting it on the dowel pin. The type guide has two major parts: The ring and the type guide (Fig. 14).

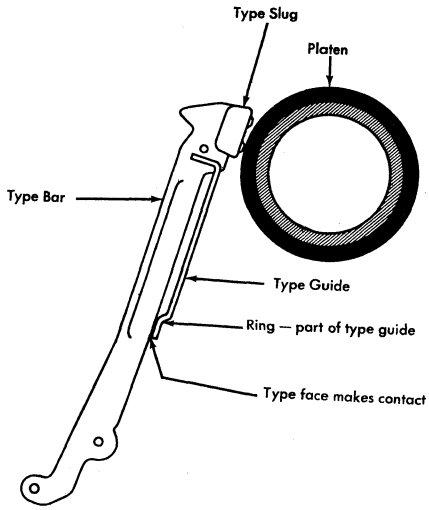

Figure 14. Type Ring and Cylinder

When a type bar is fully actuated, it contacts the ring when the type face is approximately .003" from the platen or cylinder. This relationship is known as proper ring and cylinder. During a typing operation, the type bar must whip or bend above the ring so the type face can make an impression on the paper. This whipping action prevents the type face from lingering on the paper and smearing.

(Operation)

Depression of the key button by the operator causes the rear end of the key lever to pivot about the fulcrum wire in the key lever bearing support (Fig. 15). The lug on the bottom of the keylever contacts the top lug of the trip lever forcing the trip lever to rotate down until its lower lug contacts the nylon cam. Continued depression forces the cam to rotate out of its rest position, until the serrations on the nylon heel of the cam engage the power roll. The distance between the heel of the cam and the cam rivet is less than the distance between the toe of the cam and the rivet. This is called the rise of the cam. As the power roll forces the cam to rotate, the contact point between the power roll and the cam proceeds from the heel toward the toe. The weight of the type bar and the tension of the cam lever spring hold the cam against the power roll. The rise of the cam then forces the cam fulcrum point, or rivet, away from the power roll, and causes the cam lever to rotate about the cam lever fulcrum wire. The long arm of the cam lever and the type bar link are moved toward the front of the machine. The link pulls the bottom of the type bar toward the front of the machine, causing the type bar to rotate about its fulcrum wire. The type head leaves its rest position and begins to travel toward the platen. Before the type head reaches the platen, the tail of the cam contacts the cam knockout finger (Fig. 16). The cam stops rotating, but the momentum of the type bar causes the type head to continue toward the platen. This forces the cam lever

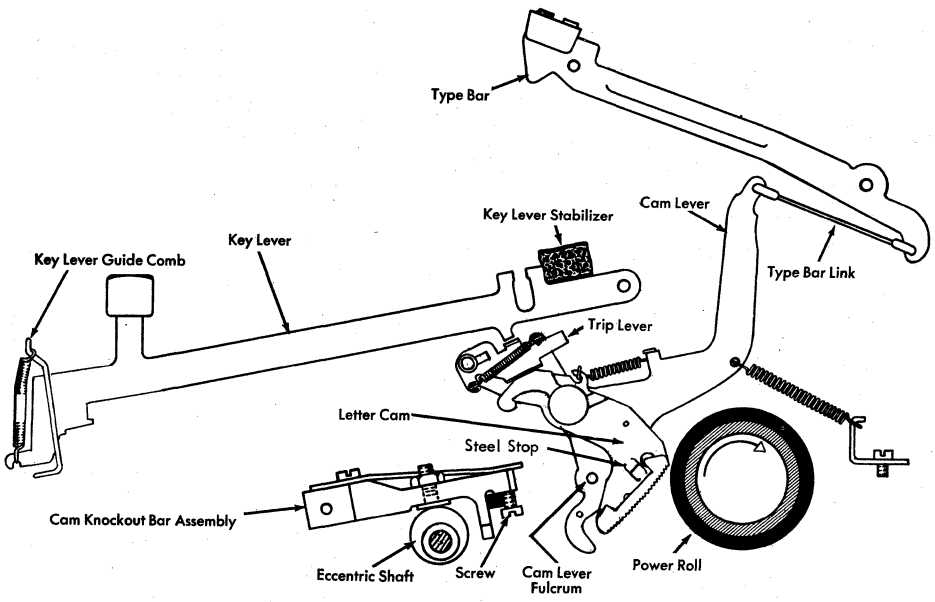

Figure 15. Cam and Type Bar Operation

to continue its motion toward the front of the machine. Continued motion of the cam lever causes the nylon shoe on the cam to leave the power roll and the cam spring restores the cam to its rest position against the cam lever. The moving type bar contacts the ring, then whips or bends, above the ring so the type head may complete its travel into the type guide. The type face strikes the ribbon and makes its impression on the paper. The striking force or impression of each type bar is determined by how long the cam is allowed to rotate against the power roll before it reaches the knockout finger. The longer the cam remains engaged with the power roll, the longer the type bar will be powered and the greater will be its striking force.

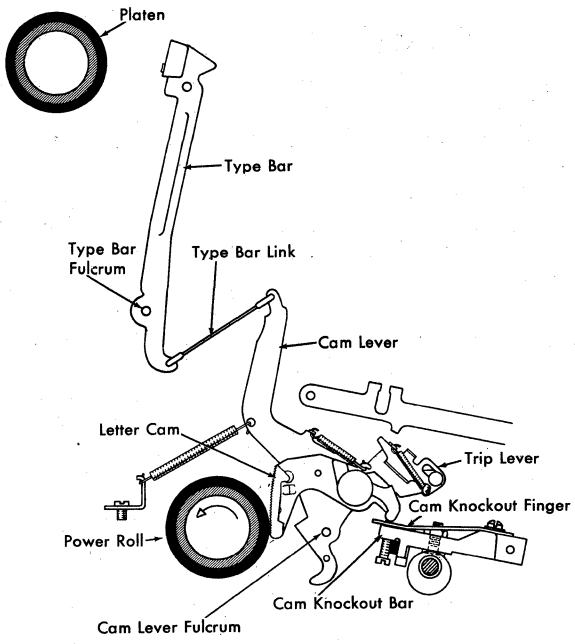

Figure 16. Cam Knockoff Point

After the type bar strikes the platen, the type bar and cam lever reverse their direction. If the key lever is held down, the rear edge of the top lug on the trip lever will engage the front edge of the lug on the key lever as the cam lever assembly restores. The cam lever will restore to its rest position, but the trip lever will remain against the key lever lug until the key lever is allowed to restore. The restoration of the key lever allows the trip lever spring to restore the trip lever up toward the rear of the machine. This action of the trip lever insures a single operation of the cam and allows the type bar to restore to the rest position, regardless of how long the operator holds the key button depressed.

When the type bar returns to rest, it strikes a spring loaded, rubber type rest pad, which is suspended between two frames on the segment support (Fig. 11). The type rest reduces type bar rebounding away from the rest position and reduces noise. This enables the type bar to be ready immediately for another operation.

The impression of the type bars can be controlled by two methods. An impression control screw isprovided below each knockout finger to give individual adjustment for this impression of each typebar (Fig. 10). An impression control indicator is available to the operator, to provide a means of regulating the height of the knockout bar assembly (Fig. 10). This adjusts the knockout point of the cams as a group. Moving the impression control indicator rotates the eccentric shaft below the cam knockout bar assembly. Raising the bar decreases the impression of all type bars, and lowering the bar increases the impression of all type bars. A reference scale, graduated from 0 to 10, is on the impression control indicator.

Repeat/Non Repeat Key Levers

A repeat/non repeat underscore is provided as standard equipment. A one piece repeat key lever, a plunger and a spring are used with a standard cam unit to provide this feature. The keylever has a two step key lever lug. The front guide comb has six positions where repeat/non repeat letter units may be installed at the factory: 0, 8, 32, 36, 39, and 42 (Fig. 9). Installation requires the removal of the rubber from the front guide comb where the repeat character is desired. Two different plunger springs are available; the lighter spring is to be used with key levers in the upper two rows.

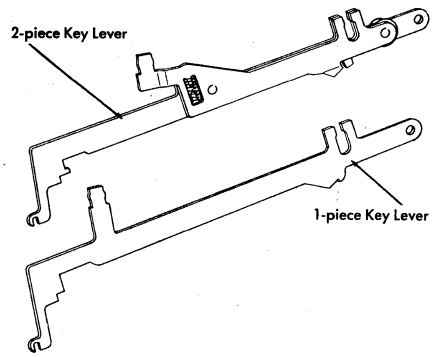

Figure 17. Repeat/Non Repeat Key Levers

When the repeat/non repeat key lever is depressed to the limit of its normal travel, the rear step on the key lever lug will provide a single operation of the cam (Fig. 17). If the key lever is held down in this position, the rear step on the key lever lug will prevent the trip lever from restoring. Further depression of the key lever is allowed by the spring loaded plunger. This will cause the front step of the key lever lug to depress the trip lever for a repeat action of the cam. If the key lever is held down in this position, the trip lever will be cammed down by the front step on the key lever lug, each time the cam lever assembly restores from a former operation.

A special two piece key lever is used for field installation of a repeat/non repeat character in any letter position desired (Fig. 17).

This feature may be crippled when a plunger and spring is used by installing a plunger bushing in place of the compression spring. It is necessary to replace the plunger with the space bar plunger in order for the bushing to be used.

ESCAPEMENT

The escapement mechanism controls movement of the carriage. The mechanism consists of the universal bar, escapement pawl, and the escapement rack (Fig. 18).

The universal bar and universal bar support are fastened to the back of the segment with two hex headed screws. Flexible mounting springs connect the universal bar to the support and position the universal bar against the back of the segment.

The escapement pawl bracket is fastened to the rear rail with

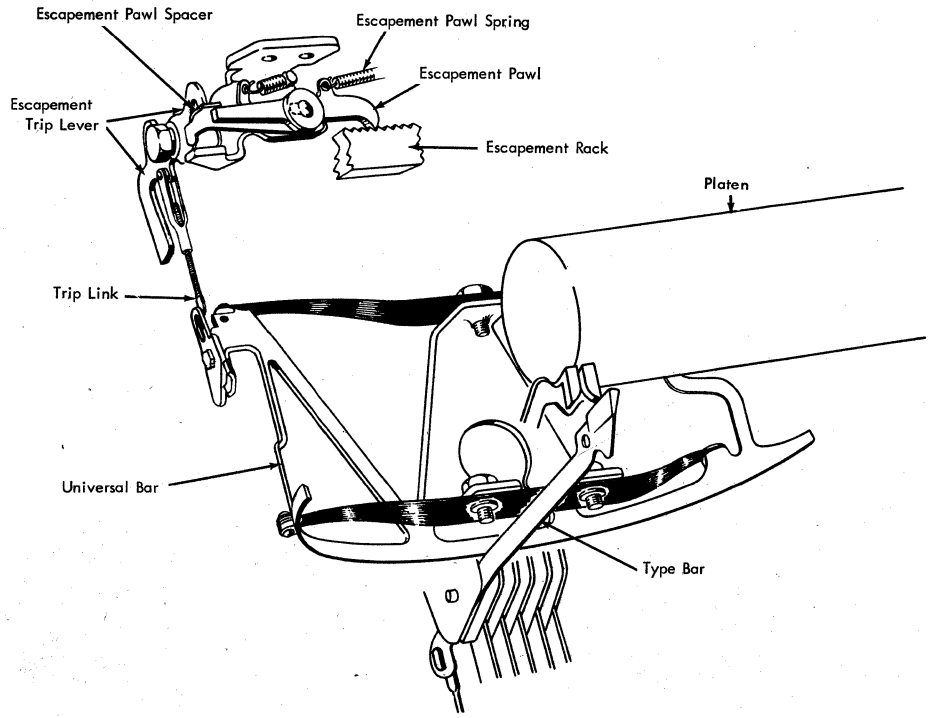

Figure 18. Escapement Mechanism

two screws. A single escapement pawl is mounted on the escapement pawl bracket by a shoulder rivet passing through an elongated hole in the pawl. An escapement pawl spring pulls the escapement pawl tip to the right and into the escapement rack. The escapement pawl spacer contains a larger elongated hole and is mounted on the same shoulder rivet as the escapement pawl. A short pawl spacer spring loads the spacer toward the right and to the rear. Also mounted to the pawl bracket with another shoulder rivet is the escapement trip lever.

The escapement rack is secured ot the underside of the carriage with dowel pins and screws. It contains a number of teeth per inch corresponding to the pitch of the typewriter.

(Operation)

The escapement is a single pawl type operated each time a type bar moves to the platen, or whenever the space bar mechanism is activated.

As the type bar moves toward the platen, it contacts the universal bar and pushes it toward the rear. An adjusting plate mounted on the universal bar transfers the universal bar motion to the escapement trip link. Motion of the trip link toward the rear rotates the escapement trip lever, on its shoulder mounting rivet, so that the top of the trip lever moves toward the front of the machine. The top of the trip lever contacts an upright lug on the escapement pawl spacer, part of which is behind the tail of the escapement pawl, and rotates the left end of the escapement pawl spacer toward the front of the typewriter. As the upright lug moves forward, it carries the tail of the escapement pawl forware. The escapement pawl pivots about its shoulder mounting rivet, and the pawl tip is removed from the escapement rack (Fig. 19).

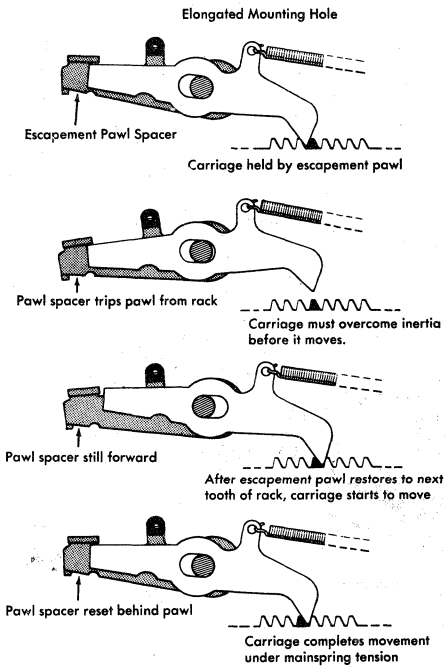

Figure 19. Escapement Pawl Operation

After clearing the rack tooth, the escapement pawl snaps to the right under tension of the pawl spring and immediately contacts the next rack tooth. The type bar continues on toward the platen and prints, causing the pawl spacer to continue its forward travel. A portion of the escapement pawl bracket serves as an overthrow stop and prevents the spacer from getting in front of the pawl tail. As the type bar reverses its direction, the pawl spacer spring restores the spacer to the rear, clear of the escapement pawl tail (Fig. 19). Because of its relatively heavy mass and inertia, the carriage does not move until all of these actions have taken place. As the carriage moves to the left under tension of the main spring, the escapement pawl is pushed to the left until the edge of its elongated mounting hole contacts the mounting rivet. This stops and holds the carriage. The tail of the escapement pawl is again in front of the escapement pawl spacer lug (Fig. 19). Thus, the escapement mechanism completes one operation and is in position for the next.

The motion described above occurs under power operation only; if a type bar is raised to the platen by hand, the carriage and escapement pawl will move before the escapement pawl spacer restores. The elongated slot in the escapement pawl spacer allows the spacer to be moved to the left past the tail of the escapement pawl and prevents either damage to parts or jamming of the carriage. As the type bar moves away from the platen the spacer will restore to its normal rest position.

Maximum escapement speed is obtained by keeping the escapement pawl spacer overthrow to a minimum after the tripping point has been reached. This permits the spacer to restore as rapidly as possible.

Each time the escapement pawl is operated, main spring tension is allowed to move the carriage one space to the left. Mounted to the power frame casting is the main spring and holder assembly containing the main spring (Fig. 20). The main spring drum rotates about a mounting stud which passes through the center of the main spring and into the power frame. Tension is applied to the main spring drum by the main spring and transferred to the carriage by the tension tape. A loop on the end of the tension tape is attached to the carriage by one of

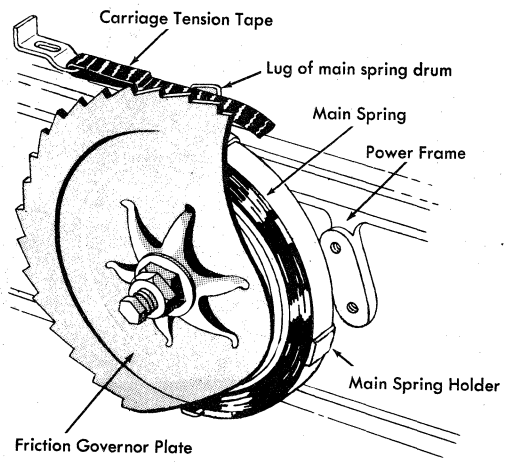

Figure 20. Main Spring and Holder Assembly

two methods. Early 12" and 16" tapes used a hook fastener which was secured in a hole in the carriage bed with a rubber plug (Fig. 21). Currently all tension tapes are screwed to the right end of the escapement rack.

An improved main spring and holder assembly was introduced ahead of the present centrifugal governor mechanism. It was designed to provide a more constand carriage tension by the use of a cross curve spring. This spring replaced the former style and was designed to minimize failures during repeat space bar operations and also to provide for a less critacal tab friction governor adjustment. Early main spring and holder assemblies were mounted to the power frame with two screws which prevented the holder from turning (Fig. 21). The improved assembly mounts to the power frame by the main spring drum mounting stud. An ear on the holder contacts the power frame and prevents rotation of the holder. By employing a special disc in the drum assembly, this type of assembly may be used as a replacement for the former style.

The improved main spring and holder assembly has been further improved for safety on machines above Serial number 553017.

The centrifugal governor drum gear and main spring are now held together by a retainer clip (Fig. 22). This prevents the main spring from accidentally jumping out of the holder when it is being installed or removed. The power frame has been countersunk to provide clearance for the retainer clip.

Installation and removal of all main springs and drums should continue to be made with extreme caution.

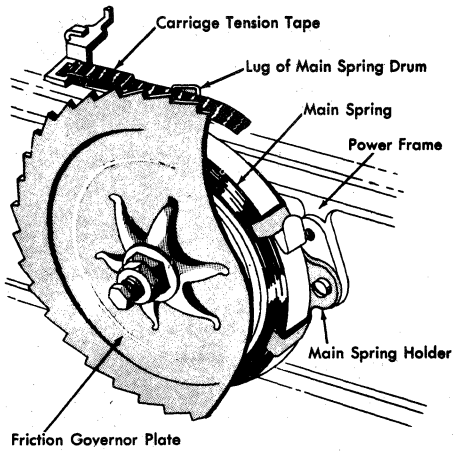

Figure 21. Early Main Spring and Holder Assembly

Two types of trip links have been used on the Model B1. One is the solid link with pin clevis, the other uses a clevis containing a compression spring. The spring clevis was designed to improve impression by equalizing the tripping force at various typing speeds. This spring clevis is not used presently and may be replaced by the conventional link and clevis if desired (Fig. 18).

Two types of escapement pawl bracket assemblies are used on the Model B1. Machines of 6 2/5 and 14 pitch, and all decimal tabulation models use an escapement pawl with .038" of left to right motion. This assembly bears no identification mark. Machines of 8, 9, 10, and 12 pitch use an escapement pawl with .058" of motion and can be identified by a round groove in the front edge of the pawl tail and spacer. The spacer used with this pawl has the upright lug positioned .010" to the right. This arrangement is referred to as the "floating pawl" and permits increased typing speed without type piling. Increasing the length of the elongated slot in the escapement pawl allows the pawl to snap further to the right after being tripped. Consequently, the carriage begins to move the pawl back to the left sooner. The pawl spacer lug, being further to the right will pick up the pawl tail earlier and be ready for the next operation.

The floating type escapement pawl is also used on the Model B lift platen typewriter above Serial number 358277. The toll biller and decimal tab machines use the former non floating style pawl.

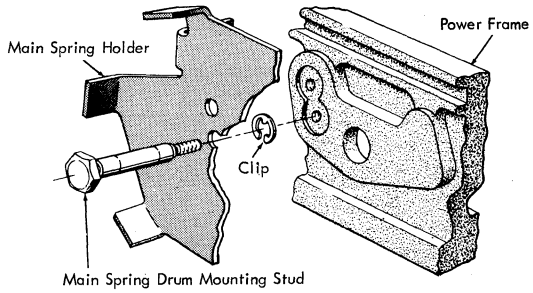

Figure 22. Main Spring Holder

MARGIN SET

The term "margin" denotes the distance between the edge of the paper and the typewritten material. Left and right margins are determined by the position of the margin stops on the margin rack. Carriage travel is limited when the stops strike the

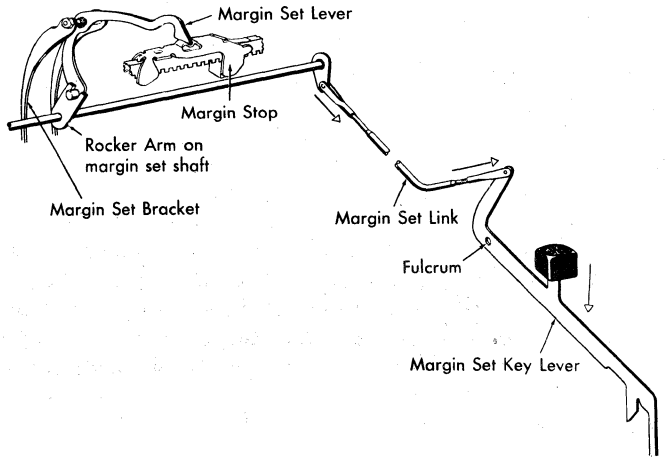

Figure 23. Margin Set Mechanism

margin control lever, which is located just below the margin rack. The margin stops encircle the margin rack and contain teeth that mesh with those on the rack (Fig. 23). The number of teeth per inch correspond to the pitch of the machine.

The margin set is designed to allow the operator to reposition the margin stops without moving her hands from the keyboard. To change the margin, the operator must follow four steps: position the carriage at the existing margin; then depress the margin set button; move the carriage to the desired position with the button held down; then release the button and check the position by operating the carriage return.

The front end of the margin set key lever has a bottom lug with an angular camming surface that contacts the carriage return key lock (Fig. 23). The upright extension on the rear of the key lever receives the adjustable clevis on the margin set link. The rear of the link is attached to a lever on the margin set shaft. The right end of the shaft is pivoted on the right side frame and the left end is pivoted on the right-hand motor bracket. A rocker arm is attached to the left side of the shaft and contacts a stud on the bottom of the margin set lever.

The margin set bracket has countersunk holes where the chamfered ends of the margin set lever hub contact the bracket. The bracket is held to the inside of the rear frame by two screws, one of which goes through the motor bracket. Earlier brackets did not extend down as far on the rear frame and did not have countersunk holes for the hub of the set lever. Prior to the use of the screw and stop nut, a pin and two C-clips were used to mount the set lever on the bracket. The changes were designed to eliminate side play in the margin set lever.

(Operation)

When the margin set key lever is depressed, its bottom lug cams the key lever locking bar into a position that locks all operations except: backspace, space bar, shift and margin release. This protects the margin set mechanism from damage by carriage return or tabulation while setting margins. The upright extension on the key lever pulls the margin set link forward so the lever on the margin set shaft rotates forward. The rocker arm on the margin set shaft moves the bottom of the margin set lever to the rear. The margin set lever rotates about its fulcrum point, and the front end of the lever is lowered. With the carriage at either margin, the margin set lever will contact the margin stop and lower it far enough to disengage it from the margin rack. With the margin set keybutton held down, the carriage may be positioned by using the space bar, backspace, or carriage release levers. The new position of the carriage will also be the new position of the margin stop after releasing the margin set key button.

Carriages longer than 12" require one or more center supports attached to the margin rack to make the rack rigid. These center supports obstruct the travel of the margin stops. Margin setting is therefore restricted to an area bounded by a margin rack center support and the extreme left or right margin.

MARGIN RELEASE

Margin release provides the operator with a means of releasing the carriage from the restriction of either the left or right margin stop without moving the stops. Margin release is used to lower the margin control lever enough to allow the margin stops to pass. This permits additional carriage travel from the position of the set margin stop to the carriage final stop, yet retains the margin stop setting for further use.

The margin release key button is attached to the front end of a long key lever that extends back to the tab actuating lever on the governor control bracket assembly (Fig. 24). The margin release key lever does not extend into the front guide comb. A shoulder screw mounts the key lever to the power frame and serves as its fulcrum point. The motion of the key lever is restricted by the key lever fulcrum wire within the elongated slot in the key lever (Fig. 24).

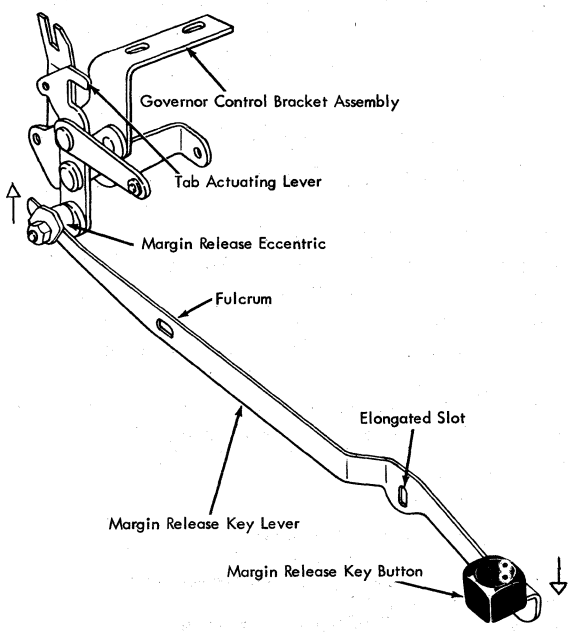

Figure 24. Margin Release Key Lever

When the key button is depressed, the key lever pivots on its fulcrum screw. The rear of the key lever contacts and raises the margin release eccentric, which is attached to the tab actuating lever. The tab actuating lever raises by rotating on its mounting rivet. A hook extension on the top of the actuating lever is positioned in a slot in the left end of the tab lever.

The actuating lever raises the left end of the tab lever, using the tab lever pivot screw as a fulcrum point. The margin control lever is lowered by this operation, as it is a part of the tab lever assembly. The margin stops may now pass over the margin control lever.

Earlier machines used a different key lever arrangement which required more force on the key button. Depression of the keybutton raised the rear end of the margin release key lever and its link. The link rotated the margin release bellcrank which moved a push rod toward the rear (Fig. 25). The push rod rotated a small bellcrank mounted on the governor control

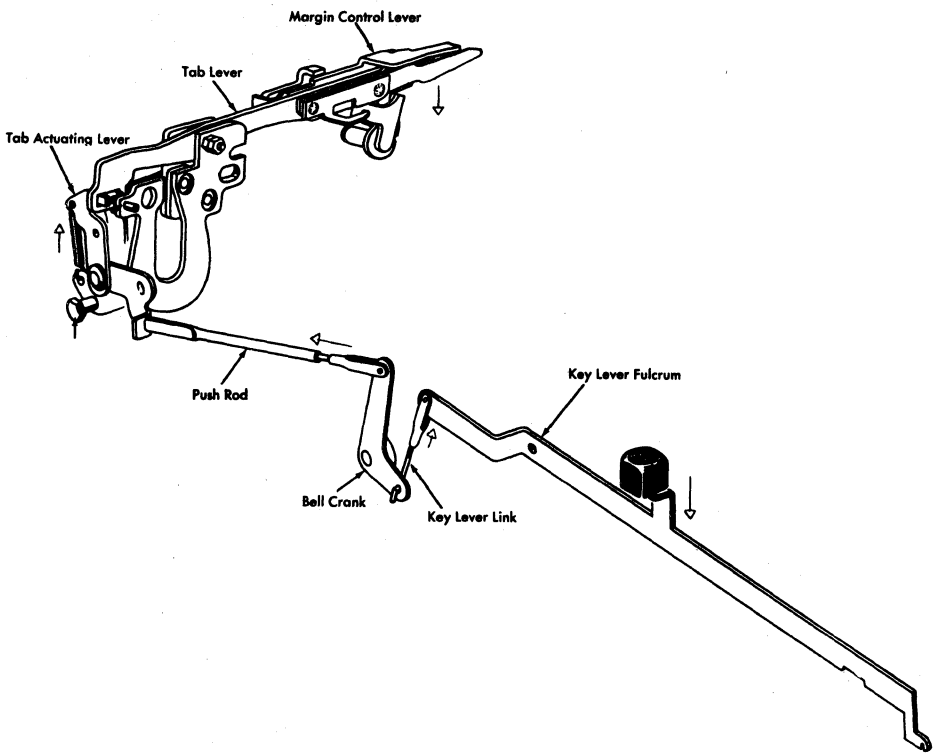

Figure 25. Early Margin Release Key Lever

bracket. The tab actuating lever was riveted to this bellcrank and was raised by this action. The balance of the motion was the same as the present style margin release.

LINE LOCK

The purpose of the line lock is to prevent the operator from typing one character over another when the carriage has reached the right margin control lever. The operator receives a warning of the approaching right margin when the bell rings approximately 10 spaces from the margin. When the letter key levers lock at the margin, the operator must then decide whether to complete or hyphenate the word being typed. To unlock the key board, the line lock is released by depressing the margin release. The operator can then complete the word or line. If the operator has just completed a word as the machine goes into line lock, moving the carriage from the right margin will release the machine from the line lock position. This can be done with either carriage return or backspace.

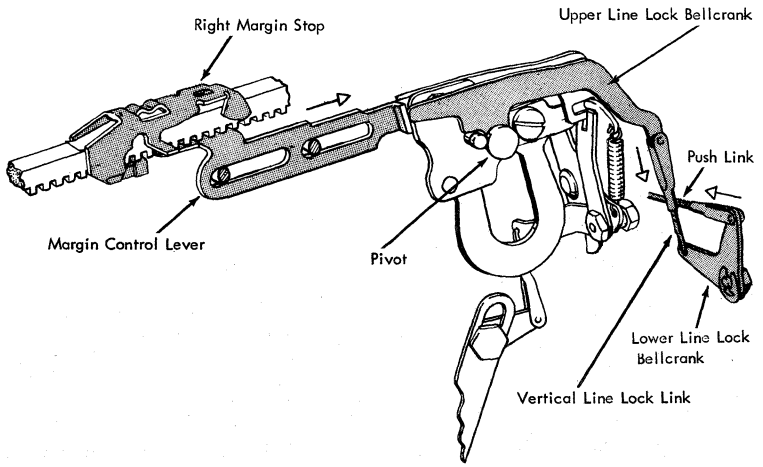

Figure 26. Line Lock Mechanism

(Operation)

The right margin stop contacts the large flat portion on the right end of the margin control lever (Fig. 26). The margin control lever is mounted to the tab lever assembly by means of elongated slots that allows left to right motion of the lever. The margin stop moves the margin control lever to the left. A lug on the left end of the margin control lever contacts the upper line lock bellcrank which is mounted by a shoulder rivet to the tab horseshoe bracket. The upper bellcrank rotates, pushing down the vertical line lock link which lowers the horizontal arm of the lower line lock bellcrank. The lower bellcrank, which is mounted to the left side frame, rotates and moves the push rod toward the front of the machine. The front end of the push rod contacts the left end of the key lever locking bar and moves it under the tab and letter key levers (Fig. 27)

The carriage return keylock is not moved during line lock. This leaves carriage return unlocked, and is done to permit the carriage to be returned to the next writing line.

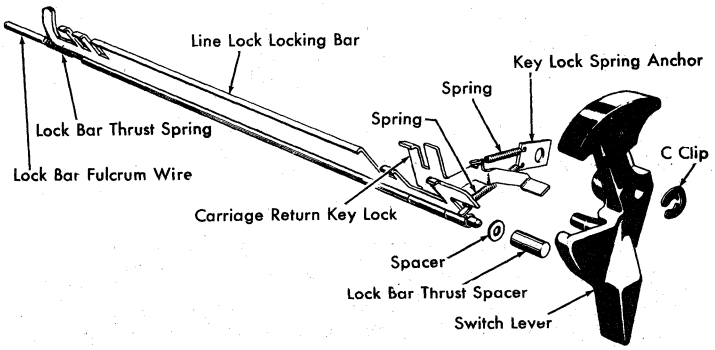

Figure 27. Line Locking Bar

The operation of margin release lowers the margin control lever and allows it to restore to the right, due to the tension of the tab check lever spring, and assume its rest position. The spring load on the key lever locking bar restores the line lock mechanism to its rest position. Moving the carriage to the right also permits the margin control lever to return to its rest position and this, in turn, allows the restoration of all line lock parts.

The letter key levers can be locked by the key lever locking bar in one of two positions. When the key lever is in the rest position, the locking bar moves underneath a locking lug on the key lever, and prevents the depression of any key lever. Should the operator have a key lever depressed as the line lock is actuated, the locking bar will move over the top of the locking lug and the key lever will be locked in the depressed position. One piece repeat/non repeat key levers are made without a locking lug to prevent their being locked in the depressed, or operating position. This feature prevents possible damage to the paper from continued repeat action at the right margin.

CARRIAGE AND RAILS

The basic purpose of the carriage is to support and position the paper as the typewriter is operated. The paper is guided around the platen by the deflector, and held against the platen by the feed rolls. The feed rolls are mounted to the inner carriage and will be covered in detail under "PAPER FEED". The inner carriage controls the front to rear position of the platen and is moved by the multiple copy control lever)Fig. 28). This lever rotates a shaft, called the platen guide shaft. This shaft includes eccentric collars that work against parts mounted to the outer carriage and cams the entire inner carriage forward or backward. The first three positions move the carriage less than the last two, affording a finer initial adjustment. The inner carriage consists of the following (Fig. 29): left and right platen guide plates, platen guide shaft, feed roll release cam shaft, paper bail pivot shaft and the paper table tie-rod. Other parts on the inner carriage will be covered under their respective mechanisms. The platen guide plates are mounted to the outer carriage in a manner that allows them to move front to rear. They are spring-loaded to the rear to eliminate any play. The left platen guide plate has one extra bearing point on the outer carriage to obtain additional stability for the line space mechanism. Earlier machines used a carriage side frame eccentric nut as a third bearing point for the guide plates, and the plates were not spring loaded.

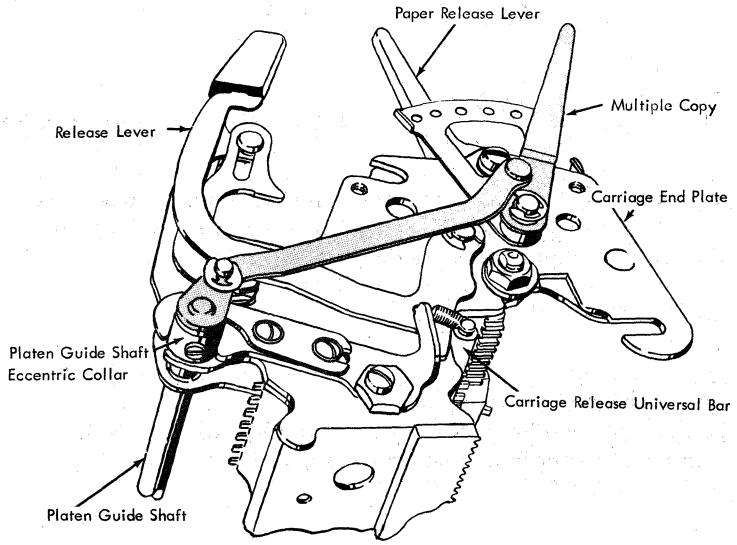

Figure 28. Multiple Copy Control

The vertical motion of the platen is eliminated by the platen latches that rotate over the top of each platen bushing and hold the bushing down against the end plates of the outer carriage (Fig. 29). The outer carriage consists of the carriage bed, and the two carriage end plates. These parts are welded together to form a box-type carriage construction that gives maximum rigidity to the carriage.

The carriage bed has two rows of milled teeth running its full length. These provide motion for the rotation of the staw wheels in the plastic truck assemblies (Fig. 30). Each truck contains four steel rollers that engage the carriage ways and the rails to allow free motion of the carriage to the left and right. The truck rollers fit into holes in the truck housing. These holes have small bosses that retain the rollers and keep

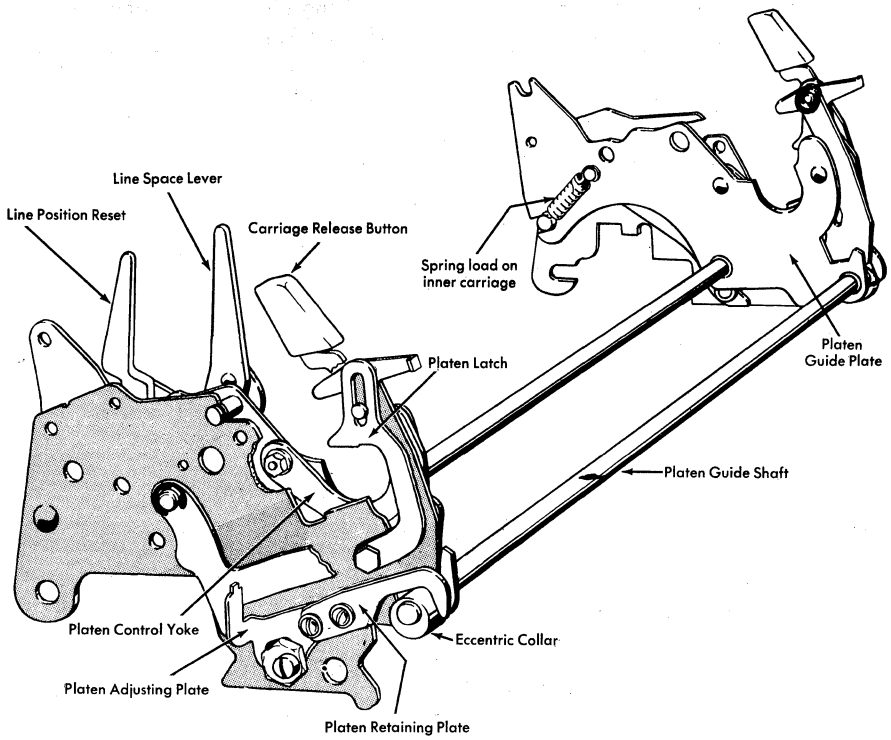

Figure 29. Carriage Parts

them from falling out when the truck is removed from the machine. Early truck rollers used nylon retainers that snapped into recesses in the truck. The ten tooth star wheel is pinned into the truck. Motion of the teeth on the carriage bed rotates the star wheel, which also meshes with similar teeth on the rail, and the star wheel moves the truck assembly. The carriage moves at a ratio of 2:1 with respect to the truck assembly. The bottom of each carriage end plate has an extension that strikes the carriage final stop, mounted underneath the front rail, when the carriage is moved beyond the left or right margin stops. The carriage final stop may be depressed against a spring load when carriage removal is desired. Carriage removal is made possible, without disturbing rail adjustments, as the carriage ways and rails have milled teeth their full length (Fig. 31). The front and rear rails are mounted on the power frame casting.

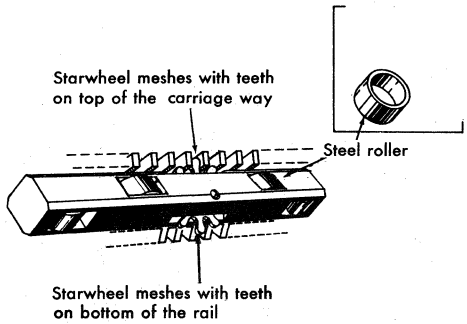

Figure 30. Carriage Truck Assembly

Carriage motion is involved in many operations of the machine. Typing, space bar and tabulation cause carriage motion to the left. Carriage return and backspace cause carriage motion to the right. Hand carriage release can be used by the operator to move the carriage in either direction. To do this, the operator depresses the left or right carriage release button and moves the carriage while holding down on the button. The button rotates the carriage release lever, which is mounted on a stud on the carriage end plate (Fig. 28). The lever pushes the carriage universal bar toward the rear of the machine. The universal bar runs the full length of the carriage and is mounted to the carriage end plates. The universal bar contacts an upright lug of the pawl release lever (Fig. 32). The pawl release lever is mounted to the rear rail by an eccentric and screw. It has a lug which extends behind the rear rail and actuates the backspace interlock. It has another lug underneath the rail that rests between the escapement pawl and the escapement rack. This lug pulls the pawl from the rack when the pawl release lever is rotated. Release of the carriage release button and restoration of all release parts to rest allows the pawl to return to the rack.

The other parts on the carriage, such as paper feed parts, tab, margin and escapement racks are covered under their respective sections. The rear rail provides the mounting for many parts that control carriage motion and position. These will also be covered under their respective mechanisms.

The number of truck assemblies, writing line and paper size vary with carriage length in accordance with the following chart.

Carriage Length	Number of Trucks	Writing Line Between Margin Stops	Writing Line (Maximum)	Paper Size
12"	4	10.4"	11.25"	11"
16"	6	14.4"	15.25"	15"
20"	8	18.4"	19.25"	19"
24"	10	22.4"	23.25"	23"
30"	12	28.4"	29.25"	29"

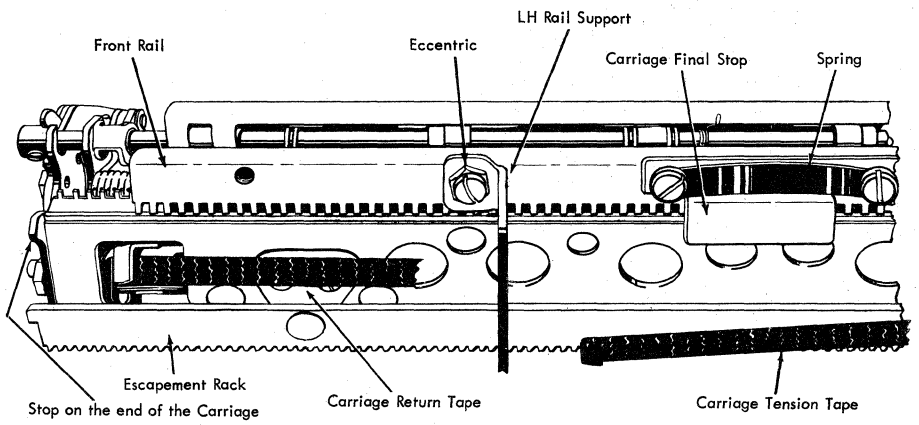

Figure 31. Carriage and Rails

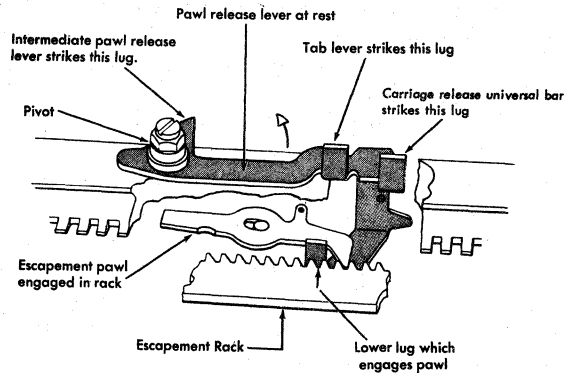

Figure 32. Pawl Release Lever

PAPER FEED

The paper feed mechanism is a part of the carriage assembly. Paper feed and paper release are the two basic functions of this mechanism.

The inner carriage provides the mounting for the paper feed mechanism so that when the inner carriage is cammed front or rear by the multiple copy control mechanism, the paper feed and release parts will move with the platen.

The paper feed mechanism is made up of many parts; all of which aid in the proper feed or release of the paper.

Paper Feed

To begin the operation, the typist places the paper against the rear paper table (Fig. 33). This table is a part of the carriage and is to the rear and above the platen. It is supported

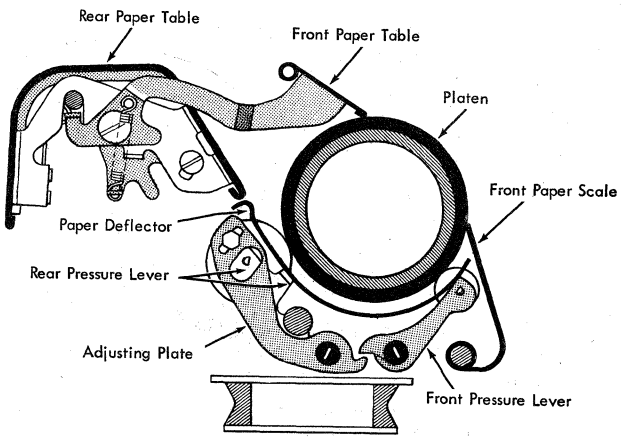

Figure 33. Paper Feed Mechanism

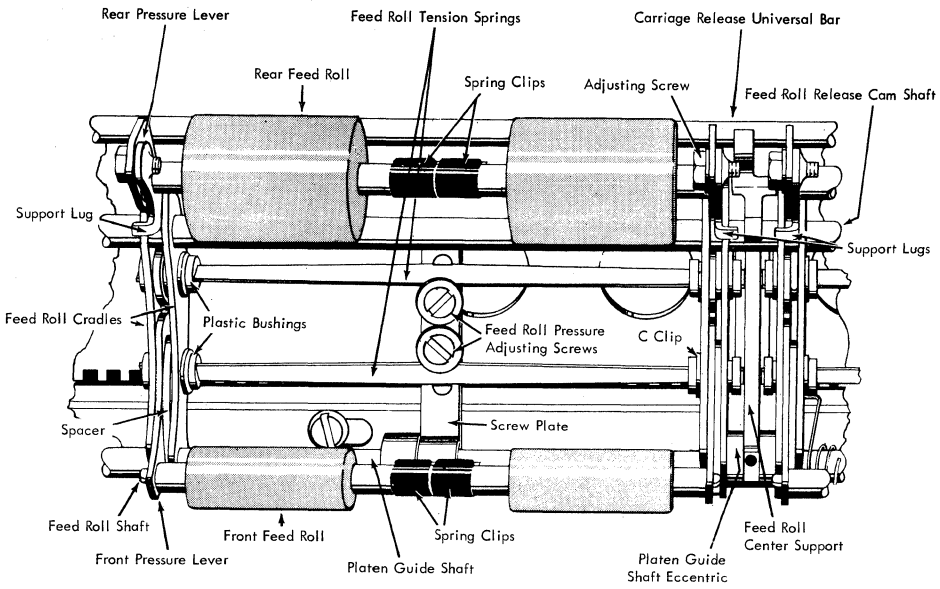

Figure 34. Feed Roll Mechanism

on the paper bail pivot shaft and the paper table tie rod. Arms from the front paper table serve as latches to hold the rear paper table to the tie rod shaft. As the paper is inserted into the machine, an adjustable guide mounted on the rear paper table serves to position the paper for its left margin position.

Next the paper contacts the rear rolled edge of the deflector (Fig. 33). This edge guides the paper into the "V" formed by the rear feed rolls and the platen. The bottom of the deflector contains lugs that stradle the feed roll release cam shaft and serve to position the deflector. Support lugs on the rear pressure levers control the distance between the deflector and the platen. Sixteen inch and longer deflectors are connected by a rod which is spot-welded within the rolled edge.

A single piece deflector, designed to facilitate manufacture is in all 16" machines above serial number 613547. Horizontal and rotational movement of the single piece deflector is prevented by two formed lugs on the rear of the deflector. These lugs seat in undercuts on the feed roll release cam shaft. The former spot-welded lug-type deflector will remain available for replacement on machines prior to this change. If it is desirable to convert to the new single piece deflector on machines prior to this change, it will be necessary to replace the feed roll release cam shaft. The new shaft is interchangable with the former shaft.

Rotation of the platen causes the paper to be fed between the rear feed rolls and the platen. Feed rolls are spring loaded against the platen and are rotated by their friction on the paper or platen (Fig. 33). As the front edge of the paper leaves the rear feed rolls, it is guided by the deflector until it moves in between the front feed rolls and the platen. Both front and rear feed rolls now hold the paper firmly against the platen and insure its rotation with the platen.

Feed roll pressure is supplied by applying a twist to flat torsion springs (Fig. 34). The ends of these springs are mounted in slots in plastic bushings which are molded to the pressure levers. Feed rolls mount on shafts whose ends mount in these pressure levers. Feed roll pressure is determined by the amount of twist put into the spring by their adjusting screws. The ends of the springs attempt to rotate the plastic bushings and pressure levers, and in this manner supply a constant upward pressure to the feed rolls. The pressure lever bushings are mounted in holes in the feed roll cradles and the cradles are mounted to the feed roll release cam shaft and the platen guide shaft. Left to right motion of the cradles is restricted by a feed roll center support on one side, and a spring clip on the platen guide shaft on the other side. Left to right motion of the pressure levers is restricted by the cradles which are held on the plastic bushings by spring clips.

Each feed roll is molded to a hub and two hubs are mounted on each feed roll shaft. This arrangement gives maximum bearing surface for the rotation of each feed roll. The feed roll shaft is mounted in "D" shaped holes in the pressure levers. These holes keep the shaft from rotating. The shaft has a spring loaded plunger at one end for ease of removal and replacement.

Feed roll hubs and rear feed roll shafts have been redesigned to reduce the length of the feed roll hub by approximately 1/4 inch. This change appears on machines above serial number 519557. Feed rolls have been placed in the center of the hub (Fig. 34) and the hub assemblies are retained on the shaft by two adjustable clips which permit adjustment to reduce end play of the feed rolls to a minimum. The clips are also used to hold the shaft in place in the rear pressure levers. The front feed rolls are still mounted on the shaft with the spring plunger. It is necessary to use this shaft in order to hold the front pressure levers in place.

The feed roll center support is mounted on the carriage bed and helps to position the feed roll cradle assemblies (Fig. 35). In addition, the center support provides rigid support for the feed roll release cam shaft and the center platen guide shaft

eccentric. Sixteen inch and longer machines use the center support as a mounting for the margin rack center support.

As the paper rotates further, it is guided upward by the front extensions on the deflector and the front paper scale (Fig. 33).

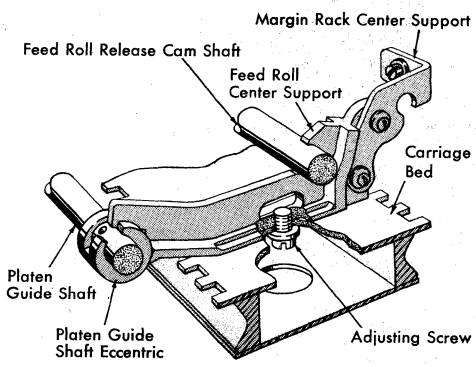

Figure 35. Feed Roll Center Support

The front paper scale is mounted on the platen guide shaft and is spring loaded toward the platen by a coil spring mounted around this shaft. The scale contains calibrations which correspond to the pitch of the machine.

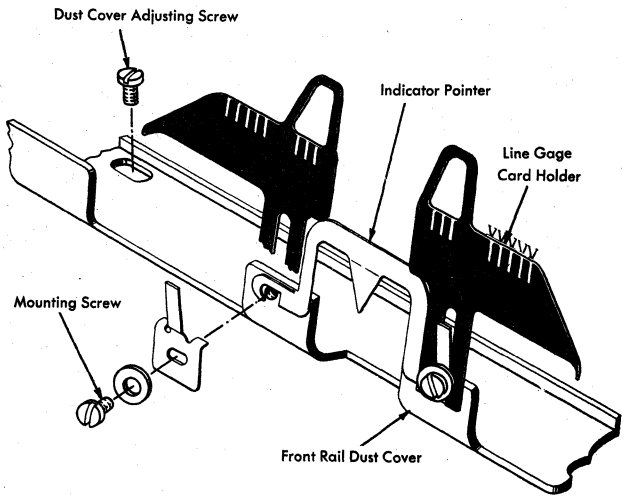

Figure 36. Line Gage Card Holders

Above the front scale and immediately below the writing line are the line gage card holders (Fig. 36). These assist in holding the paper, and more specifically, cards to the platen in the writing area. The line gage card holders are mounted to the front rail dust cover, which in turn is mounted to the front rail. The card holders also have a scale calibrated to the pitch of the machine. Later machines use an offset line gage card holder for the purpose of reducing the possibility of underprinting on the paper.

The two screws that mount the card holders also mount the indicator pointer (Fig. 36). This pointer is used to indicate the position of the carriage in relation to the type guide. The operator reads the front scale calibration indicated by the pointer to check the carriage position.

Above the writing line the paper is engaged by two or more rubber rollers which are mounted on the paper bail (Fig. 37). These rollers hold the paper to the platen above the writing line so as to reduce the possibility of over printing on the paper. The rollers also feed the paper away from the operator so the writing line is plainly visible.

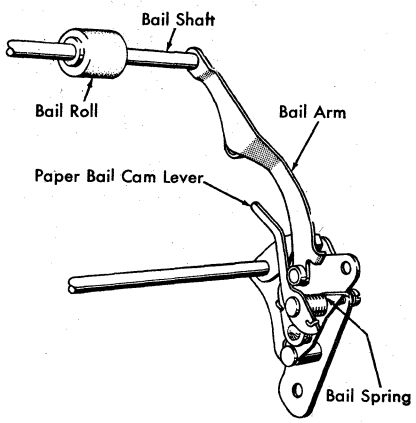

Figure 37. Paper Bail

The paper bail has three positions which are; above the plate in the raised position, in front of the platen in the forward position, and against the platen in the operating position. These positions are made possible by the use of paper bail cam levers to which the coiled bail springs supply pressure. The bail arms are mounted to the paper bail pivot shaft, and are free to rotate about this mounting. The pivot shaft is also free to rotate. A steel roller is mounted on the bottom of each bail arm and receives pressure from the cam lever. This pressure forces the rear end of the bail arm up and the front end, including the bail rolls, down. The bail rolls are free to rotate about the bail shaft, but contain a spring clip that restricts their laterial motion, unless they are pushed with enough force to over come the resistance of these spring clips. When the bail is moved from the forward to the operating position, a plastic roller mounted on each bail arm rides over chrome plated strips of metal, called bumpers, which are mounted on each carriage end cover. These insure easy operation and help the bail rolls pull the paper against the platen in the area of the writing line.

Next the paper passes in front of the front paper table (Fig. 33). Its purpose is to prevent refeeding of the copy paper and can be used as an erasing platform.

The front paper table contains two scales; the top is calibrated in inches, the bottom corresponds to the pitch of the machine. This table provides an easy method of checking machine pitch. Simply count the number of calibrations on the bottom scale in one inch on the top scale. The sum equals the pitch of the machine.

Paper Release

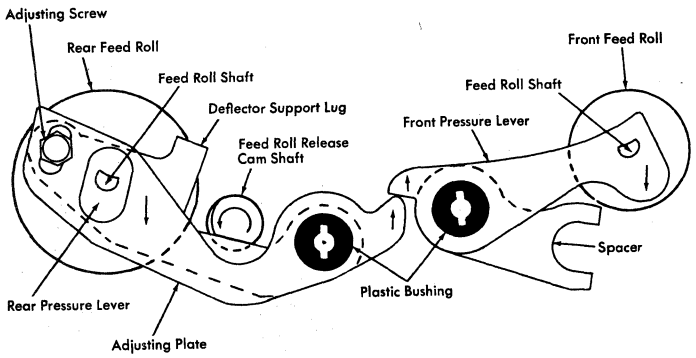

Figure 38. Feed Roll and Cradle Assembly

Paper release is accomplished by lowering all feed rolls simultaneously so that the paper can be easily repositioned by the operator. This is accomplished by pulling the feed roll release lever toward the front of the machine. The lever rotates about a stud on the right platen guide plate and pulls on a link connected to a bellcrank mounted on the right end of the feed roll release cam shaft. This action rotates the cam shaft which extends the full length of the inner carriage and passes through each cradle assembly. Each rear pressure lever, in the raised or feed position, rests in a camming slot in the bottom of the cam shaft (Fig. 38). As the cam shaft rotates, the flat, recessed side of the camming slots are turned away from the rear pressure levers forcing the levers down. The rear feed rolls are also lowered (Fig. 38). The adjustable plates, which are mounted to the rear pressure levers by hexagonal screws, move with the pressure levers. The adjusting plates use the rear pressure lever plastic bushings as a pivot point. There is a hole in each cradle assembly in which the bushings are mounted. The front of the adjusting plates have a hook-like extension that moves up as the plates rotate. This hook contacts a similar hook on the front pressure levers and moves them upward. The front pressure levers rotate about their cradle mounting, and the front end of the levers move downward. The front feed rolls are mounted on these levers and are lowered by this action. Since the sides of the cradles must be far enough apart to allow room for the rear pressure levers and adjusting plates at the rear bushings, spacers are used on the front bushings to prevent side motion of the front pressure levers. Figure 38 shows these parts in the feed position and the arrows indicate the motion that will occur during paper release.

PLATENS

Platens are available in various sizes and grades of rubber to equip the typewriter for different types of work. In addition to feeding the paper, the platen must back up the paper and absorb the type blow. Type impression is determined to a large extent by the platen. If the platen rubber is soft, the type impression is not as sharply defined as that obtained using a harder rubber platen. However, as the hardness is increased, the tendency of the type to cut the ribbon and the paper is increased. Selection of a platen is determined by the style of the type and the particular job it will be required to perform.

A code number and letter are stamped on the right end of the rubber to identify the various grades of rubber hardness and platen diameter.

The letter is used for control purposes at the factory and may be disregarded by the Customer Engineer in the field. The code number identifies the following specifications.

NUMBER 1. A soft rubber platen of standard 1 3/4" diameter used for general typewriting applications.

NUMBER 2. A standard diameter platen with rubber slightly firmer than that of a number 1. Generally used with carbon paper ribbons.

NUMBER 3. A standard diameter platen with the hardest rubber for preparation of a small number of carbon copies requiring sharp impression. Unsuitable for stencil writing or similar applications.

NUMBER 4. A hard rubber platen, undercut 1/32" on the diameter. Used for typing a large number of carbon copies.

NUMBER 6. A platen of the same hardness as number 2 but undercut 1/32". Used on lift platen carriages.

NUMBER 7. A hard rubber platen 1/16" undercut in diameter. For typing the maximum number of copies.

NUMBER 8. A platen of standard diameter with rubber firmer than a number 2 platen. Generally used with bolder type styles, especially with fabric ribbon.

NUMBER 9. A special platen for typing stencils. The diameter is standard and the rubber is the softest available.

Platen rubber may be adversely affected by numerous factors such as light, heat, ageing, etc. It should be kept in mind that the code number designates the characteristics of a new platen. An old or worn platen may be considerably harder than a new platen of the same number and may also vary slightly in diameter.

Other factors, in addition to the platen, greatly influence the number and legibility of carbon copies the typewriter will produce. The size and style of type are very important. The supplies, particularly the copy paper and carbon paper, are also determining factors.

Universal Platen

A universal platen which may be used interchangeably on the Model 01, Model A, and Model B typewriters is available in the five different carriage lengths (Fig. 39). Standard Model A and B Lift Platens, and Card Holding Platens incorporate the universal design. The platen hardness code numbers remain unchanged.

Universal platens are shipped with grey knobs and 33 tooth ratchets. If other line spacing is desired, the ratchet must be changed at the time of installation. The grey knobs may be changed locally to the Model A knobs if the customer finds the grey color objectionable. The universal platen will not accept the Model 01 knobs.

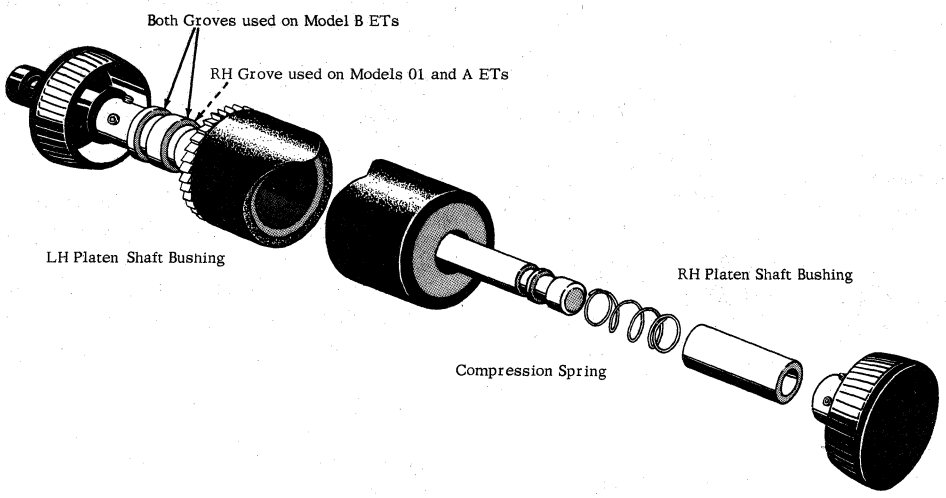

Figure 39. Universal Platen

The holding collar that prevents platen end play is located next to the left hand knob. A plain collar under spring tension is assembled on the platen shaft next to the right hand platen knob.

When the universal platen is initially installed, it is necessary to adjust the right hand knob for the desired length. A redesigned detent release lever must also be installed to avoid interference between parts.

Pin Feed Platen

The pin feed platen available for the Model B ET in 12", 16", 20" lengths provides a method of feeding multiple-copy forms, with carbon paper interleaved, through the typewriter. Retractable pins are mounted in pin wheels at each end of the platen cylinder. These pins engage holes along the edge of the form and cause it to feed as the platen rotates. The pins also serve to keep the parts of the form aligned or in register. Feed fingers hold the form against the pin wheels to insure that the pins engage the holes in the form properly. Each pin wheel is adjustable to permit the pins to protrude just above the front paper scale. An anchor rod, mounted to the paper table in place of the copy guide, maintains the pin wheels in their proper position.

Rubber covered platen cylinders are available corresponding with platen numbers 1, 4, and 6. Cylinders are available in different lengths, measured between the pins, to accomodate a variety of form widths.

The platen ratchets are the same as those used on the standard platen and include the platen variable button to permit repositioning of the form to the writing line.

During operation the feed roll release lever must be in the forward or released position. The form is fed by the pins and misfeeding results if the feed rolls are engaged. A detent spring is installed to hold the feed roll release lever in its released position.

Card Holding Platen

The card holding platen provides a means of holding cards so that the operator may more easily type near the card's edge. A metal insert in the platen provides an opening which receives the card and clamps it in the platen.

An adjustable stop positioned laterally along the metal insert provides a means of locating cards at the correct typing position.

Card Positioning Platen

The IBM card positioning platen adaptable to the 12" Model B1 ET is used for rapid feeding of IBM cards into and out of the typewriter. It is a number 1 platen equipped with a 44 tooth ratchet. A metal card holding blade, containing an adjustable card guide runs the full length of the platen. A left hand platen knob, approximately 2 1/2" in diameter provides an efficient method of positioning the platen. A downward hand motion on the knob feeds the card to a predetermined writing line. Rotation of the platen is stopped by an adjustable radial stop located on the left end of the platen shaft. An upward hand motion on the knob causes the card to be ejected from the platen and indexes the platen so that the card holding blade is in position to accept another card. The left hand knob contains a clutch which allows the knob to continue turning when the platen reaches its stops, thereby eliminating undue wear or parts breakage.

Clamp-Type (Waybill) Platen

The Clamp-Type (Waybill) Platen offers a fast front feed by means of a clamp which opens to accept either a single card or a multiple part form of maximum .093" thickness and maximum width of 9 inches. As the platen is rotated downward, the blade closes and the bottom 1/4" of the form is held securely in the typing position.

This platen is available with #1, #2, and #3 rubber hardness for all 12" Model B ET's with fabric or carbon ribbon feed.

Adjustable stops, secured by means of set screws, are provided on the platen shaft for locating the first writing line and card loading position. A positive indexing operation is best obtained with the feed rolls held in the released position.

FUNCTIONAL CAMS

The service mechanisms of the typewriter are the space bar, carriage return, tab, backspace, shift, and ribbon feed. These mechanisms employ all metal cams called functional cams. The space bar and tab mechanisms use double lobe cams located on the left side of the machine (Fig. 40). The carriage return and backspace use single lobe cams located on the right side of the machine (Fig. 41). The double lobe, double action shift cam is also located on the right side of the machine (Fig. 42). The double lobe, ribbon feed cam is located above the power roll on the left side of the machine.

When a functional key lever is depressed, the cam link pivots the cam release lever. The lug on the cam is disengaged from

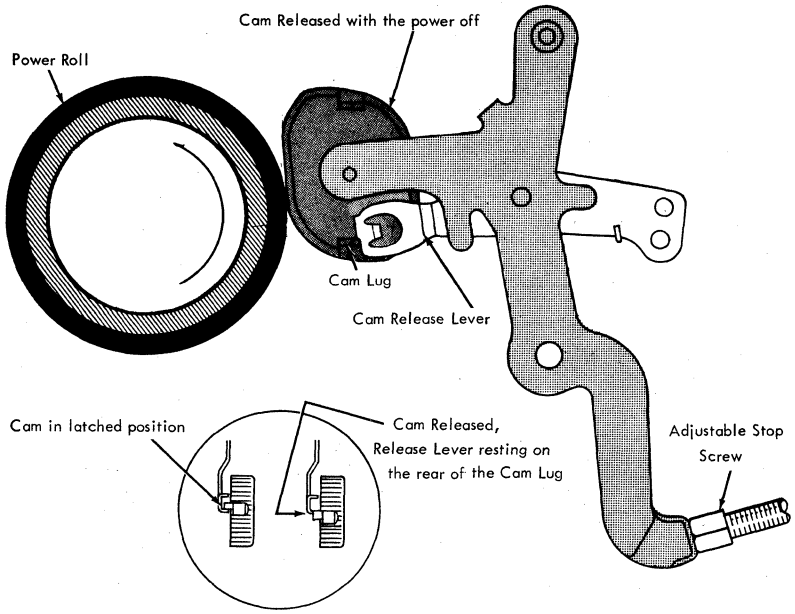

Figure 40. Double Lobe Cam

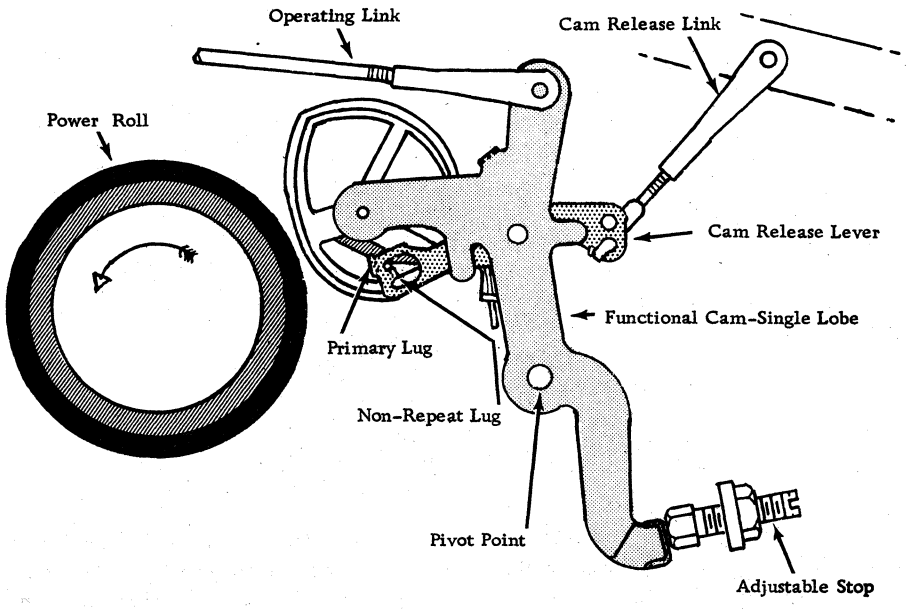

Figure 41. Single Lobe Cam

the primary lug of the release lever and a spring loaded finger forces the cam into the rotating power roll. The cam revolves with the power roll causing the cam frame and the operating link to be actuated. If the key lever is held down, the non-repeat lug of the release lever prevents the cam from repeating or re-engaging the power roll. As the key lever is allowed to restore to its upper or rest position, the cam lug resets from the non-repeat lug to the primary lug of the release lever.

A double lobe cam has two lugs on the cam and makes a one half revolution at each operation of the key lever (Fig. 40). A single lobe cam has a single lug on the cam and makes a full revolution at each operation of the key lever (Fig. 41). The shift cam has two lugs but one is offset so that the cam makes a one half revolution when the key lever is depressed, and completes the revolution when the key lever is restored upward (Fig. 42). Only the shift mechanism uses this double action type cam.

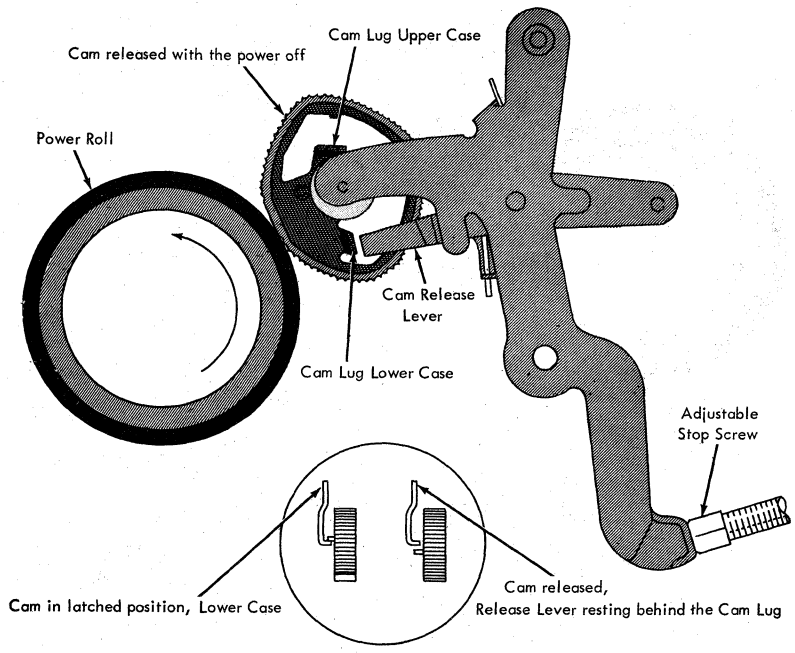

Figure 42. Double Lobe Shift Cam

SPACE BAR

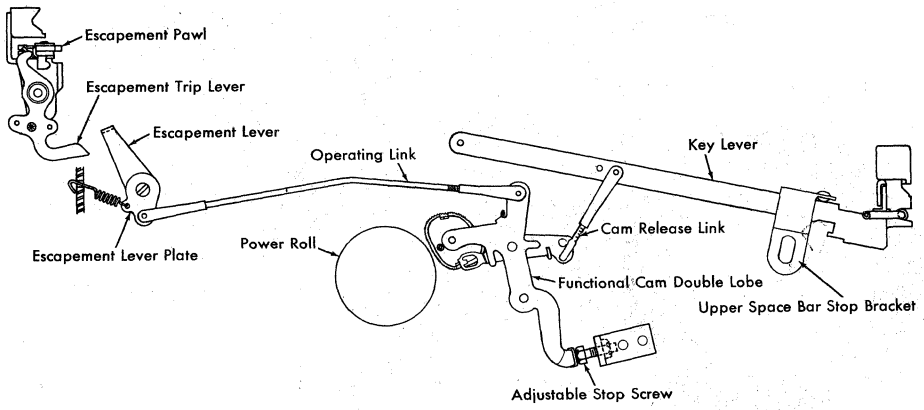

Figure 43. Space Bar Mechanism

The space bar mechanism provides the operator with a means of moving the carriage to the left one space at a time without placing a typed character on the paper (Fig. 43).

The space bar is mounted on two brackets and contains a sponge rubber insert for noise reduction. The left bracket is mounted to the space bar key lever by two screws. An equalizing rod fits into the U-slot of the left bracket and passes through the hole of the right bracket. This equalizing rod is mounted and pivots in holes on the right and left side frames and its purpose is to guide and support the space bar.

The space bar key lever fulcrums about the key lever fulcrum wire which passes through the key lever bearing support. A

stop bracket located on the left side frame prevents overtravel of the space bar key lever when in its rest position.

Attached in the front hole of the space bar key lever is the adjustable clevis of the cam release link. The opposide end of the cam release link fits into one of the holes of the cam release lever.

The space bar cam is a double lobe single action cam. The cam is attached to the cam lever bearing support by a short fulcrum wire which passes through the holes of the cam body. The space bar cam pivots about this fulcrum wire upon each single or repeat operation of the space bar. Attached to the top of the cam body is the adjustable clevis of the space bar operating link. This operating link extends toward the rear of the machine and is attached to the escapement lever end plate by a non-adjustable clevis. The escapement lever end plate is screwed to the left end of the escapement lever shaft. One end of a spring is attached to the escapement lever end plate and the opposite end to the machines power frame and its purpose is to hold the cam into the power roll on each operation of the space bar. The escapement lever shaft passes through two fixed holes in the power frame.

Rotation of the shaft moves the escapement lever toward the rear, causing it to strike the trip lever. The trip lever then operates the escapement mechanism in the same manner as a normal escapement. The universal bar is not moved during space bar operation due to the elongated slot that mounts the escapement trip link to the universal bar.

The space bar mechanism features a controlled repeat/non-repeat operation. Depression of the space bar key allows the cam to trip. Further downward movement of the key lever depresses the spring-loaded plunger in the key lever guide comb and allows the cam to repeat. This plunger arrangement is the same as that employed for repeat/non-repeat operations on the letter key levers.

SHIFT

The purpose of the shift mechanism is to raise or lower the type basket and permit double case typing. Two key buttons, one on each side of the keyboard, can be used to actuate the shift mechanism (Fig. 44). If the operator desires to remain in upper case, a shift lock is provided for this purpose. The shift lock may be released by depressing either shift key button and the basket will return to lower case.

The shift mechanism may be divided into two dependent mechanisms, the basket assembly and the actuating and buffing assembly.

The basket assembly consists of: the type bars and segment, the segment support, and the shift toggle levers assembly. These parts move as a unit to raise or lower the type bars so that upper and lower case characters are available.

The type bars and the segment are assembled to the segment support. The segment support is attached to the power frame by four flat springs called segment guides. The segment guides support part of the weight of the basket mechanism and suspends it so that it floats. The guides also prevent side movement of the basket assembly, but allow vertical movement. The vertical movement is limited by a combination of stop brackets, stop screws and motion adjusting nuts. The stop screws pass through holes in the stop brackets and the brackets are screwed directly to the power frame. The motion adjusting nuts are assembled to the stop screws above the brackets. The stop screws pass through threaded holes in the segment support with the large screw heads down. Rubberized washers insulate the nuts and screws heads from the stop brackets. The downward motion of the basket assembly is limited by the motion adjusting nuts when they contact the stop brackets. The upward movement of the basket is limited by the heads of the stop screws contacting the underside of the stop brackets.

Two toggle brackets are attached to the left and right side of

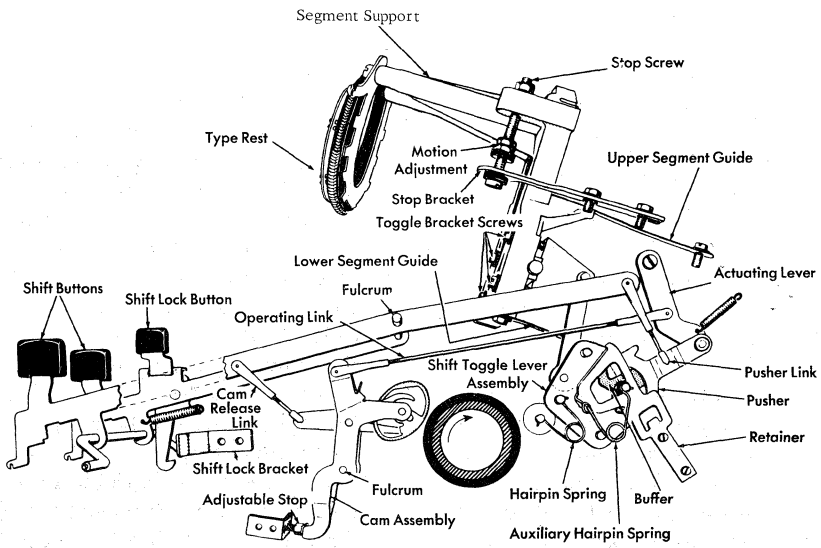

Figure 44. Shift Mechanism

the segment support. A pin is inserted between the toggle brackets and the segment support, so the brackets may be pivoted into position by their mounting screws. Toggle links are pinned to the rear of the toggle brackets and extend down to studs on the front of two shift toggle plates.

The left shift toggle lever plate is pressed on a shaft that passes through bearing holes in the power frame casting. The right plate is pinned to the shaft. When the toggle plates and shaft are rotated, the segment support is moved up or down by the toggle links. Two heavy hairpin springs are mounted to studs on the toggle plates and studs on the side frames. The toggle springs hold the basket mechanism in either the fully raised or lowered position. They also aid the basket in its movement. The right toggle lever plate has upper and lower pins extending to the right in the machine.

The shift actuating and buffing mechanism supplies motion and force to the pins on the right toggle lever plate, causing it to rotate. This action causes the basket assembly to be raised or lowered.

The shift mechanism incorporates two key levers. The left shift key lever fulcrums in the key lever bearing support and contains the shift lock. The right key lever pivots in the key lever bearing support and extends toward the rear of the machine. The underside of both key levers have hooks that engage an equalizing shaft which pivots between the left and right side frame. The shaft causes both key levers to be depressed when one is actuated. The right key lever has a hole in front of its pivot point that receives the clevis of the cam release link. The cam release link hooks into the shift cam release lever.

The shift cam is a double lobe double action cam. Double action means the cam will be released and rotate over one lobe when the keylever is depressed. When the key lever is released, the cam will be released again and rotate over the second lobe. Later machines include a spring between the shift cam and key lever. This spring reduces the possibility of the shift cam repeating.

The back end of the right key lever has a hole that receives the clevis from the shift pusher link. The shift pusher and the buffer are shoulder riveted to the shift actuating lever. This is called the shift pusher lever assembly. The actuating lever pivots on a shoulder screw in the power frame and is spring loaded to the rear. A shift operating link extends from the cam frame to the actuating lever. The buffer has two studs: one is located so that it passes through a cut out in the shift toggle levers plate, the other stud is on the forward end of the buffer and passes through a window in the retaining plate.

The retaining plate is held to the power frame by two screws and it holds the pusher and buffer assembly in toward the toggle lever plate. The window in the retaining plate limits the upper and lower positions of the buffer. The retaining plate has two formed lugs that extend toward the center of the machine. The lugs limit the upper and lower positions of the pusher. An auxiliary hairpin spring hooks on a lug on the retaining plate and on the forward stud on the buffer. It aids in positioning and holding the buffer.

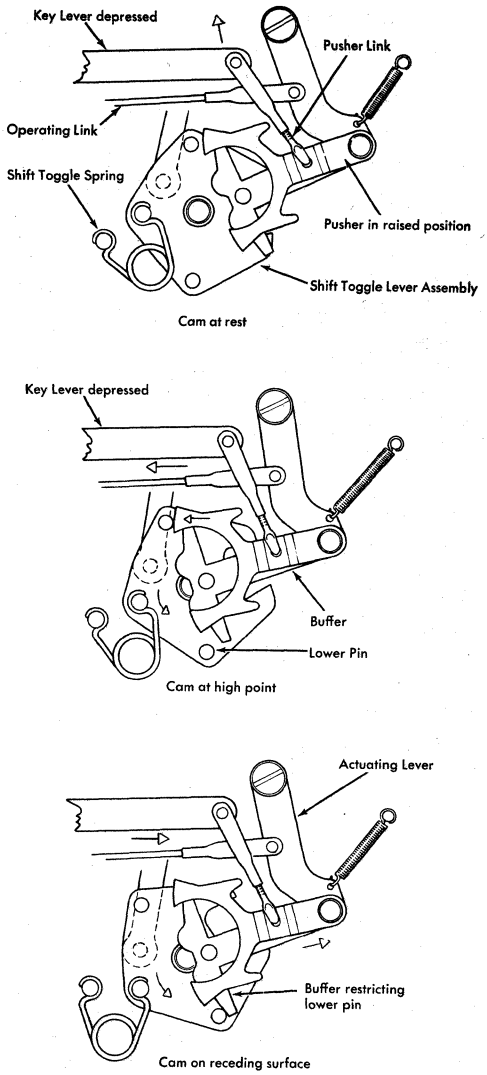

Figure 45. Pusher and Buffer Operation

(Operation)

The depression of either shift key button causes both key levers to depress since they are connected by an equalizing rod (Fig. 44). Depression of the front end of the right key lever raises the rear end. This raises the shift pusher, by means of the pusher link, until the upper arm of the pusher is directly behind the upper pin on the shift toggle lever plate (Fig. 45). The cam release link has been lowered enough by this action to rotate the lug on the cam release lever out of the path of the outer lug on the shift cam, and into the path of the inner cam lug (Fig. 46). The cam is rotated into the power roll by the spring arm, and held against the power roll by the spring on the actuating lever. As the cam rotates from 0° to 90°, it pulls the operating link forward. The operating link rotates the actuating lever about its mounting screw and this brings the pusher and buffer forward. The upper arm of the pusher contacts the upper pin and moves it forward. This causes the shift toggle lever to rotate counterclockwise against the tension of the two toggle springs. Rotation of the right toggle lever plate causes both toggle links, the segment support, segment and type to start their downward motion. The four segment guides flex to allow this movement. During this action

the pusher worked and the buffer merely moved forward with it without performing any service. When the cam reaches 90°, or its first high point, the toggle springs are carried over center by the momentum of the basket mechanism and the upper pin leaves the pusher. The toggle springs reverse their direction of tension and now power the operation. The toggle levers assembly continues to rotate and the lower pin contacts the lower wing of the buffer (Fig. 45). Buffer restoration is limited by the receding surface of the cam which is serrated and still engaged with the power roll. The toggle springs, therefore, are not allowed to slam the segment support into lower case, but can only complete the operation as fast as the cam will allow the buffer to restore. When the washer and motion adjusting nuts on the stop screws strike the stop bracket, rotation of the toggle levers ceases and the buffer leaves the lower pin. The stud on the back of the buffer is cammed upward by the bottom of the cutout in the toggle lever plate until the buffer hairpin spring is over center. The buffer spring then continues to raise the buffer until the buffer spring stud contacts the upper edge of the window in the retainer (Fig. 44). The buffer is now positioned to work on the upper pin in the next shift operation. The tension of the toggle springs now holds the mechanism in the upper case position. The key levers are still held down or locked down by the shift lock. The cam has rotated 180° and the inner lug on the cam is against the cam release lever lug (Fig. 46).

When the key lever is released and restores upward, the bottom arm of the pusher is dropped behind the lower pin on the toggle lever plate. The lug on the cam release lever moves out of the path of the inner cam lug and the cam is released on the power roll. The release lever then moves into the path of the outer cam lug, to prevent a repeat operation. The cam moves the pusher forward and the lower arm on the pusher contacts the lower pin in the plate. This causes the toggle lever assembly to rotate clockwise and move the segment support upward. The toggle springs power the mechanism after the cam has reached 270°, its second high point, and the buffer works on the upper pin to cushion the basket mechanism. The pin on the back of the buffer is cammed downward by the top of the cutout in the toggle lever plate as the buffer completes its restoration. The cutout and the buffer spring position the buffer in line with the lower pin before the next operation is begun.

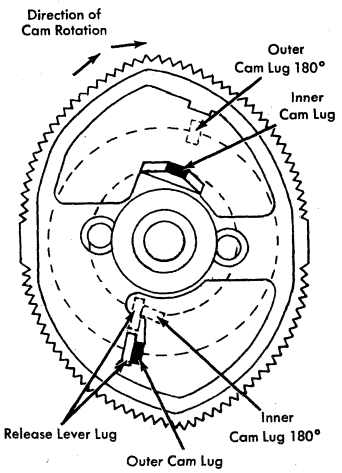

Figure 46. Shift Cam

The distance the segment support travels, either up or down during shift, is called shift motion. This distance corresponds to the distance between the bottom of the upper and lower case characters. The majority of IBM type styles have a motion of .265", however, a few of the larger type styles have a motion of .300".

TABULATION

The tab mechanism permits the operator to place typing in previously determined accurate columns at a minimum of two spaces between columns. A rack of tab stops, mounted on the carriage and corresponding to the pitch of the typewriter, allows the operator to select the positions where the carriage will stop when the tab mechanism is activated. The operator may then place typing in straight columns by tabulating to the same stop when ever it is necessary to place figures in that column. Tab stops may be set or cleared by depressing the appropriate button located on the front cover at the right and slightly above the keyboard. Through linkage, these buttons operate set and clear levers attached to the rear frame of the typewriter (Fig. 47). Spring fingers in the tab rack hold the stops in either position. All set tab stops can be cleared in one operation by holding down the clear button and operating the carriage return simultaneously. The tab rack does not contain stops within a few spaces of either margin as tabulation in these areas is infrequent. Additional stops may be installed if the customer so desires.

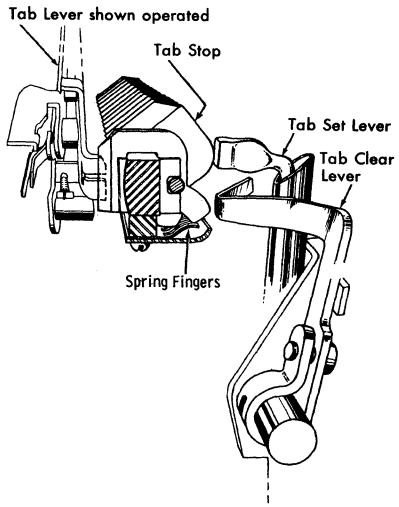

Figure 47. Tab Set and Clear Levers

The basic part of the tab mechanism is the tab lever assembly consisting of the tab lever, tab check lever, margin control lever, tab latch, extension, leaf spring and pawl release hook (Fig. 48). It is mounted to a shock-absorbing horseshoe shaped bracket on the left side of the rear rail by means of a pivot stud. The tab lever can rotate freely about the pivot stud.

(Operation)

Depressing the tab key releases a double lobe single action cam. As the cam is rotated by the power roll, the cam frame pulls the operating link and the top of the tab actuating lever toward the front of the machine (Fig. 48). The actuating

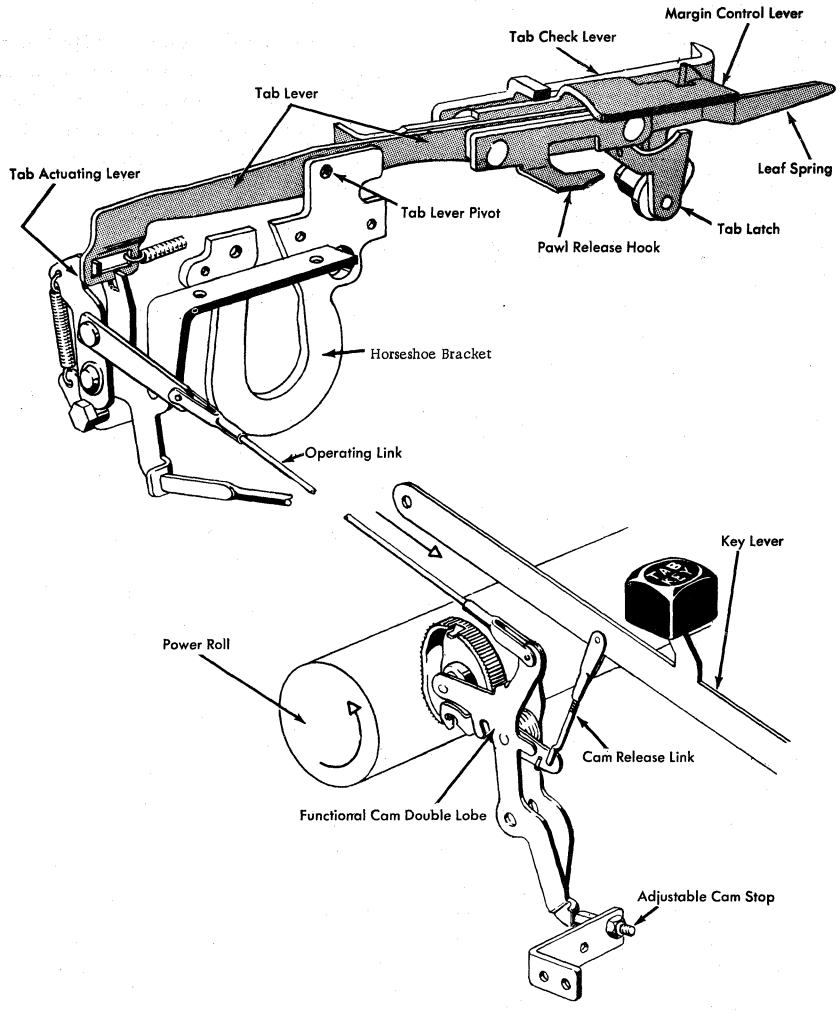

Figure 48. Tab Mechanism

lever is mounted to the governor control bracket so that it can move upward to raise the left end of the tab lever during margin release, and can also rotate to bring the left end of the tab lever forward during tablulation. The latter action causes the tab lever to rotate about its pivot stud and the right end moves toward the rear of the machine.

As the right end of the tab lever moves toward the rear, the following seven things happen almost simultaneously:

1. The tab lever leaf spring moves the rebound check lever to the rear where the lever is latched in its operated position over a pin on the rebound check bracket (Fig. 49).

2. The pawl release hook contacts the rear upright lug on the pawl release lever, causing the pawl release lever to rotate and remove the escapement pawl from the rack (Fig. 50). This frees the carriage to travel to the left under power of the main spring.

3a. The governor control lever is rotated by the left end of the tab lever until the governor pawl link moves the governor pawl into engagement with the friction governor plate (Fig. 51). This stops the rotation of the governor plate, which is spring loaded against a piece of

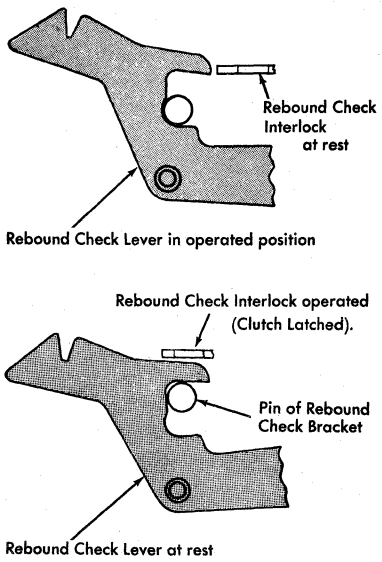

Figure 49. Rebound Check Lever Operation

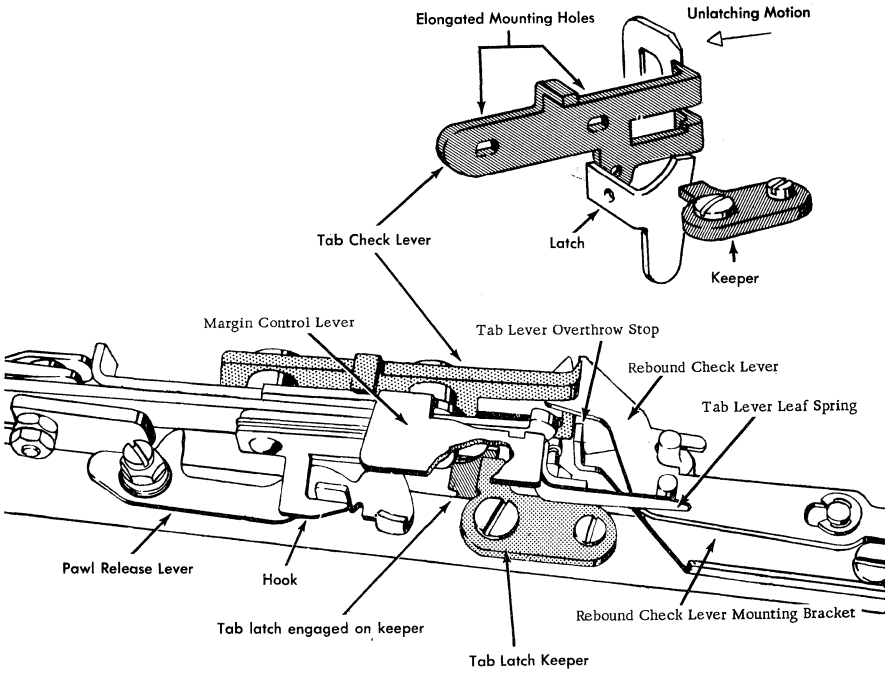

Figure 50. Tab Lever Mechanism

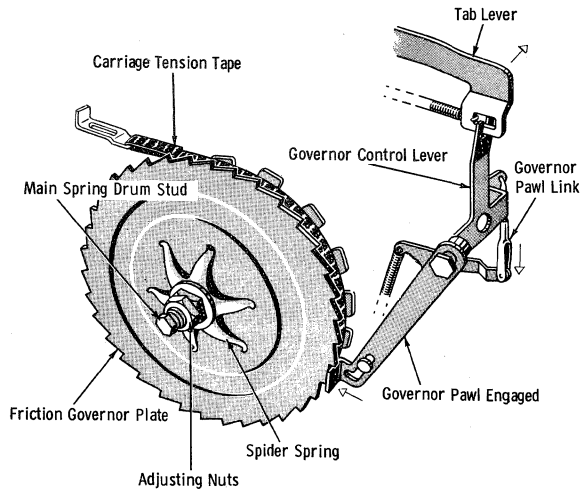

Figure 51. Friction Governor Mechanism

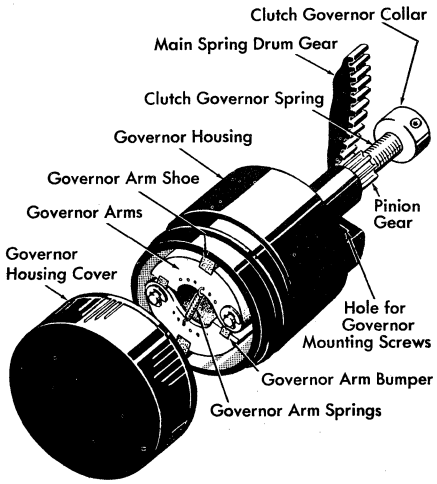

Figure 52. Centrifugal Tab Governor

felt glued to the main spring drum. This control on the rotation of the main spring drum provides a method of reducing excessive carriage speed during tabulation. The governor pawl is mounted by elongated holes to allow the carriage to build up some momentum before the braking action of the governor begins.

3b. Machines above serial number 475,055 contain a tabular governor mechanism designed to provide a uniform carriage speed during tabular operation. The main spring is wound in the opposite direction to the existing main spring for best operation of the governor.

The improved mechanism includes a 4-inch plastic gear attached to the main spring drum. This gear is used to drive a pinion gear which is attached to the centrifugal governor assembly (Fig. 52).

Inside the governor housing are two governor arms. During tabulation, the governor arms are thrown out, due to centrifugal force, against the inside of the governor housing. This causes a braking action which slows the speed of the carriage. A spring attached between the two governor arms is positioned to control the amount of governor action. By positioning this spring closer to the governor arm pivot points, more governing action is obtained. To increase the carriage speed, the spring should be moved away from the governor arm

pivot points.

The governor has a spring clutch which utilizes a flat coiled spring to drive a shaft when turned in one direction, and slip on the shaft when turned in the opposite direction. This clutch consists of a coil spring, pinion gear, and clutch collar. The clutch collar is fastened, by means of set screws, to the shaft that turns the governor arms. The pinion gear and clutch collar are butted together and are connected by the spring. As the carriage is moved to the left, the pinion gear turns the spring, which tightens itself around the clutch collar and thereby turns the governor arms. When the carriage is moved to the right, the spring expands and slips around the clutch collar. This permits the governor arms to remain at rest.

4. The tab check lever, which is mounted on two rivets through elongated holes, is spring loaded to the right. It is moved far enough to the rear to be struck by the first set tab stop that comes along.

5. The tab latch is spring loaded to the right against the left side of the tab latch keeper (Fig. 50). It is moved to the rear far enough for it to rotate to the right behind the tab latch keeper. This action latches the tab lever out where it will remain until the latch is pushed off the rear edge of the keeper. The rotation of the latch is limited by a right angled member of the latch striking a surface of the tab check lever.

6. Rotation of the pawl release lever causes the backspace interlock to be rotated. This action prevents the backspace pawl from entering the escapement rack and allows tabulation to supersede backspace (Fig. 53).

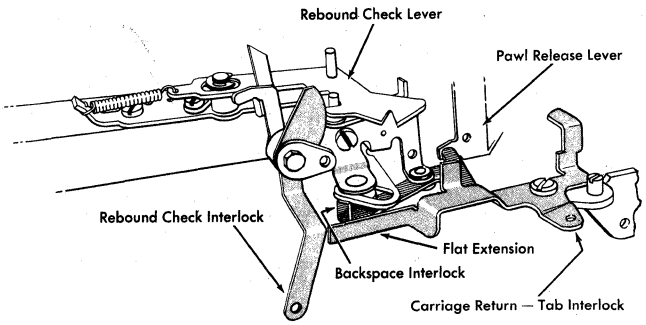

Figure 53. Interlocks

7. Movement of the tab latch stud toward the rear prevents any rotation of the carriage return tab interlock. This prevents the clutch latch from latching the clutch and allows tabulation to supersede carriage return (Fig. 53).

The carriage moves to the left and the first set tab stop moves the rebound check lever toward the front. As the carriage continues to move, the stop enters the "V" slot of the rebound check lever. The rebound check lever is still under tension of the leaf spring, and immediately snaps out to be latched in its operated position. The tab stop then strikes the tab check lever, moving it to the left (Fig. 54). The tab check lever moves the tab latch to the left until it is no longer behind the keeper. At this time the travel of the carriage is stopped and the momentum is absorbed by the horseshoe bracket. The set tab stop now bounces off the tab check lever and allows the tab lever, governor pawl, pawl release lever and backspace interlock to return to rest. At the same time the escapement pawl returns to the escapement rack. The right side of the "V" slot in the rebound check lever restricts the bouncing motion of the tab stop to the right. The pin in the rebound check lever bracket supports the rebound check lever in this operation. As the carriage moves to the left again, it brings an escapement rack tooth against the pawl, and takes up the sliding motion in the escapement pawl. The rebound check lever is cammed to rest by the set tab stop which strikes the left side of the "V" slot and unlatches the rebound check lever from the pin of its bracket.

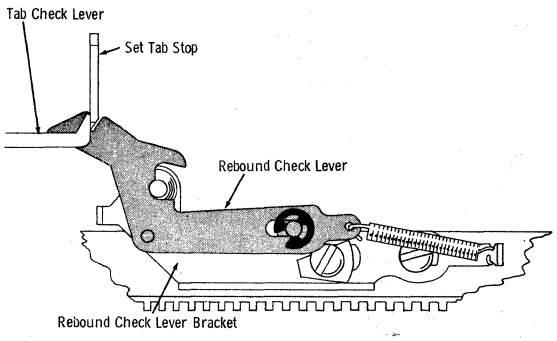

Figure 54. Rebound Check Lever

The momentary delay between tab lever restoration and rebound check lever restoration makes it necessary to have a rebound check interlock (Fig. 53). This interlock prevents the rebound check lever from catching a set tab stop when a carriage return operation occurs immediately after the tab lever goes to rest. The interlock will move to the left and cam the rebound check lever back to rest when the clutch lever is latched. This will prevent a lockup of the carriage. If, on the other hand, a set tab stop happens to be bearing against the rebound check lever at the instant the clutch tries to latch, the resistance of the rebound check lever will prevent the clutch from latching and all parts will return to rest after a line space operation.

The operator may tabulate when there are no set tab stops to the right of the tab check lever. When this occurs, the right margin stop moves the margin control lever to the left. This moves the tab check lever to the left and unlatches the tab lever. If the tab lever is latched out beyond the right margin stop and no tab stops are set, the final stop on the right end of the tab rack will serve as an unlatching device.

Tab levers used on the 8, 9, and 10 pitch typewriters will have no identifying mark. The 12 pitch tab levers

will have an "O" stamped on the rear surface of the tab check lever. The 6 2/5 and 14 pitch tab levers will have a spring mounted in place of the right tab check rivet, in addition to the "O" mark. The reason for the identification is the variation in sliding motion of the tab check lever on different pitch tab levers.

Earlier machines used a rebound check lever that did not have a "V" slot or check lever interlock (Fig. 55). The rebound check lever was moved to the rear by a leaf spring and as soon as the tab lever restored to rest another leaf spring returned the rebound check lever to rest.

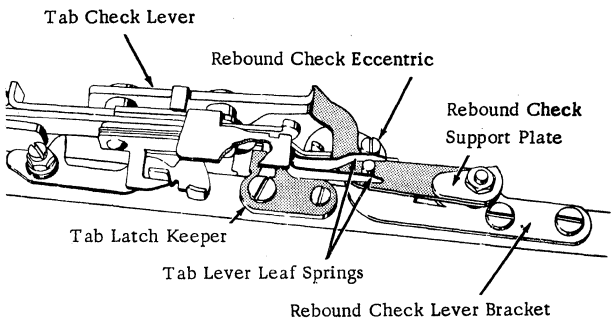

Figure 55. Early Tab Mechanism

CARRIAGE RETURN

The carriage return mechanism provides the operator with a means of returning the carriage to the left margin and line spacing the paper. A line space operation can be obtained at the left margin, and also at any other position of the carriage if backspace and carriage return are operated simultaneously.

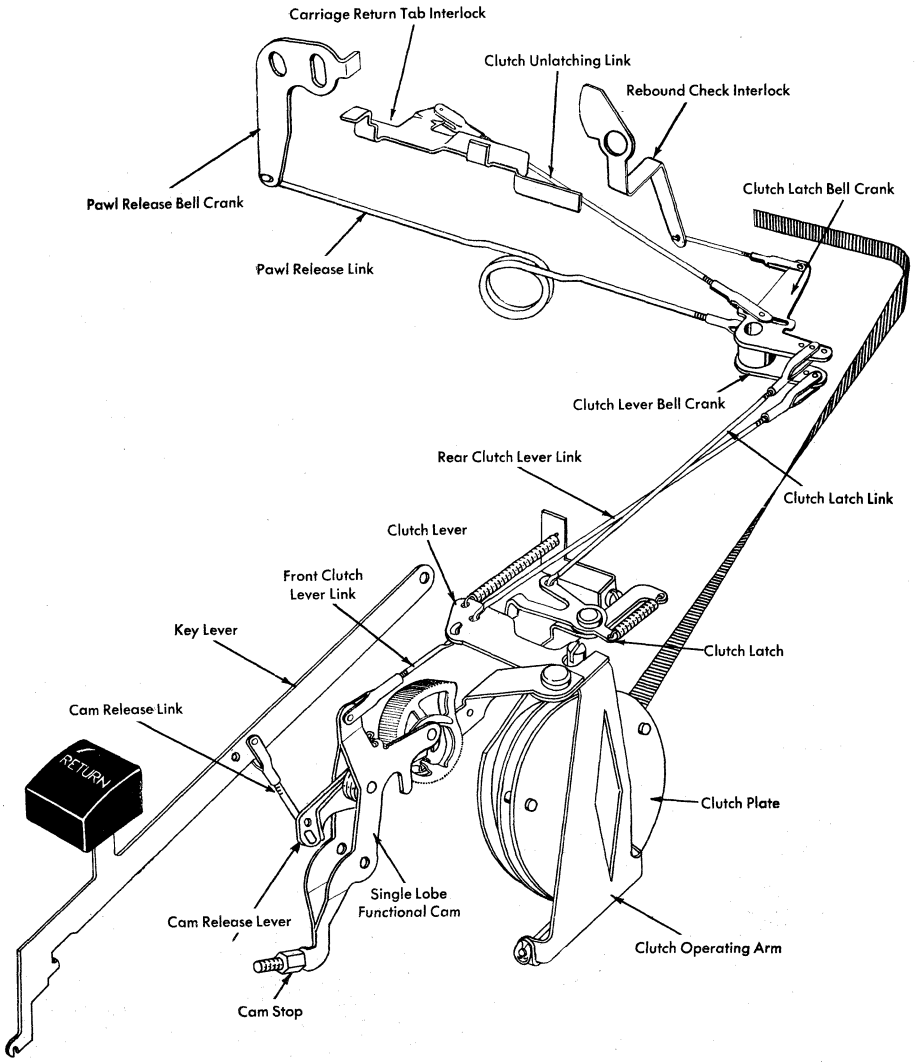

Figure 56. Carriage Return Mechanism

The operation of the carriage return mechanism depends upon the position of the carriage when the operation is started. If the carriage is located at any position but the left margin, a full carriage return operation takes place. If the carriage is located at the left margin, the carriage return operation reduces to a line space operation.

Consider first a full carriage return operation. The carriage return key lever releases the single lobe functional cam at the right end of the power roll (Fig. 56). As the cam rotates, the cam frame pulls the front clutch lever link toward the front of the machine. This rotates the clutch lever counter-clockwise about its mounting. The slot in the clutch lever moves to the left and, by means of a stud within this slot, moves the top of the clutch operating arm in the same direction. The bottom of the operating arm is mounted on a pivot shaft, one end of which is spring loaded to the left by a compression spring (Fig. 57). This provides an adjustable control on the amount of pressure the operating arm will bring to bear against the clutch plate. The operating arm pushes the clutch plate against the clutch disc. The clutch disc is mounted on the power roll shaft so that it is constantly turning with the power roll. The clutch plate and clutch pulley are joined by three studs that cause them to rotate together. The clutch disc is now forced against the clutch pulley and causes it to rotate and wind up the carriage return tape.

One end of this tape is attached to the pulley, and the other end to a stud on the index pawl carrier (Fig. 58). The initial pull on the tape line spaces the platen and then the carriage is pulled to the right. The clutch lever also moves the rear clutch lever link forward and rotates the lower bellcrank, moving the pawl release link toward the right (Fig. 56). This link rotates the pawl release bellcrank, which contains a lug that projects toward the rear. This lug rises striking a hook shaped projection on the intermediate pawl release lever causing this lever to rotate and strike the pawl release lever (Fig. 59). Rotation of the pawl release lever removes the escapement pawl from the rack. The pawl release lever also operates the backspace interlock so that the backspace pawl cannot enter the rack during a carriage return operation.

As the carriage return cam reaches its high point, the clutch lever is rotated far enough to allow the clutch to rotate under tension of its spring until it latches the clutch lever in the operating position (Fig. 60). The latch moves the clutch latch

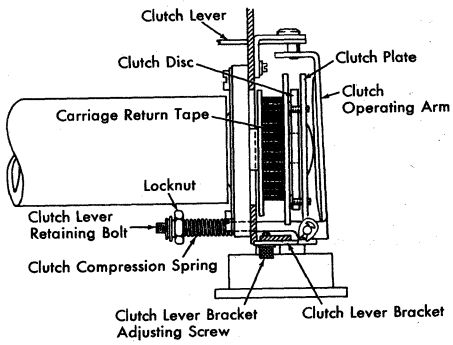

Figure 57. Clutch Mechanism

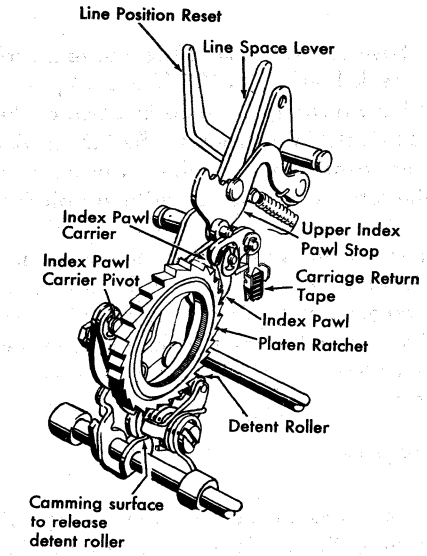

Figure 58. Indexing Mechanism

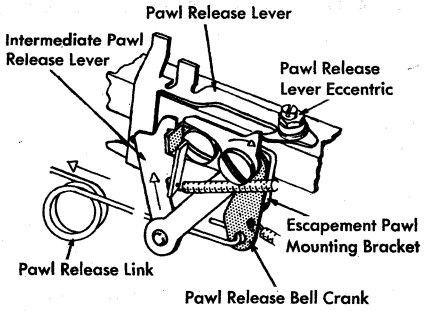

Figure 59. Pawl Release

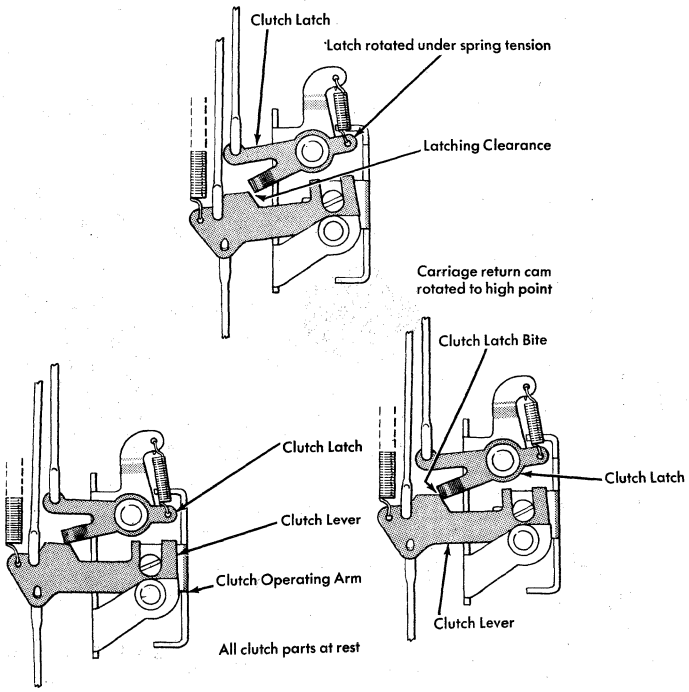

Figure 60. Clutch Latch Operation

link, its bellcrank, and the clutch unlatching link and causes the carriage return tab interlock to rotate clockwise (viewed from the top of the machine) (Fig. 56). Rotation of this interlock is limited by the interlock eccentric stop which limits the amount of engagement of the clutch latch behind the clutch lever (Fig. 61). The clutch latch bellcrank also rotates the rebound check interlock to insure that the rebound check lever is not in the operated position. At this time the carriage return tape is pulling the carriage toward the left margin.

As the carriage approaches the left margin, the left margin stop contacts the margin control lever and moves it toward the left (as viewed from the back of the machine) (Fig. 61). A lug on the margin control lever rotatesthe margin control bellcrank, which performs three main functions.

First, it rotates the air cylinder bellcrank to actuate the air cylinder plunger. This causes a vacuum on one side of the plunger and compresses the air on the other side (Fig. 62). This action retards the travel of the margin control bellcrank, allowing the carriage to decelerate gradually without slamming noisily at the margin.

Second, the margin control bellcrank releases the intermediate pawl release lever from the pawl release bellcrank by knocking the hook shaped extension of the lever off the lug of the bellcrank. This action permits the pawl release lever to restore to its rest position, allowing the escapement pawl to enter the escapement rack. This occurs approximately one space or less from the left margin.

Third, the margin control bellcrank contacts the carriage return tab interlock and rotates it counter-clockwise (from the top of the machine). The interlock moves the clutch latch linkage and unlatches the clutch. All the clutch parts restore to rest and the carriage moves a small distance to the left, under main spring tension, to take the sliding motion in the escapement pawl. This small distance is called overbank and is controlled by the position of the margin rack, by controlling the position of the escapement rack, when the escapement pawl enters the rack. Clutch unlatching occurs just before the travel of the carriage is stopped by the margin control lever striking its final stop (Fig. 61).

If the carriage return were immediately operated again, the second operation reduces to a line space operation. This means that the carriage will retain its position, but the platen will be rotated to place the paper on a new writing line. The escapement pawl is not removed from the escapement rack and the clutch latch does not engage the clutch lever. However, the carriage return cam completes its rotation and brings the clutch surfaces together momentarily. The carriage return tape pulls on the line space mechanism to index the platen. Since the carriage is already at the margin, the margin control bellcrank is in the operated position, holding the hook on the intermediate pawl release lever away from the lug on the pawl release bellcrank. The pawl release bellcrank rotates as the cam rotates but the bellcrank cannot operate the intermediate pawl release lever (Fig. 61). Thus, the pawl release lever is not operated and the escapement pawl remains in the rack.

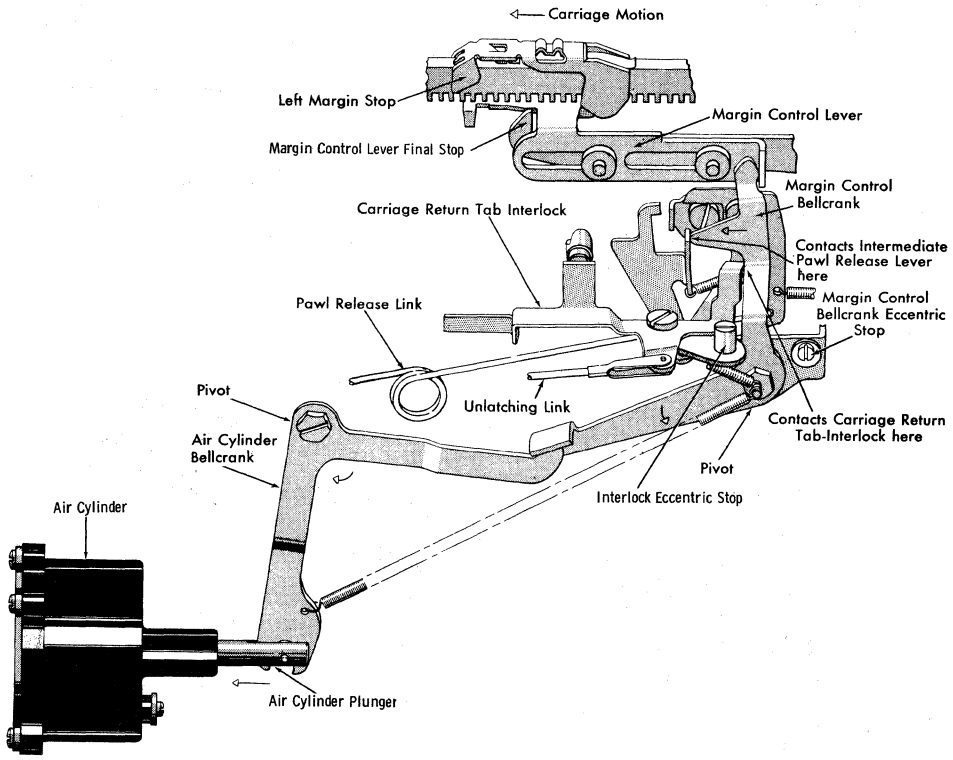

Figure 61. Margin Control Bellcrank Operation

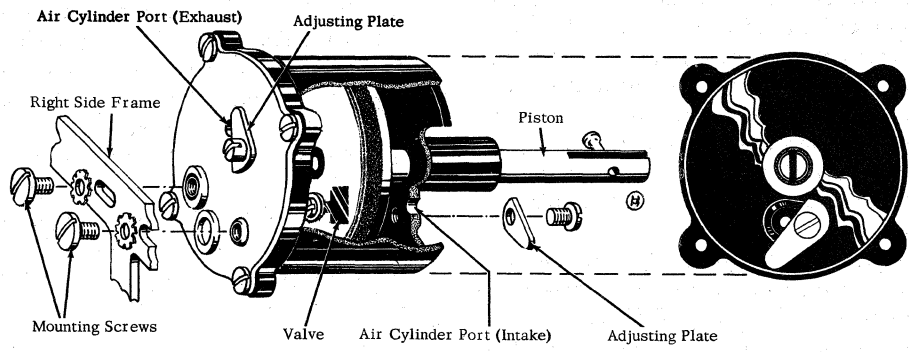

Figure 62. Air Cylinder

The margin control bellcrank aslo keeps the carriage return tab interlock from rotating and through the linkage prevents the clutch latch from following the clutch lever. As the carriage return cam completes its rotation, all parts restore to rest and the operation is complete.

In both of the above operations, the pull on the carriage return tape operates the line space mechanism to index the platen. The tape pulls the index pawl carrier down against the tension of the spring loaded index lever. As the pawl knockout lever leaves the upper index pawl stop, the index pawl is allowed to rotate under spring tension. This rotation raises the index pawl knockout lever, and allows the point of the index pawl to move forward and engage a platen ratchet tooth. The ratchet is rotated until the index pawl strikes the lower index pawl stop. The rotation of the ratchet has caused a ratchet tooth to lower the spring loaded detent roller as the tooth passes over the roller. As the index pawl strikes the lower stop, the detent roller again enters the low point between two ratchet teeth and holds the ratchet in the new position (Fig. 63). The ratchet has serrations within its inner circumference that are engaged with matching serrations on the platen ratchet driver

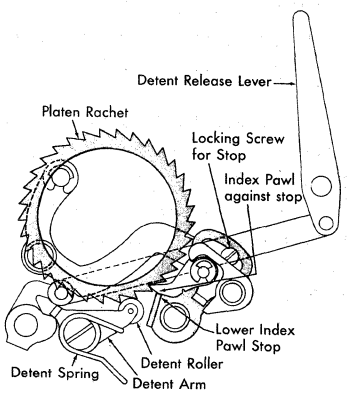

Figure 63. Detent Release

(Fig. 64). The driver is confined to an elongated slot in the platen end plug, so that any rotation of the ratchet causes the driver and the platen to rotate the same amount. The

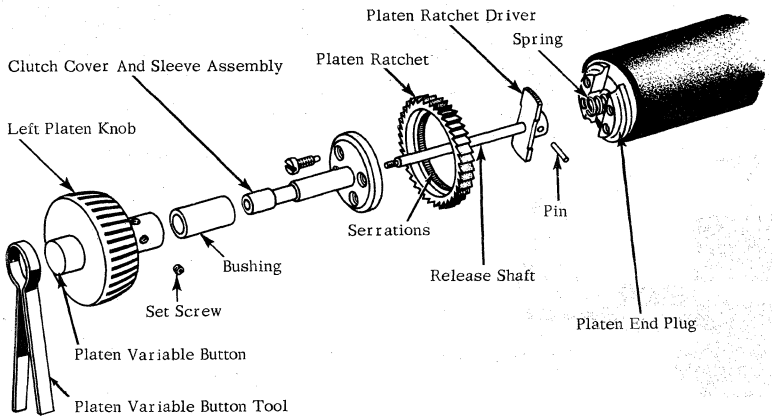

Figure 64. Platen Mechanism

operator is provided with a platen variable button which will disengage the driver from the ratchet and allow the operator to rotate the platen to a position other than the normal spacing provided by the ratchet.

The detent roller can be temporarily released from the ratchet to allow typing above or below the writing line. Moving the line position reset to the rear cams the detent roller from the ratchet and permits free rotation of the platen. Normal line spacing can be restored by setting the line position reset back in the normal, or forward position.

To obtain double or triple line spacing, the operator places the line space lever in the position marked "2" or "3" on the carriage end cover (Fig. 58). The rest position of the index pawl is raised so that it will enter the ratchet at a higher point and rotate the ratchet a greater number of teeth.

Platen ratchets are supplied with various numbers of teeth to facilitate selection of the desired number of lines per inch. The choice of a ratchet is governed by the size of type and the amount of typed material required on a page. The 33-tooth ratchet, which provides six lines per inch is considered standard. The Reference Manual contains a platen indexing chart listing the proper number of ratchet teeth, for any desired spacing, in number of lines per inch.

During carriage return operation, several mechanical interlocks are actuated. One of these is the carriage return-tab interlock which transfers motion from the margin control bellcrank to unlatch the clutch. This lever, as its name implies, provides interlock action between carriage return and tab. If these mechanisms are operated together, the tab latch stud will rotate the interlock to unlatch the clutch or prevent the clutch from latching. By touching the tab key just after depressing the carriage return key, an operator can use this interlock feature to obtain a partial carriage return and causes a tabulation to the nearest set tab stop. This short cut is of special value when typing columns of figures.

Another lever, called the rebound check interlock, is also operated during carriage return (Fig. 53). This lever is designed to restore the rebound check lever to rest when carriage return is operated. This prevents the rebound check lever from holding on the right side of a set tab stop and locking the carriage when the clutch is pulling the carriage to the right.

A flat extension, on the right end of the carriage return-tab interlock, follows the backspace interlock when the clutch is latched (Fig. 53). When the backspace pawl is in the rack, the backspace interlock can not rotate. This will prevent rotation of the carriage return-tab interlock, which in turn prevents the clutch from latching.

Another situation arises if the backspace and carriage return are operated simultaneously. The backspace pawl moves first so that the backspace interlock cannot clear the pawl. The rotation of the carriage return-tab interlock is blocked by the backspace interlock so that the clutch cannot latch. The backspace interlock also restricts the motion of the pawl release lever, which in turn prevents any rotation of the pawl release bellcrank. However, the carriage return cam is powering pawl release, but the motion is absorbed by the pawl release link. This is the reason for a spring type pawl release link. The clutch surfaces are brought together momentarily to pull on the tape and line space the platen, but a full carriage return is prevented because the backspace pawl is in the rack. Thus, depressing the carriage return and backspace simultaneously provides a full backspace, but only a line space operation of the carriage return mechanism.

The carriage return has a repeat/non-repeat feature to permit repeat operation when the key lever is depressed beyond its normal travel. The arrangement is identical to the method described under the space bar section.

Earlier machines did not have the rebound check interlock, as they used the old style rebound check lever. Earlier machines also did not have the extension on the carriage return-tab interlock that actuates the backspace interlock, as they used a separate backspace carriage return interlock that will be covered in detail under the backspace section of this manual.

BACKSPACE

The backspace mechanism provides the operator with a method of moving the carriage to the right, one space at a time. The main usage is for error correction and centering of work on a page.

Depressing the backspace key lever releases the single lobe backspace cam to engage the power roll (Fig. 65). Leverage

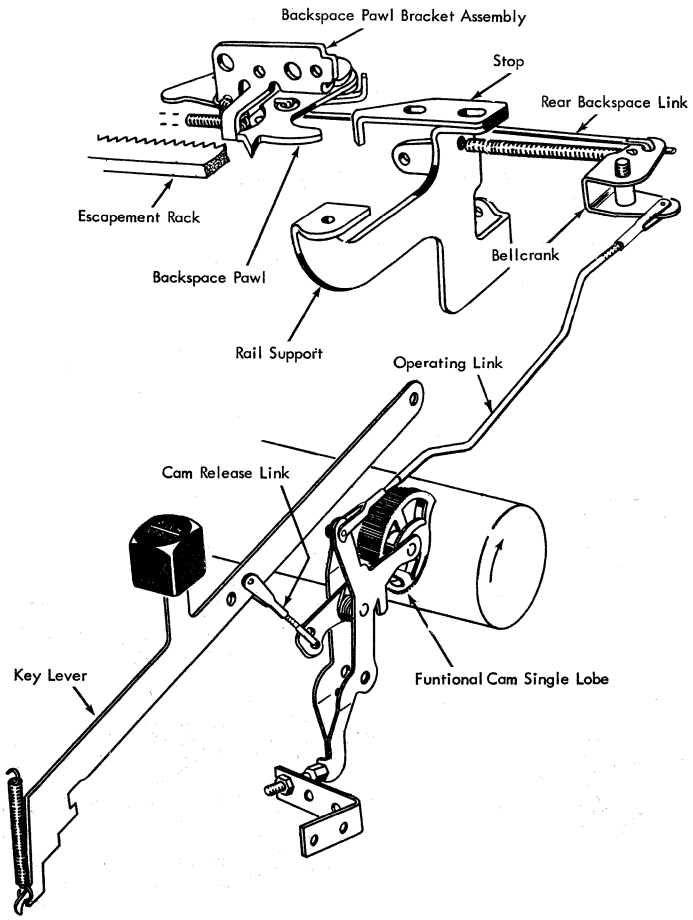

Figure 65. Backspace Mechanism

developed on the cam frame is transfered by the operating link to the backspace bellcrank. The bellcrank rotates and pulls the backspace pawl link to the right. The backspace pawl is mounted on a diagonally cut elongated hole; as it is pulled to the right, it is cammed into the escapement rack (Fig. 66-A). Two springs, attached to the head of the backspace pawl, cause the head to delay any movement to the right until the backspace pawl is moved into engagement with the escapement rack (Fig. 66-B). When the tooth of the backspace pawl fully engages the teeth of the escapement rack, the continuing pull of the linkage starts to move the carriage to the right (Fig. 66-C). The motion continues until the carriage moves far enough to allow the escapement pawl to snap into the next tooth of the escapement rack (Fig. 66-D). At this point the motion of the backspace pawl is stopped by the backspace pawl stop and it, in turn, halts any further motion of the carriage to the right. The backspace pawl has now completed two jobs. First, it overcame carriage tension and mass when it moved the carriage one space to the right. Second, it locked the carriage in the new position long enough for the carriage momentum to the right to be blocked by the pawl and its stop. The backspace cam now drops off its high point and all parts return to rest.

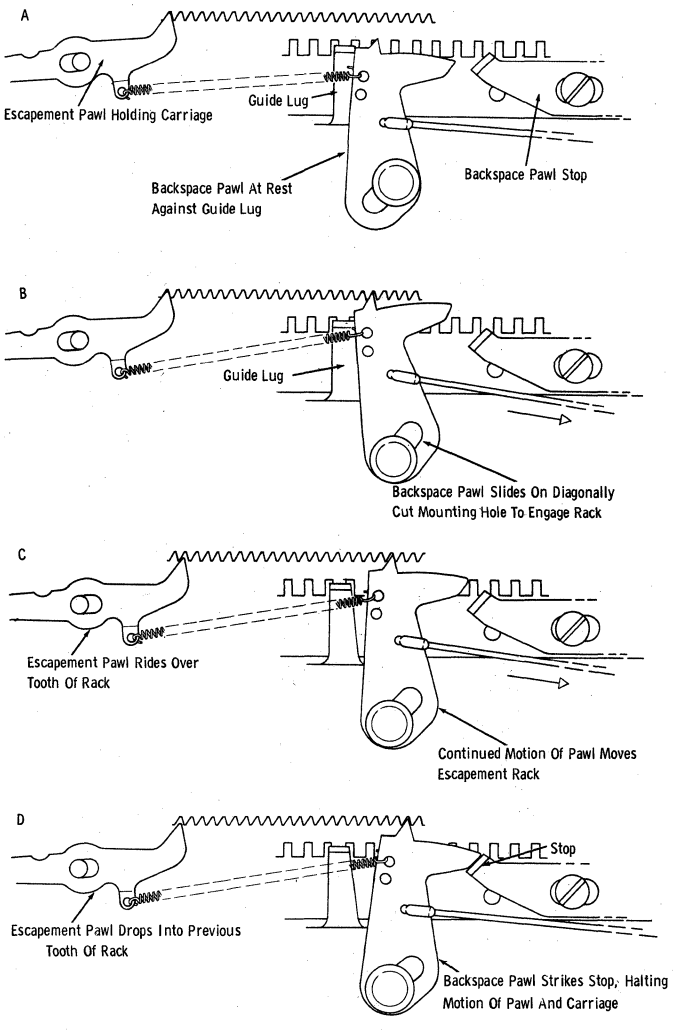

Figure 66. Backspace Pawl Sequence Of Operation

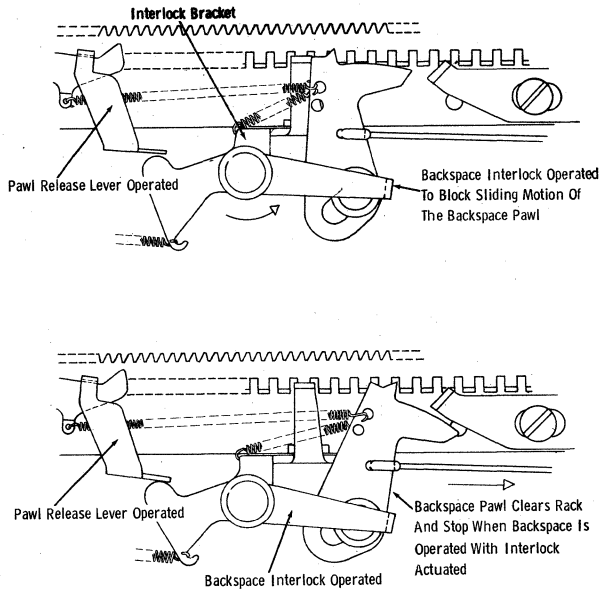

Figure 67. Backspace Interlock

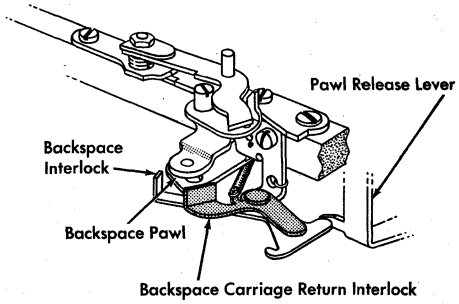

Figure 68. Early Backspace Interlock

A backspace interlock is also mounted on the backspace pawl bracket. The interlock is actuated any time the pawl release lever is operated by tab, carriage return or hand carriage release. The interlock does not prevent the backspace pawl from rotating, but prevents its entry into the escapement rack and also prevents the pawl release lever from removing the escapement pawl from the rack any time the backspace pawl is in the escapement rack (Fig. 67).

Another interlock, called the backspace-carriage return interlock, was used on earlier machines to prevent the clutch from latching during simultaneous operation of backspace and carriage return (Fig. 68). It did this by rotating as the backspace pawl entered the rack; one end of it following the backspace pawl, the other end contacted the carriage return-tab interlock. This prevented the carriage return-tab interlock from rotating if the carriage return were operated, and consequently prevented the clutch latch from engaging the clutch lever. The spring on the backspace-carriage return interlock had to be of greater strength than the clutch latch spring for successful operation.

Current Model B1 machines use the extension of the carriage return-tab interlock, that extends behind the backspace interlock, for the same purpose. If the backspace pawl is in the escapement rack, the backspace interlock cannot be rotated

and will block any rotation of the carriage return-tab interlock which is necessary for clutch latching.

The single tooth backspace pawl has replaced the former backspace pawl in all six pitches of the typewriter. This pawl is the same as the double tooth backspace pawl in all other respects. This improvement eliminated the need for stocking six different backspace pawl assemblies. The change took place on machines above serial number 486609.

On earlier machines, the double tooth backspace pawls were made to correspond to the pitch of the machine. For identification purposes, the pitch was stamped on 6 2/5, 8, 9, 14, and 16 pitch pawls. Twelve pitch pawls were stamped with an "O" and 10 pitch pawls had no marking.

RIBBON

The ribbon mechanism performs the two basic operations of lifting and feeding the ribbon. The lift mechanism raises the ribbon to the writing line, as the type bar prints, and then lowers it to provide a visible writing line. The feed mechanism must then move the ribbon laterally to move the used portion away from the typing area. The typewriter can be equipped to feed a 9/16" wide fabric ribbon, a 5/16" wide carbon paper ribbon, or both. The fabric ribbon mechanism will be covered first.

Ribbon Lift

The basic part of the ribbon mechanism is the ribbon lift bail assembly, which extends across the bottom of the typewriter (Fig. 69). This assembly is mounted to the side frame on pivot screws. The assembly is made of two parts: a shaft that pivots on the mounting screws, and a bail that is free to rotate about this shaft. The motion of the letter cam lever pivots the bail about the shaft. A link attached to the bail transfers the motion to the ribbon lift mechanism. This motion rotates the actuating lever (Fig. 69) which pulls at the center of a toggle arrangement. The arms of the toggle are moved into a straight line, forcing the lift lever to raise from its stop. The lift lever, in turn, moves the ribbon lift guide to lift the ribbon to the typing position. The amount of lift obtained is inversly proportional to the angle between the two arms of the toggle. The angle and consequently the amount of lift, can be controlled by the position of the "Color Control" button on the front cover of the typewriter. Linkage from this button rotates the color control shaft and the positioning plate. A positioning plate controls the angle of the toggle arrangement and is held in one of four positions by a spring loaded detent roller. The lower arm of the toggle is mounted on the positioning plate and the angle of the toggle is changed as the positioning plate is rotated. In the stencil position, the arms of the toggle are almost in a straight line, and the motion from the lift vane pulls the toggle over center. The result is that the ribbon is not noticeably lifted. The operator has three other lift positions, each one raising the ribbon higher as the button is raised higher. The three positions utilize the top, middle and bottom of the ribbon. The higher the button the smaller the angle between the arms of the toggle, and the greater the amount of lift.

Ribbon Feed

The motion of the lift bail is also transferred, by the release lever link (Fig. 69), to the release arm of the ribbon feed cam.

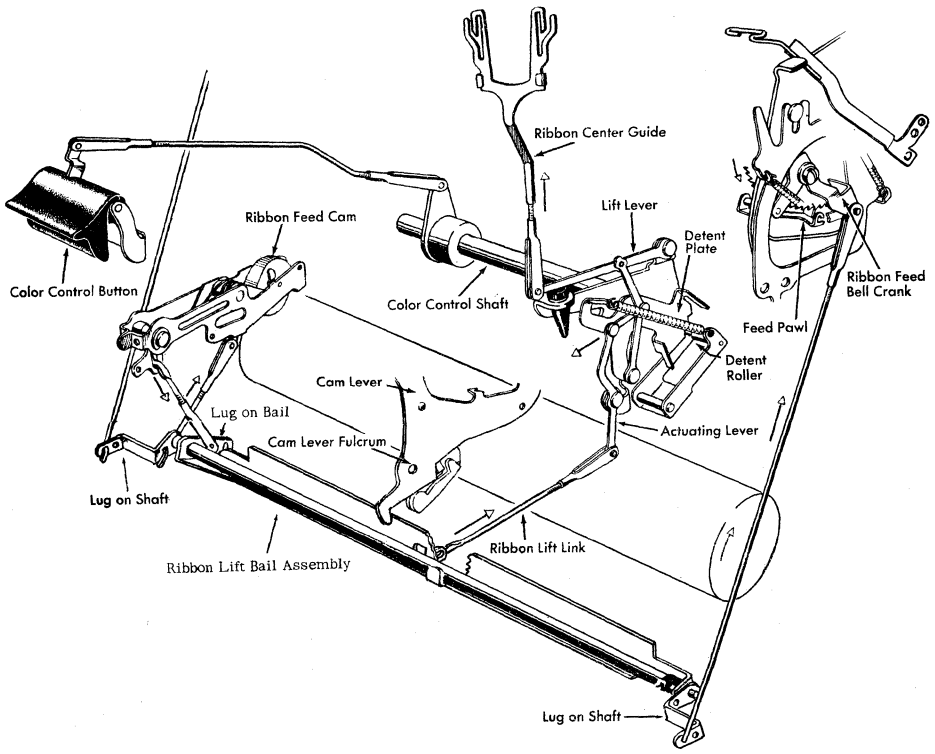

Figure 69. Ribbon Mechanism

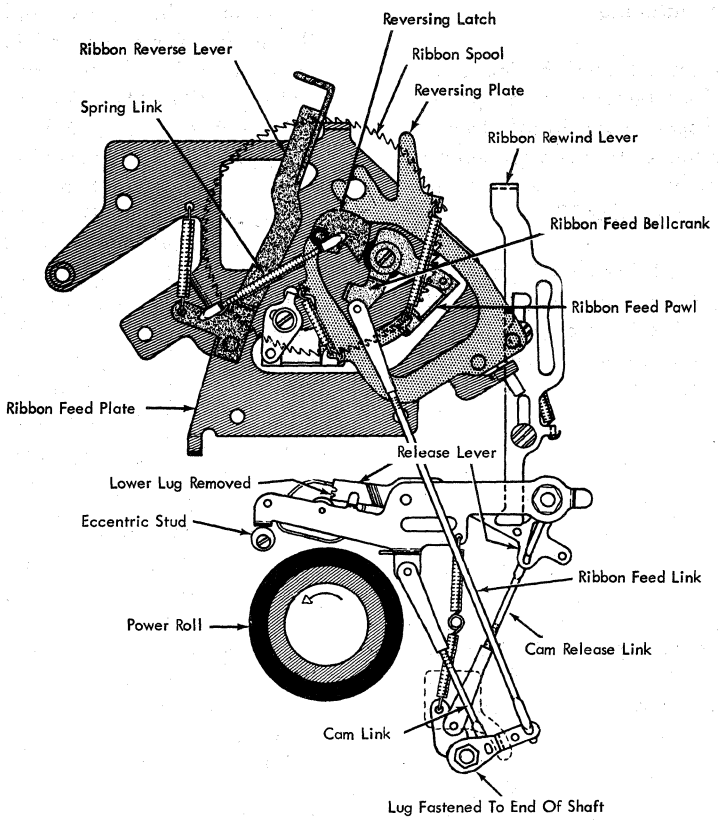

Figure 70. Ribbon Feed

The ribbon feed cam engages the power roll and raises the cam frame on its mounting stud on the left side frame. This motion is transmitted by the cam link to the shaft of the ribbon lift bail assembly. The cam link is attached to the cam frame and to a lug on the left end of the shaft. There are lugs attached to both ends of the shaft, and they pass through arc-shaped holes in the side frames. These lugs and the shaft transfer the motion of the ribbon feed cam to the ribbon feed links (Fig. 69). The ribbon feed links rotate the ribbon feed bellcranks which carry the ribbon feed pawls (Fig. 70). One feed pawl is engaged with a ribbon spool while the other feed pawl is held disengaged. Motion is transmitted so that a feed pawl rotates its spool past its check pawl and feeds the ribbon in one direction. As the feed pawl restores to its rest position, the check pawl prevents the ribbon spool from following the feed pawl.

Ribbon Reverse

Reversing the direction of the ribbon feed requires an automatic disengagement of the feed and check pawls from the feeding side and an engagement of the feed check pawls with the supply spool. The engagement of the pawls is controlled by two reverse plates mounted on the ribbon feed plates (Fig. 70). When a reversing plate is in its upper position, the pawls on that side are engaged; when a plate is down, it holds the pawls out of engagement with the spool. The reversing plates are positioned by the ribbon reverse rod which extends across the machine from one plate to the other. If one reverse plate is moved, the motion is transmitted through the ribbon reverse rod to position the other plate at the same time. Thus, as one side becomes the feeding side, the other side becomes the supply side, and vice-versa

As the supply spool becomes empty, the ribbon becomes taut and pulls the ribbon reverse lever, on the supply side,(Fig. 71)

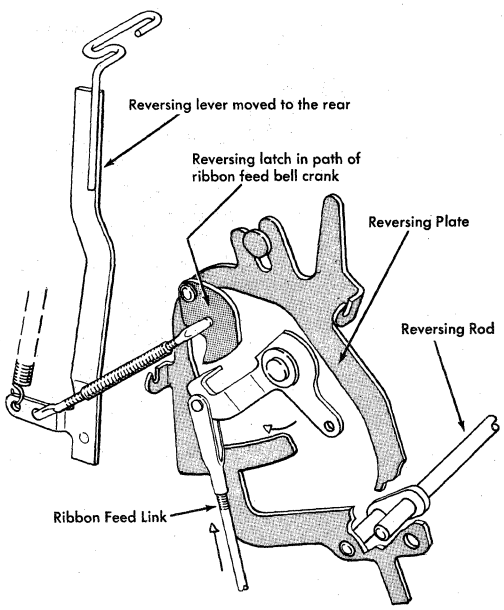

Figure 71. Ribbon Reverse

toward the rear of the machine. When the reverse lever is moved to the rear, a spring link rotates the reversing latch which is riveted to the reversing plate. The latch is now positioned in the path of the ribbon feed bellcrank. During its next feed stroke, the bellcrank strikes the reversing latch and forces the reversing plate to its upper position. The pawls are thus engaged with the empty spool and are simultaneously disengaged from the full spool by the action of the ribbon reverse rod.

In order to expedite replacing a ribbon, the typewriter is equipped with an automatic ribbon rewind mechanism. This feature utilized the ribbon feed cam as a repeating cam. The ribbon rewind lever, in front of the left ribbon spool, may be latched down to rotate the cam release lever and allow the cam to repeat. The rewind lever will remain in the latched position until the ribbon has rewound completely. The action of the ribbon reverse rod actuates the ribbon rewind trip lever which automatically unlatches the ribbon rewind lever (Fig. 72).

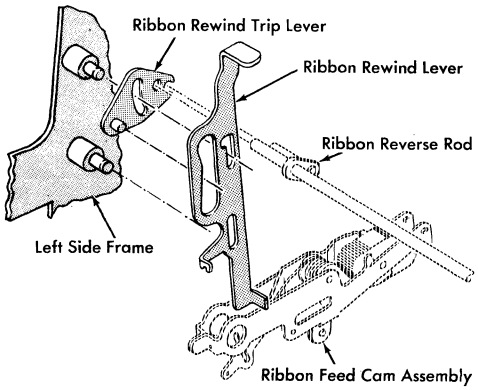

Figure 72. Ribbon Rewind Mechanism

Carbon Ribbon Attachment

The carbon ribbon attachment utilizes the same ribbon lift mechanism as the fabric ribbon, except that the ribbon lift guide is designed to lift and feed a 5/16" wide carbon paper ribbon. The ribbon feed mechanism uses the same cam and shaft arrangement but only has one feed link which is attached to the left lug on the shaft of the ribbon lift bail assembly. Two magazines are mounted to the front typewriter case. The spool of ribbon is mounted on the hub of the right magazine plate. The ribbon is threaded through the ribbon guides to the left magazine plate. The ribbon is fed by a pair of geared rubber rollers (Fig. 73). The front, or feed roller, is mounted on a shaft that also has a nylon feed ratchet mounted on it. The feed ratchet, called an escapement wheel, is rotated by a feed pawl. The feed pawl is powered by the same ribbon feed cam lug on the shaft and feed link arrangement previously described. The feed pawl may be disengaged from the nylon feed ratchet by pulling forward on the ribbon feed throw-out lever. This lever slides on two rivets mounted to the left hand magazine plate. It is desirable to use this throw-out lever when using the fabric ribbon feed mechanism.

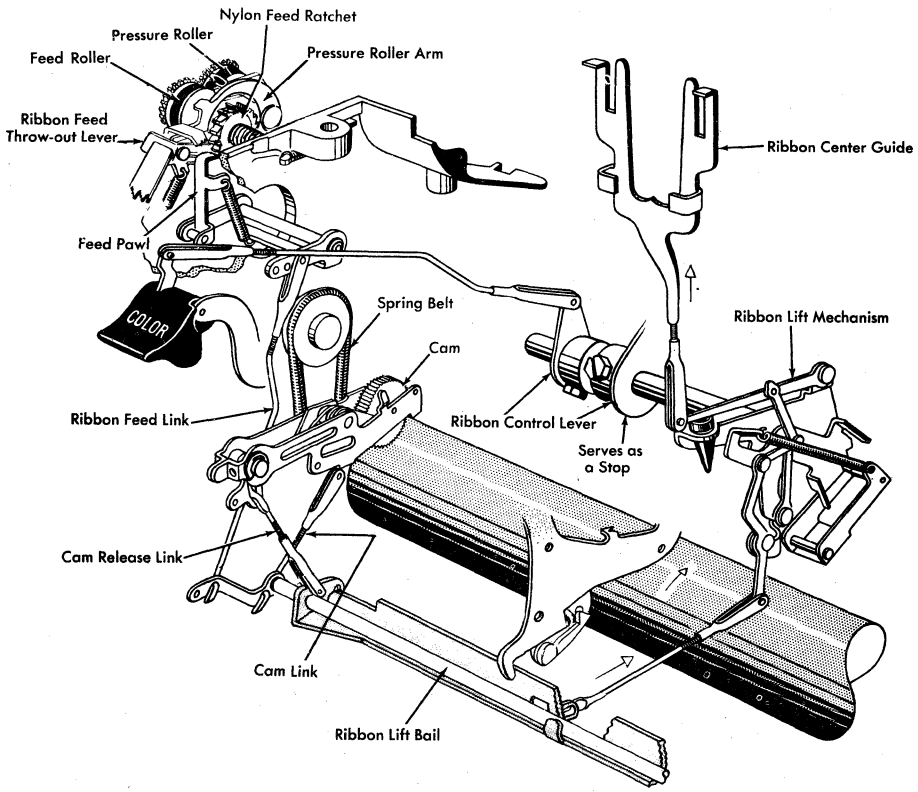

Figure 73. Carbon Ribbon Mechanism

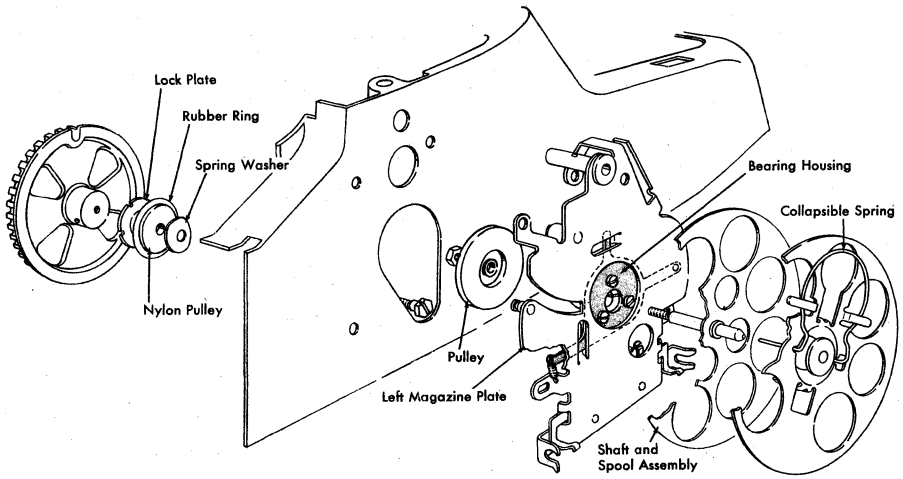

Figure 74. Ribbon Take-up Mechanism

After the ribbon leaves the feed and pressure rollers, it is rewound on a large take-up spool which is mounted on the left magazine plate. The take-up spool is driven by a spring belt which is powered by a nylon rewind pulley fastened to the power roll pulley. The rewind pulley supplies constant tension to the take-up spool by slipping against the spring belt when the machine is idling, and ribbon is not feeding. When the ribbon is fed, the spring belt uses the rotation of the rewind pulley to drive the take-up spool.

Escapement wheels are available with tooth sizes for 6 2/5, 8, 9, 10, 12 and 14 pitch machines. The pitch number is stamped on the side of the escapement wheel.

The pressure roller latches when it is pushed to the rear (Fig. 73). This allows the operator to move easily thread the ribbon through the guide loop and rollers. The operator then pushes down on the latch and releases it so that the geared rollers re-engage and hold the ribbon in a feeding position. The outer half of the take-up spool is attached to the inner half by a collapsible spring that hooks behind the inner spool when not compressed.

On machines above serial number 581357, a noiseless style of carbon ribbon rewind has been installed (Fig. 74). The bearing housing of the take-up spool is attached to the left hand magazine plate under spring tension, in a manner permitting vertical movement of the bearing in the magazine plate. A large steel pulley, attached to the shaft and spool assembly, runs directly on a rubber tire pulley mounted by a hex-headed screw to the power roll pulley.

This rotates the take-up spool in a direction opposite to that of previous take-up spools. Variable tension may be obtained through adjustment of the hex-headed screw in the power roll pulley against a spring washer. The lock plate maintains this adjustment after it is set. The removable outside spool flange and the collapsible spring have been changed to permit winding the ribbon in a circular (rather than elliptical), form on the take-up spool.

Machines may use either fabric ribbon or carbon paper ribbon by utilizing a combination ribbon lift guide and both types of corner guides. The operator must remove one ribbon from the guides and thread the other one when wishing to change from one ribbon to the other.