IBM

ELECTRIC PUNCHED CARD ACCOUNTING MACHINES

CUSTOMER ENGINEERING MANUAL OF INSTRUCTION

INTERPRETERS

Types 550, 551 and 552

INTERNATIONAL BUSINESS MACHINES CORPORATION
NEW YORK, NEW YORK

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ACCOUNTING MACHINES

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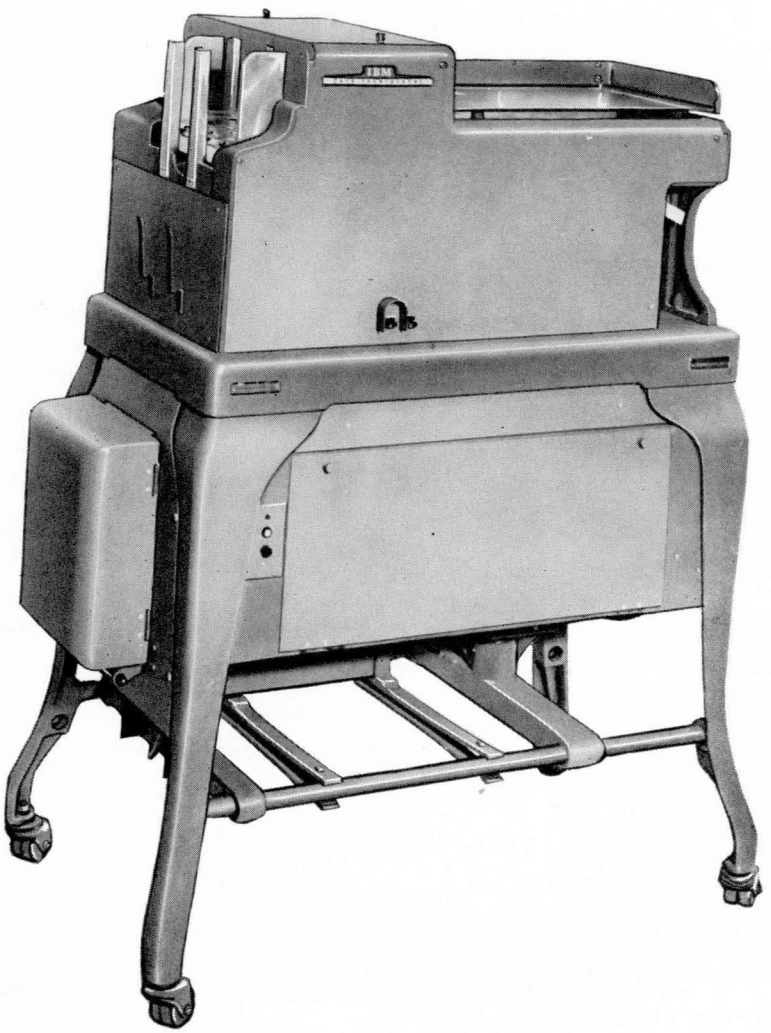


AUTOMATIC INTERPRETER

Type 550-551

AUTOMATIC INTERPRETER

Type 550

FUNCTIONAL PRINCIPLES

THE IBM CARD, which is the operating unit of the IBM Accounting Method, carries all of the necessary information concerning a single transaction. All forms of business require that each and every transaction be recorded. At the completion of a business period, all of these single transactions are grouped and compiled into a completed report.

During the time the business period is in progress, many office people have to refer to many individual transactions that are taking place. The problem of instructing many people to read the IBM numerical punched code can be eliminated by interpreting the cards on the Type 550 Automatic Interpreter. Trained and untrained IBM Accounting Machine operators can readily read the interpreted data across the top of the card. Figure 1 illustrates an interpreted IBM card form.

BASIC FUNCTIONS

THE IBM AUTOMATIC INTERPRETER, Type 550, is a machine used to translate numerical data punched in an IBM card into printed figures across the top edge of the card. Forty-five columns of interpreted data constitute the full printing capacity of the machine, but any forty-five columns, or any number of columns up to and including forty-five, may be selected and printed. Each of the forty-five printing positions contains a numerical character for each punching position of the card, plus a mechanical zero and a blank position. A 12-hole in the card will print a 12, an 11 or X-hole in the card will print an 11, and a 0-hole in the card will print a 10 or 0. By means of the control panel each printing position can be controlled to print the figures 0 through 9 plus the 10, 11 and 12 characters, or just the 0 through 9 figures.

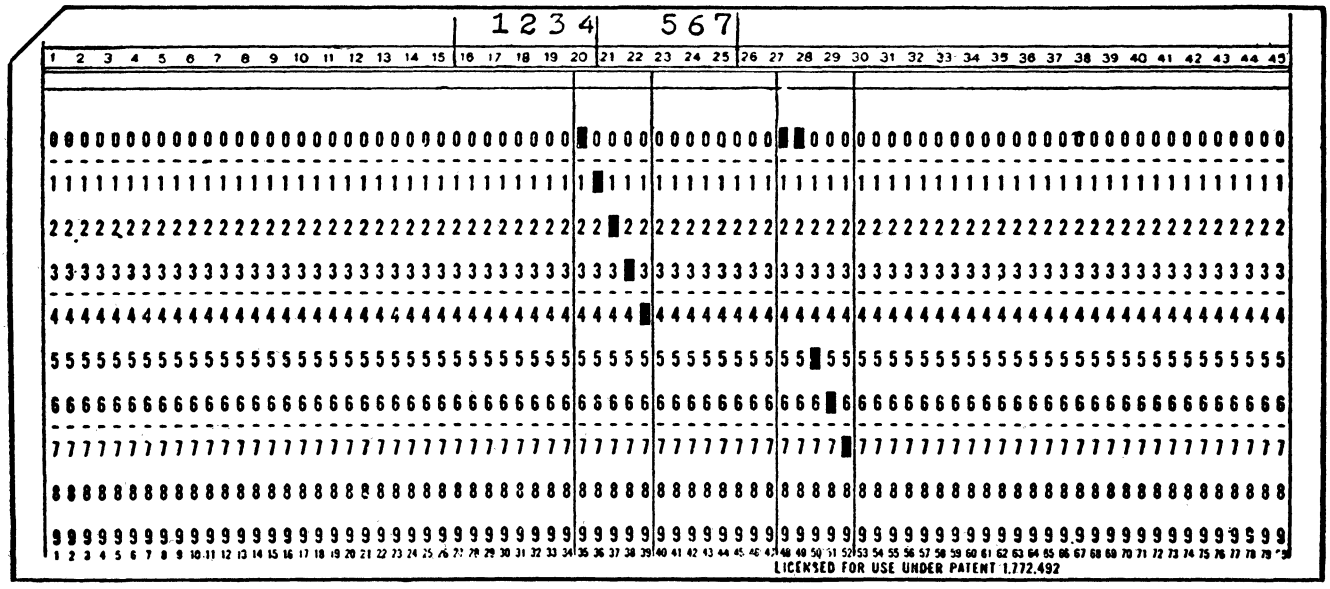


Figure 1. Interpreted IBM Card Form

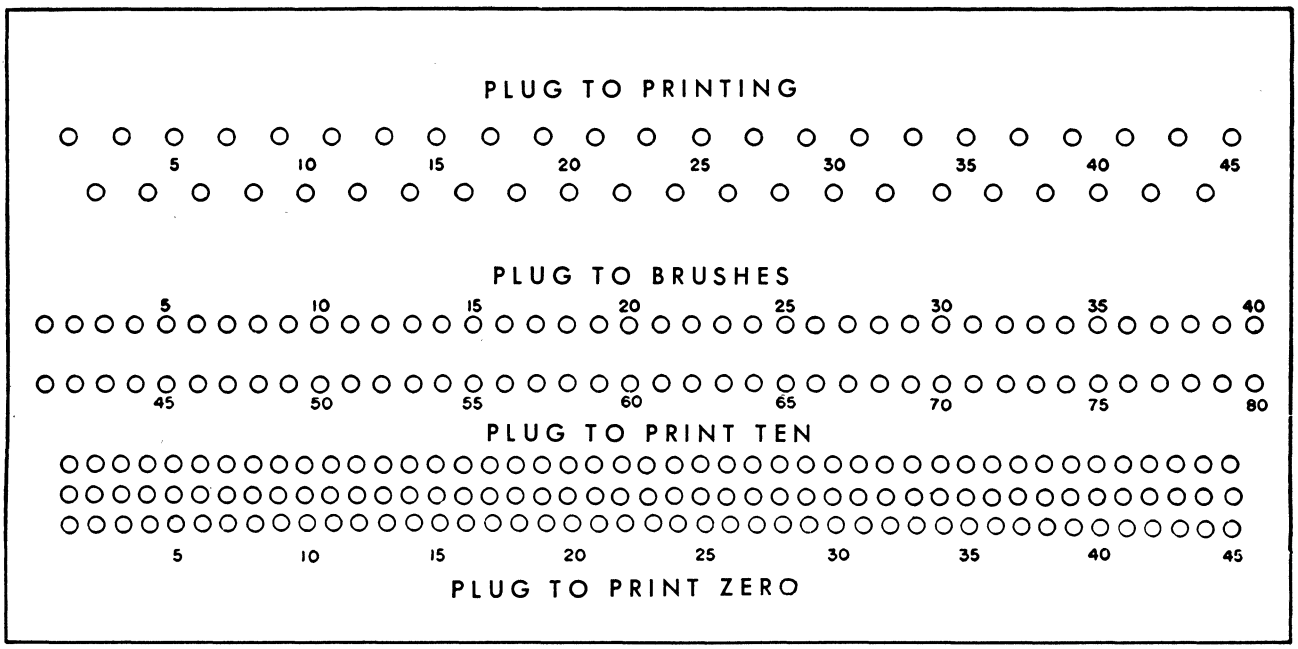


Figure 2A. Standard Type Control Panel (Type 550-551)

FEATURES

Power Requirements, Dimensions

The Type 550 Automatic Interpreter is available for operation from any standard voltage supply source. All machines operating on an AC supply voltage are equipped with a transformer and rectifier that provides 115V, DC power for internal circuit operation; machines supplied with DC external line power other than 115V, DC are equipped with a dynamotor for the same reason. This machine is mechanically driven by a 1/4 hp motor.

The following table gives the current requirements, weight and dimensions for the Type 550 machine.

Line Voltage	*Running Current*
115V — 60 cycle	5.0 amps
115V — DC	3.9 amps
230V — 60 cycle	2.5 amps
230V — 50 cycle	3.0 amps
230V — DC	2.8 amps

Weight: 640 lbs. packed for shipment
470 lbs. unpacked
Dimensions: Length – 37″, Width – 22″,
Height – 47″

Switches, Controls

There are three switches and control keys located on the front of the Type 550 machine: the main line switch that controls the input line power to the machine, and the machine start and stop keys. When

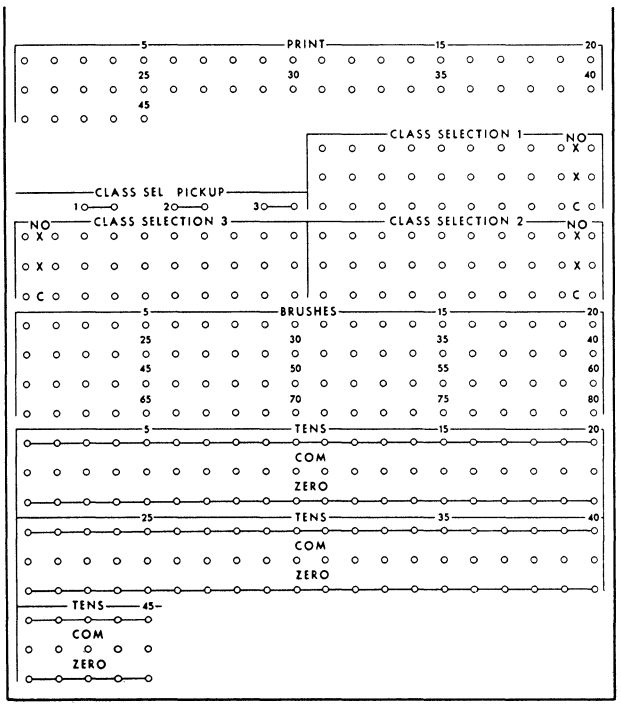


Figure 2B. Automatic Type Control Panel

the main line switch is ON and the start key depressed, the drive motor will operate the machine. When cards are feeding correctly the machine will run continuously. The machine may be stopped at any time by depressing the stop key. This machine will not stop when the card stacker becomes full of interpreted cards.

On the right end of the machine is located a handwheel which enables the operator and customer engineer to operate the machine by hand.

Located under the glass cover and in the approximate center of the machine are 45 short and 2 long zero-suppression levers that are used to control the printing of mechanical zeros to the right of interpreted significant digits. The operation of this unit will be explained under *Zero Suppression.*

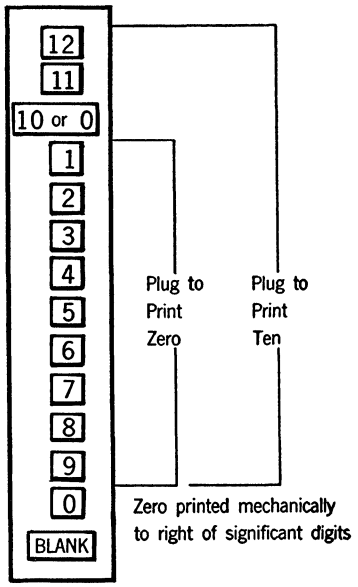


Figure 3. Type Bar Printing Positions (Type 550-551)

Card Feeding

The control panel for the Type 550 Automatic Interpreter is of the *fixed type* and is located in the lower front panel of the machine. The machine can also be supplied with a single-panel, automatic-type control panel. The panel provides a means whereby the operator may select the card columns and the printing positions required to perform various interpreting operations. Figures 2A and 2B illustrate the two types of control panel used on the Type 550 machine. Note that the functions of the control panel hubs can be divided into three groups:

1. Plug to Printing (Print). Forty-five receiving impulse hubs internally wired to the forty-five print magnets. Usually wired to *plug to brushes* hubs.

2. Plug to Brushes (Brushes). Eighty emitting impulse hubs internally wired to the eighty reading brushes. Usually wired to *plug to print* hubs.

3. Plug to Ten, Common, Plug to Zero (Ten, Common, Zero). Forty-five groups of three hubs, one for each printing position. These hubs are used to control the printing of zeros and special characters.

Figure 3 illustrates a single type-bar printing position. When numeric printing of a type-bar is required, the jackplug is inserted between the common and plug-to-print-zero hubs. When these hubs are wired, the type-bar will not be set up by a 12, X, or 0-punch in the card. Zeros will be set up in the type-bar by a mechanical means; a series of zeros will print to the right of any interpreted significant digit unless controlled by the zero-suppression levers.

When the jackplug is inserted in the common and plug-to-print-ten hubs, all of the card impulses (12 through 9) can be read and the type-bars will be set up to print 12, 11, 10, 9, 8, 7, 6, etc. If a zero is to be printed for a zero-punched hole in the card, a piece of zero type should replace the 10 type. Zeros will be printed electrically in exactly the same manner as significant digits. When double punches, such as X and 3, occur in the same column, the 3 will be interpreted only if the jackplug is wired to print zero.

Zero Suppression (Figure 4)

The printing unit of the Automatic Interpreter is composed of a single continuous bank of 45 type-bars. Because it is necessary to divide the printing into columnar fields, a device has been provided for preventing the printing of zeros to the right of interpreted amounts.

Next to the feed mechanism and under the glass cover is a series of 45 short levers and a columnar indicating strip corresponding to the 45 printing positions. These short levers are normally locked in the

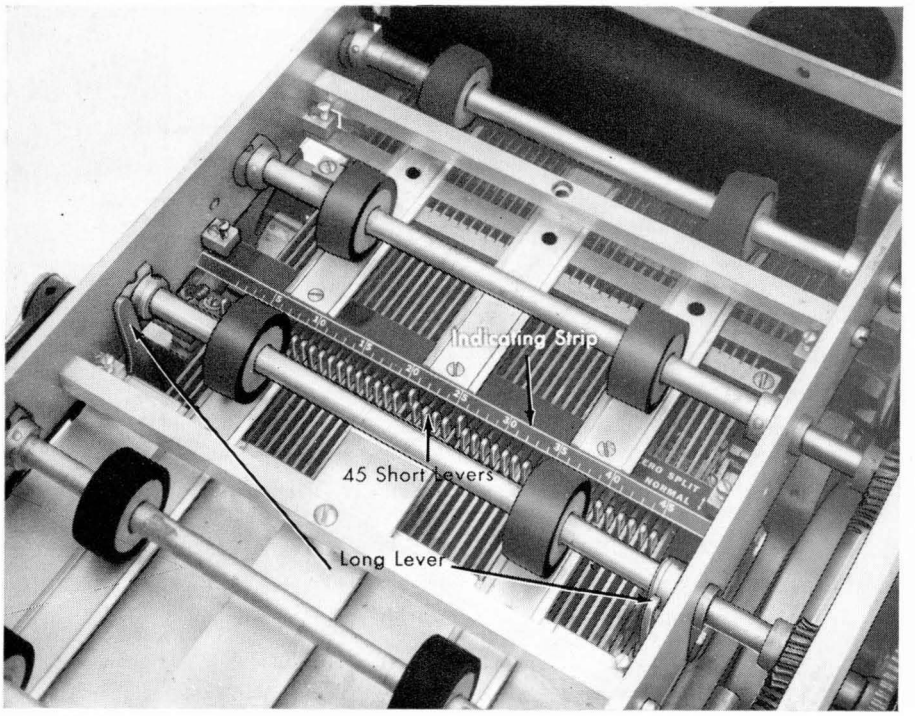


Figure 4. Zero Suppression

position to which they have been set by a mechanism controlled by either of the two long levers situated on the back and front rails.

If two fields on a card (positions 16 through 20 and positions 21 through 25, as shown in Figure 1) are to be printed, the locking mechanism should be set as follows: Press either of the long levers toward the stacker and then move the short levers in columns 21 and 26 towards the feed mechanism. All the other short levers should be away from the feed mechanism. The setting of the 21st lever prevents the printing of zeros to the right of position 20, up to the first significant digit interpreted to the right. Likewise, setting of the 26th lever prevents the printing of zeros to the right of the second field. Figure 4 illustrates the zero suppression lever settings for this operation.

Electrical Zeros (Figure 5)

When zeros are to be printed in a given position, regardless of whether or not a significant digit appears to the left, the printing may be accomplished by specifying a 0 in the type bar position corresponding to the 0 position in the card.

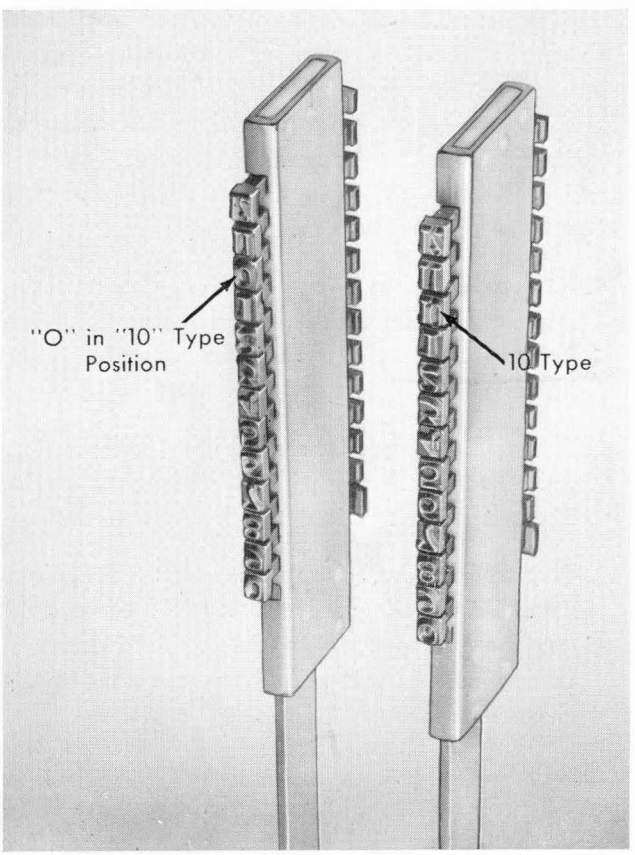


Figure 5. Electrical Zero Printing

THE LOCATION of the principle units of the Type 550 Automatic Interpreter is shown in Figures 6, 7 and 8. Figure 8 schematically illustrates how the mechanical power is transmitted from the drive-pulley to all of the units on the machine. This schematic illustration is intended to be used in conjunction with the machine photographs (Figures 6 and 7).

MECHANICAL POWER SUPPLY

A STUDY OF the means of transmitting the mechanical power from the 1/4 hp drive motor (Figure 7) to the various units should first be made. Starting at the drive motor, it will be seen that a V-belt will turn the drive pulley on the main drive-shaft. All of the mechanical power that is used in this machine to operate the various units is taken from two worm gears and a helical gear on the main cam-shaft (Figure 8). Let us analyze and determine the function and purpose of each of the three power take-off positions.

Looking at the rear of the machine along the main drive-shaft (Figure 8), it can be seen that two worm-gear power take-off positions are at the right of the drive pulley and the helical gear is to the left of the drive pulley. The two worm gears will be invisible on the machine because they are enclosed within the drive housing. The first worm gear to the right of

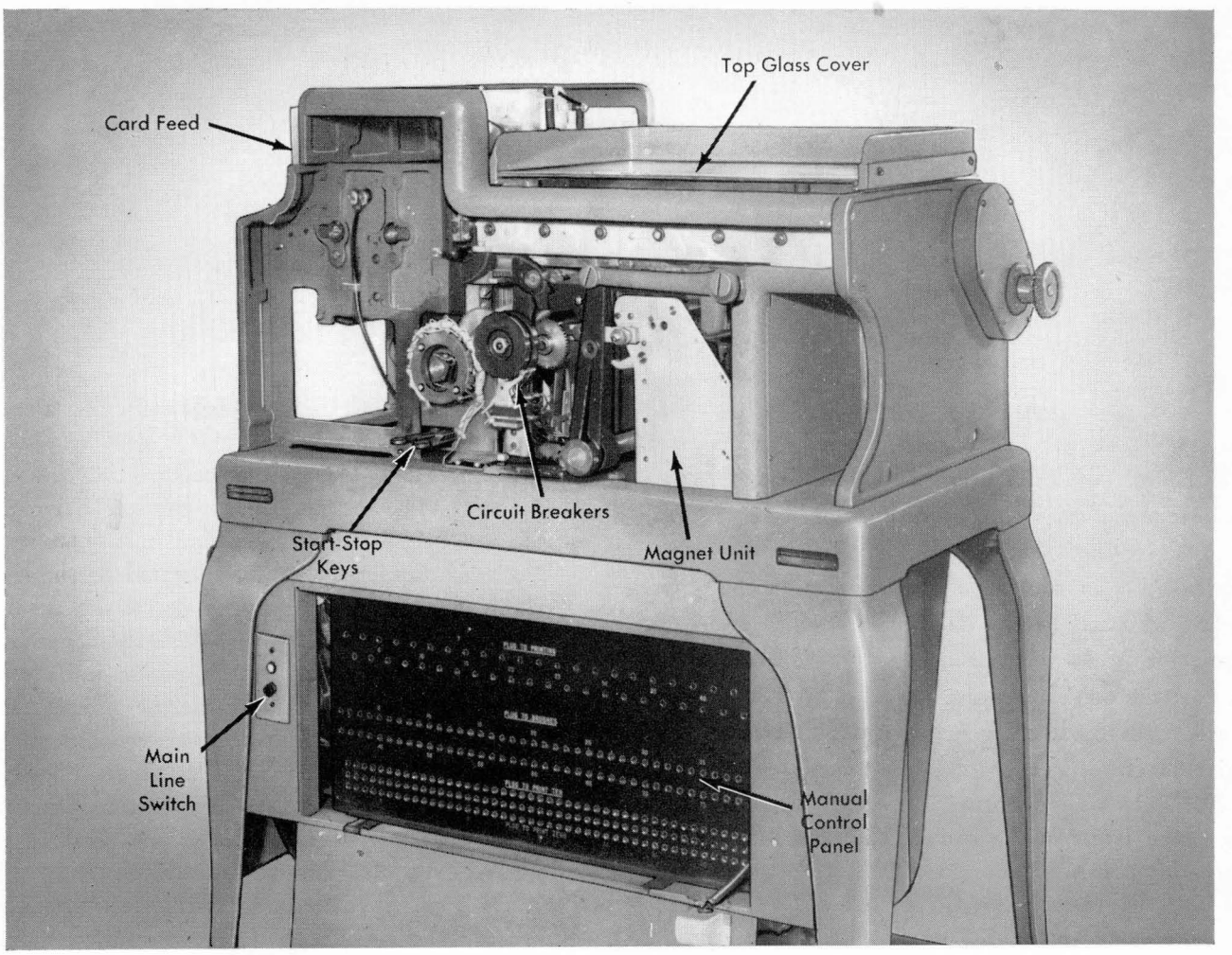


Figure 6. Type 550 — Front View

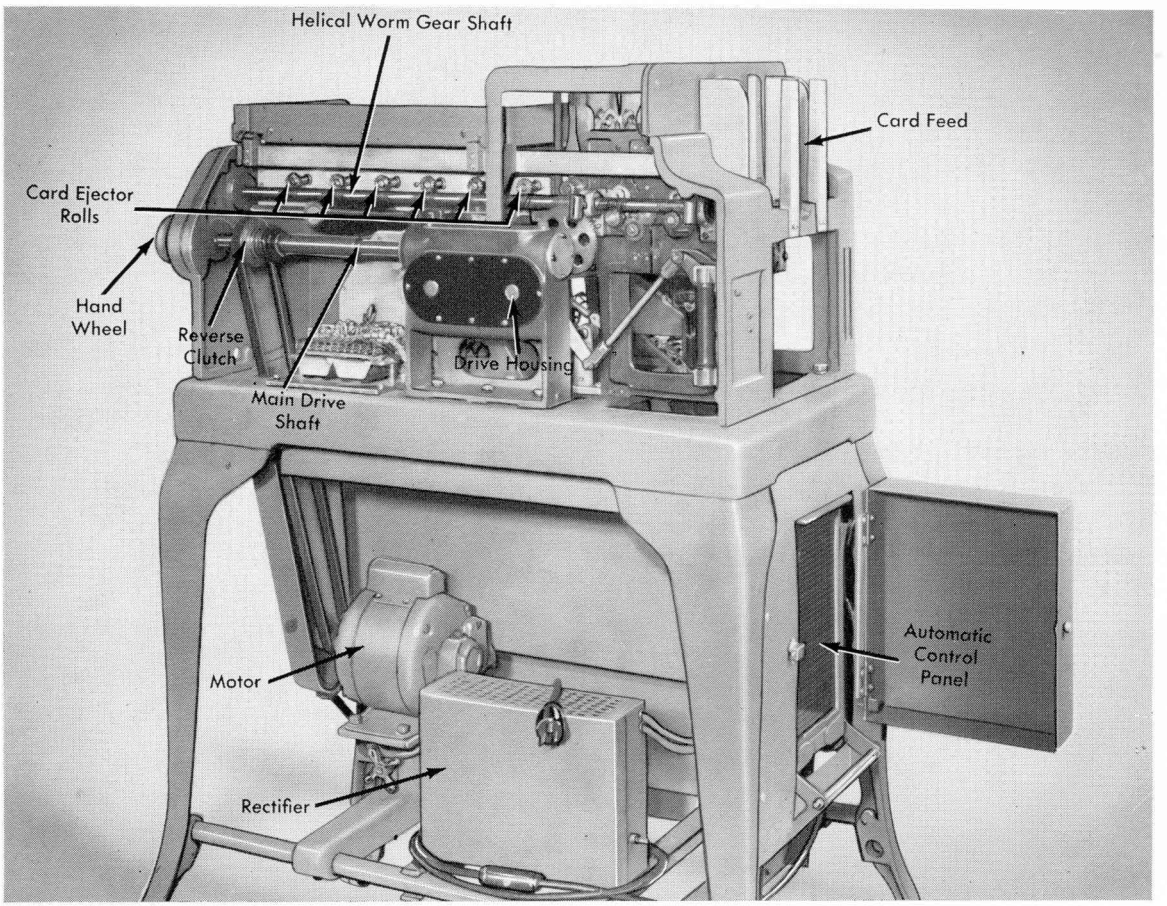


Figure 7. Type 550 — Rear View

the drive pulley operates the hammer cam shaft; the second worm gear drives the card-picker cam-shaft. The helical gear meshes with a second helical gear to drive the helical worm-gear shaft. Located on the main drive-shaft between the drive pulley and two worm gears in the drive housing is a ratchet-type, spring-operated, reverse clutch. This will prevent any damage to the drive housing or its driven mechanism in case the drive pulley is accidentally turned backward. NOTE: The drive pulley is free on the main drive-shaft.

Located on the hammer cam-shaft, which extends from the front to the rear of the machine, are five operating cams. The first cam, nearest the drive housing, is the crosshead-cam which operates the crosshead and the type-bars. The second cam is the knockoff cam that operates the restoring of the magnet unit. The third cam is the hammer cam which operates the hammer bail and the individual hammers. The fourth and fifth cams are fiber cams that operate the electrical cam contacts (motor cam and zero-cam contacts). On the front end of the hammer-cam shaft is located the circuit-breaker drive-gear that drives the circuit-breaker cam-unit.

The card-picker cam-shaft is located to the right of the hammer-cam shaft and is driven by a worm gear within the drive housing. Directly behind the drive-housing and pinned to the picker-knife cam-shaft is the card-picker cam. Note the outer surface of this internally cut cam serves as the machine index. Also pinned to the picker-knife shaft and located inside the drive-housing is the intermittent drive-gear.

Inside the drive housing and to the right of the card-picker cam-shaft is the intermittent gear (inner). This gear is pinned on the intermittent drive-gear shaft and meshes with the intermittent drive gear. These two intermittent drive-gears provide intermittent mechanical motion to the intermittent feed-roll.

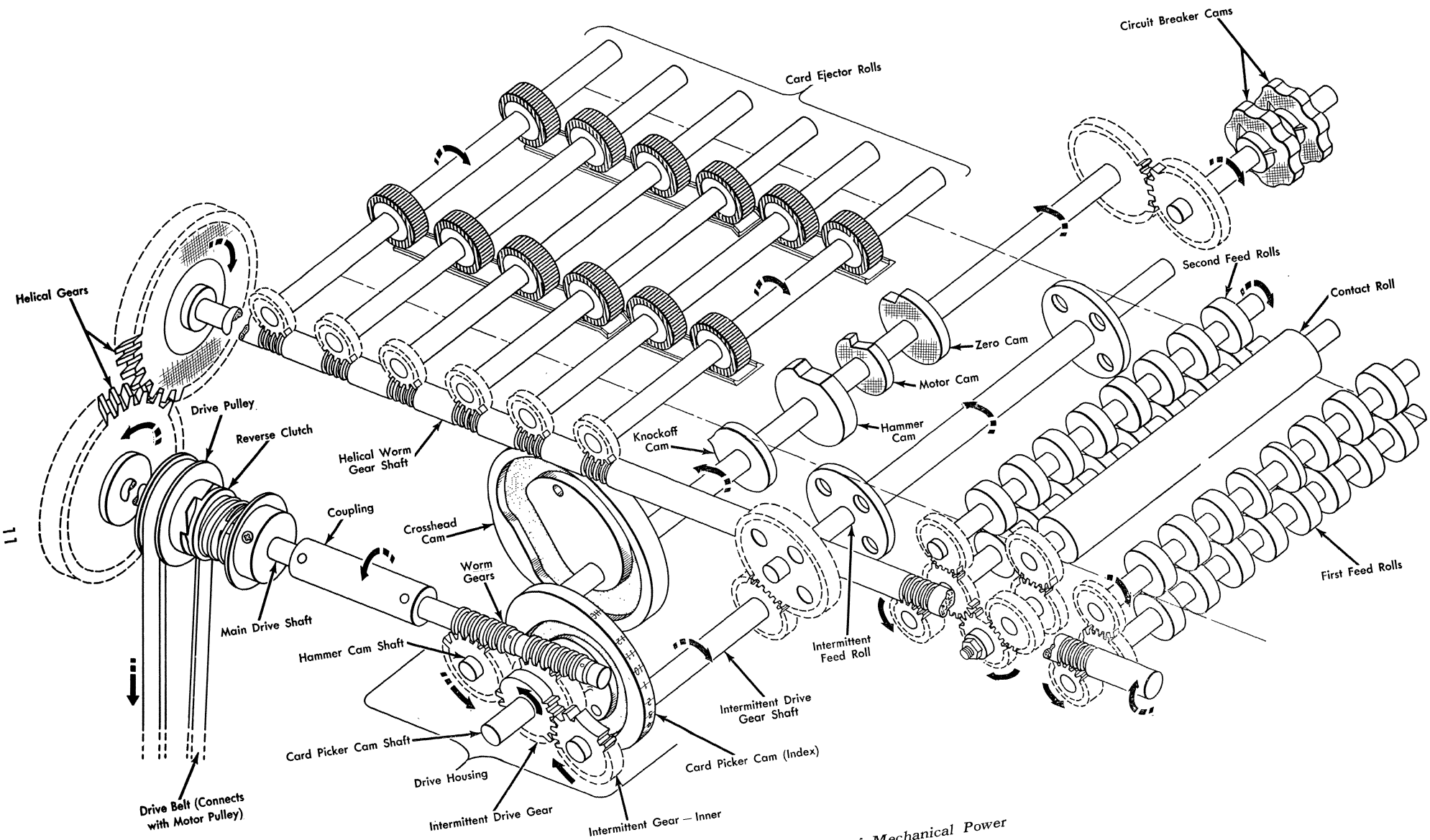


Figure 8. Type 550-551, Schematic of Mechanical Power

The helical gear, on the main drive-shaft, meshes with a second helical gear to drive the helical worm-gear shaft. The principal purpose of the helical worm-gear shaft located on the rear of the machine (Figure 8) is to drive the six card-ejector rolls, the ribbon-feed mechanism, feed rolls number 1 and 2, and the contact roll. Note the helical worm-gear shaft is also under control of the reverse clutch.

MACHINE UNITS

Card Feed (Figure 9)

The card feed unit on the Type 550 Automatic Interpreter is very similar in appearance and function to the card feed unit of the Type 080 Horizontal Sorter. Cards are placed in the hopper face-down, 12-edge toward the throat. The reciprocating motion of the feed knives picks the bottom card from the deck and moves it to the first feed-rolls. This reciprocating motion is derived from the internally-cut card-picker cam, the bell-crank action of the cam follower, and the adjustable connecting linkage. Note in Figure 8 that the card-picker cam is driven at a constant rate of speed from the main drive-shaft through the intermittent-drive worm-wheel.

Index (Figure 9)

The outside perimeter of the internally-cut card-picker cam has marks scribed on it which function as the machine index. These markings are as follows: 12 and CC which coincide, 11, 10, 1, 2, 3, 4, 5, 6, 7, 8, 9, KC, IF and HC. The meanings and uses of these index markings are as follows:

12, 11, 10, 1, 2---8, 9. Numbers representing the different punching positions of the card.

CC — position for timing the crosshead cam.

KC — position for timing the knock-off cam.

IF — position for timing the intermittent feed.

HC — position for timing the hammer-cam.

The adjustment section of the reference manual gives the correct timing relationship for each of the timing marks. See Index, Type 551, page 29.

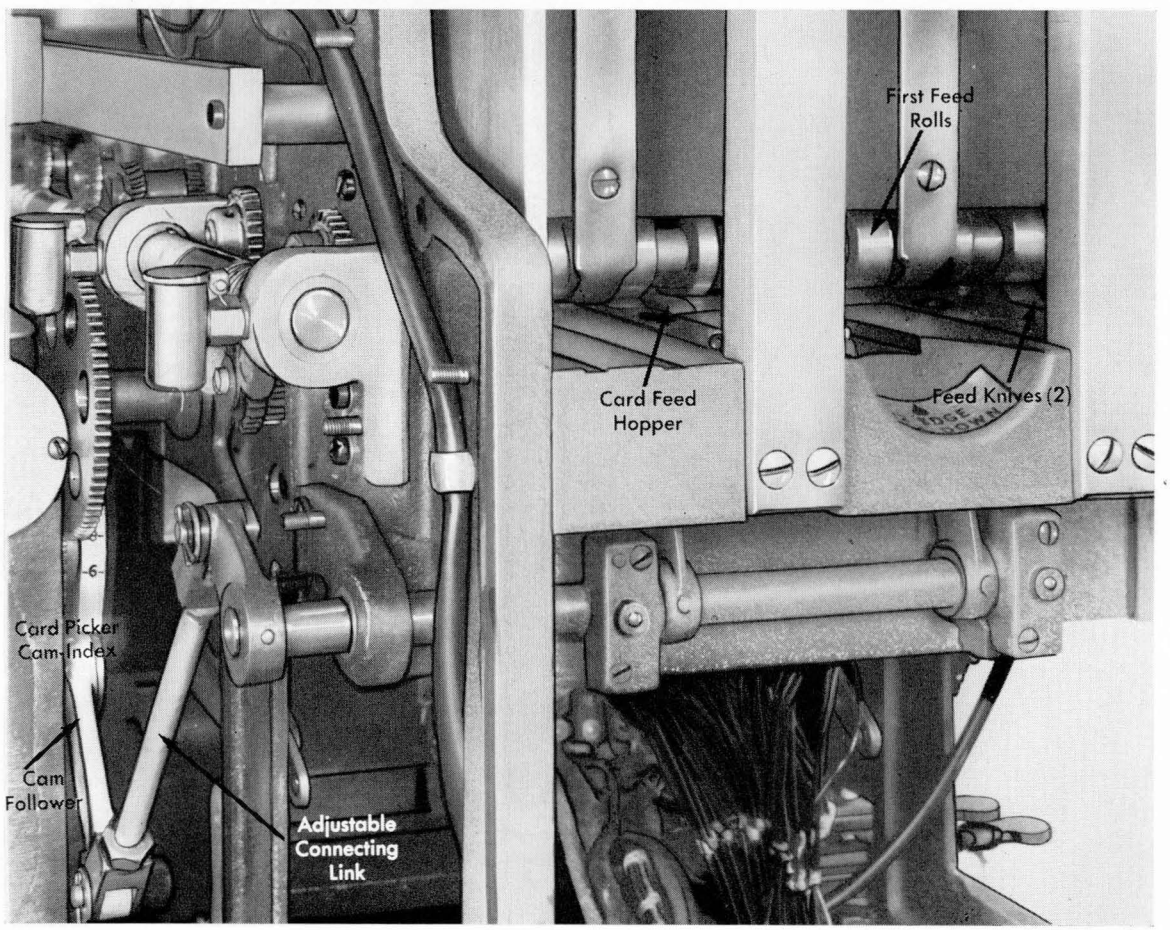


Figure 9. Card Feed Unit

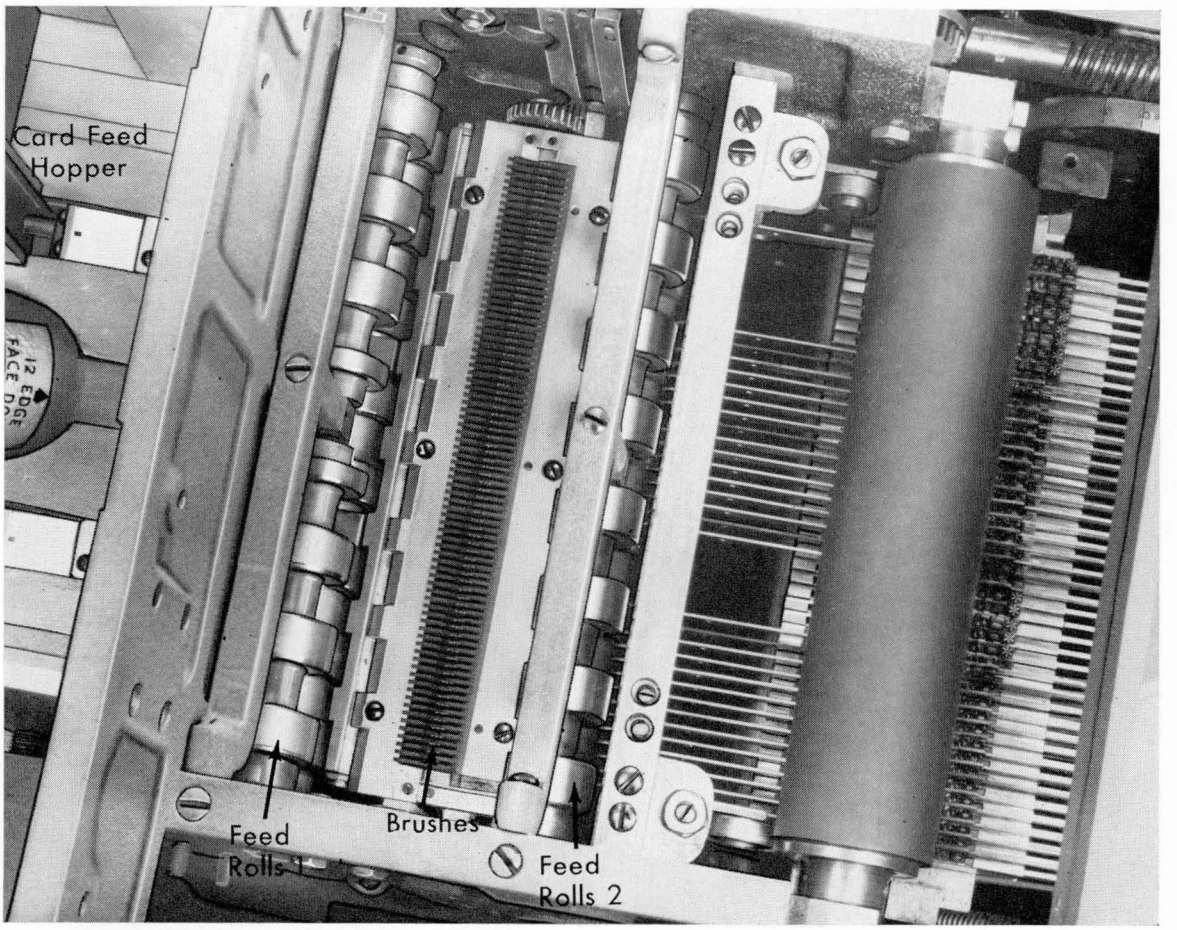


Figure 10. Number 1 and 2 Feed Rolls

Feed Rolls (Figure 10)

There are two sets of continuously-running steel feed-rolls located to the right of the card-feed hopper. The first set of feed rolls receives the card from the feed knives and moves it through the reading brushes to the second set of feed rolls. There have been several names given to the two sets of feed rolls, but for the sake of the discussion in this manual, term them first and second feed rolls, counting from left to right.

Located between the two sets of feed rolls are the 80 reading-brush and the contact-roll unit assemblies. Included in the contact-roll unit is the card-lever contact. The first pair of feed rolls moves the card through the brush reading-station to the second set of feed rolls which continues the card movement to the third set or intermittent feed-rolls.

The card moves at a constant rate of speed through the first and second sets of feed rolls to the intermittent feed-rolls. Note the first two sets of feed rolls are driven from the helical-gear worm-shaft.

Contact Roll and Brush Slide (Figure 11)

The brush reading-mechanism in the Type 550 Automatic Interpreter is made up of two separate units, the brush-slide assembly and the contact-roll-slide assembly. These two units are located between the first and second pairs of steel feed-rolls and extend between the front and rear side frames of the machine. Both units can readily be removed; the brush-slide can be removed from the bottom of the machine while the contact-roll slide can be removed from the top of the machine.

The brush-slide assembly is an 80-column brush unit, similar in design to the Type 513 Reproducing Punch brush-unit. The unit basically consists of a card guide or brush plate, an 80-column brush-holder with brushes and a brush-holder frame with two latching plungers. The two plungers latch in adjustable plates, located in the front and rear machine side frames, and position the brush-slide-unit card-guide in the card line between the first and second sets of feed rolls.

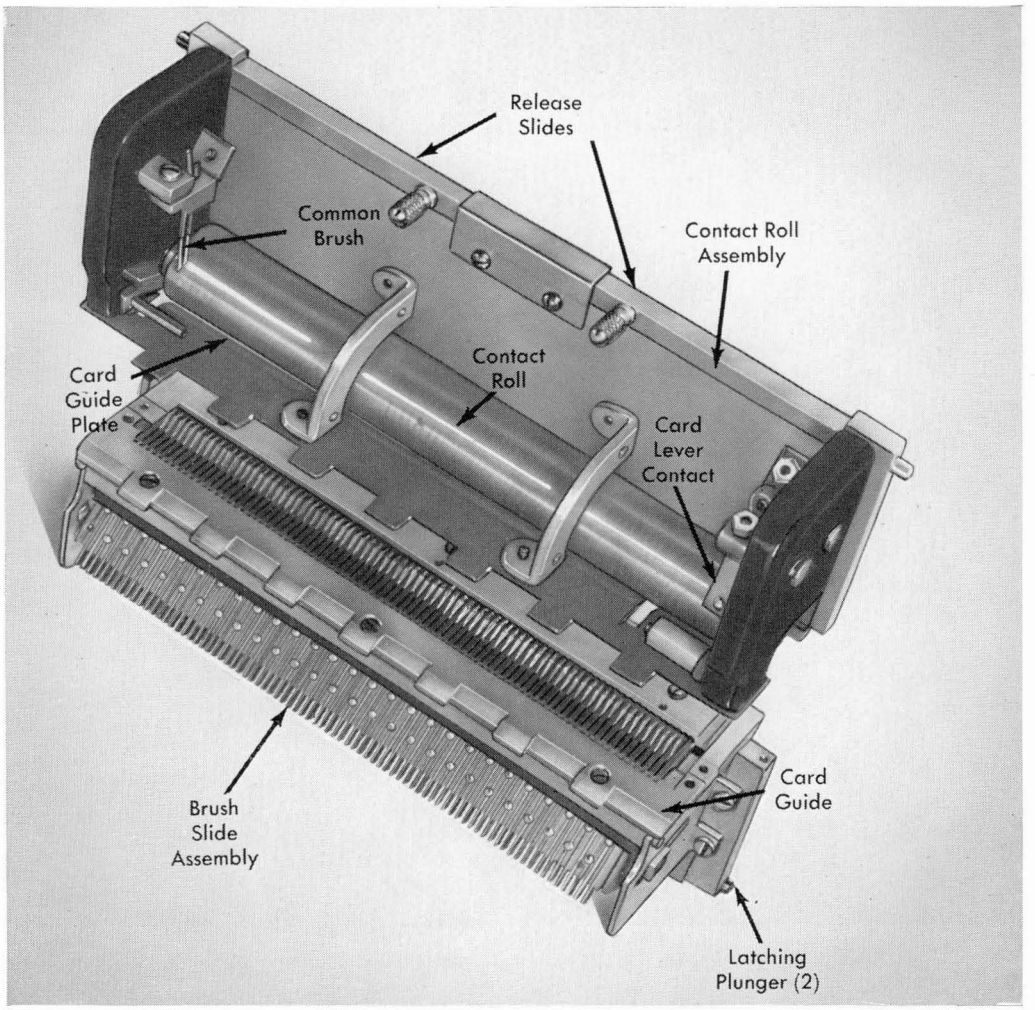


Figure 11. Contact Roll and Brush Slide (Type 550)

The contact-roll-slide assembly resembles to a great extent the contact-roll unit used in the Type 285 Electric Accounting Machine. This unit basically consists of a gear-driven contact-roll, a card lever and card-lever contact, two fiber card-guide plates and a contact-roll frame with two spring-operated release-slides.

These two units, brush-slide and contact-roll slide, function as a single unit and do all of the card reading. Two pairs of slide guides, located on the inside of the machine side-frames, are used to guide both units into their respective operating positions; the contact-roll slide will be positioned above the card line, the brush slide will be located below the card line. These slide guides also position the two units so that the center line of the contact roll will be in the correct relationship with the scribed line on the brush separators.

Circuit Breakers (Figure 12)

Two circuit breakers are located on the front of the Type 550 machine, supplying timed impulses to the contact roll for brush-reading purposes. The two circuit-breaker cams are driven through an idler gear from the hammer-cam shaft. Note the circuit breaker cams make two complete revolutions per machine cycle providing the machine with two sets of twelve brush-reading impulses. Only the first set of twelve impulses is used because the feeder circuit to the circuit breakers is under the control of the card-lever contact. The unit was designed in this manner for manufacturing reasons.

This illustration also shows the location of the digit emitter (optional device).

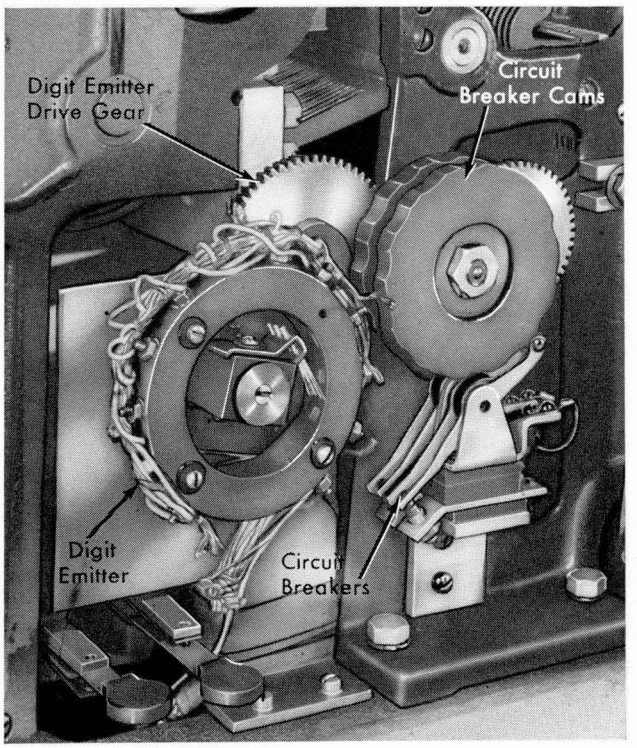


Figure 12. Circuit Breakers

Drive Housing (Figure 13)

The drive housing on the Type 550 machine is mounted on top of the base on the rear of the machine. This unit receives its mechanical power from the main drive-shaft. The unit consists of two worm gears, their worm wheels and two intermittent gears. One of the worm gears and worm wheels drives the hammer-cam shaft, while the other worm gear and worm wheel drives the card-picker-cam shaft and the intermittent gears. The intermittent gears drive the intermittent-gear shaft and the intermittent-feed assembly. All gears in the sealed drive housing operate in a bath of heavy gear oil.

Intermittent Feed Roll (Figure 14)

The intermittent feed roll is located to the right of the second pair of continuously-running feed-rolls, in a position to pick up the card from the second feed rolls and move it to the printing station. The function of the intermittent feed roll is to move the card to printing position, stop the card during the printing operation, then continue the card movement to the card-ejector feed-rolls.

The intermittent-feed-roll assembly consists of an intermittent-feed-roll shaft extending between the side frames; located on this shaft are two large feed rolls. Operating in conjunction with the large feed rolls are individual, ball-bearing idler feed-rolls. The idler feed-rolls are held in position by individual adjustable bracket assemblies, which provide a means of applying adequate and even feed-roll tension.

Intermittent-Feed-Roll Drive-Gears (Figures 14 and 15)

The two intermittent gears, the intermittent-gear shaft, and the outer intermittent gear comprise the intermittent-feed-roll drive-mechanism. The intermittent gears and shaft are located within the drive housing while the outer intermittent gear is outside the drive housing to mesh with the intermittent-feed-roll gear. The principal parts that accomplish the intermittent movement are the two intermittent gears which are constructed with a section of conventional gear teeth and a section minus the gear teeth.

The two intermittent drive gears operate together as illustrated in Figures 15A, B and C. Figure 15A illustrates the two gears in a position where the intermittent drive gear is driving the intermittent

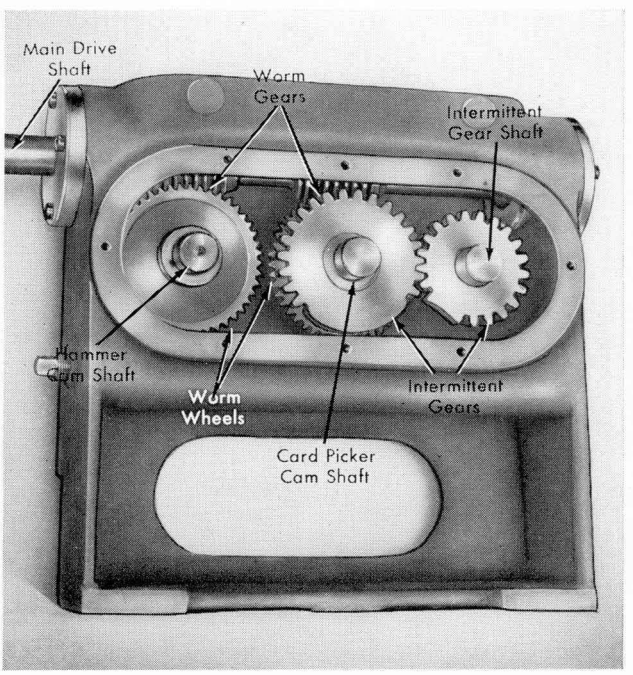


Figure 13. Drive Housing — Type 550

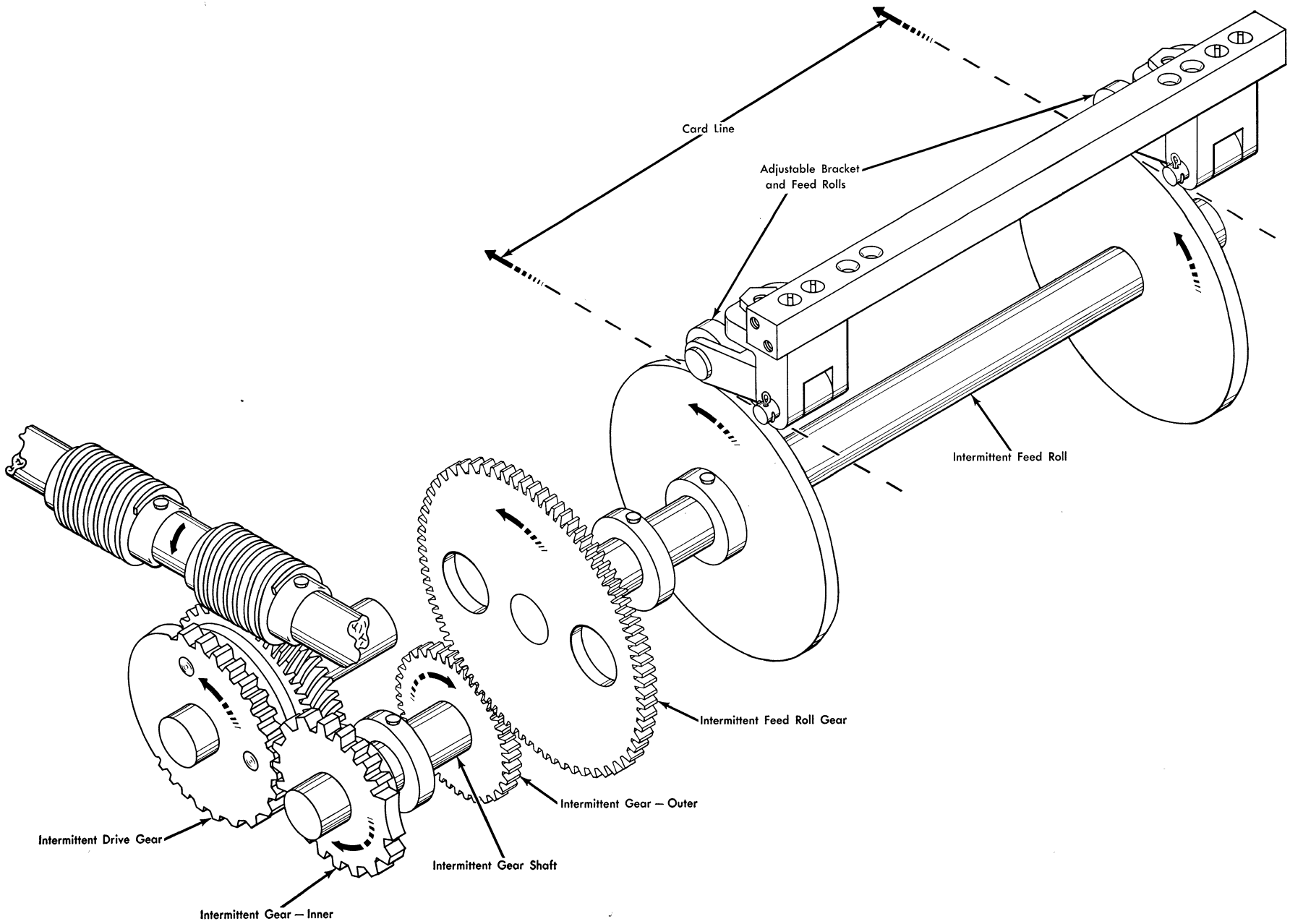


Figure 14. Intermittent Feed Rolls and Drive Mechanism

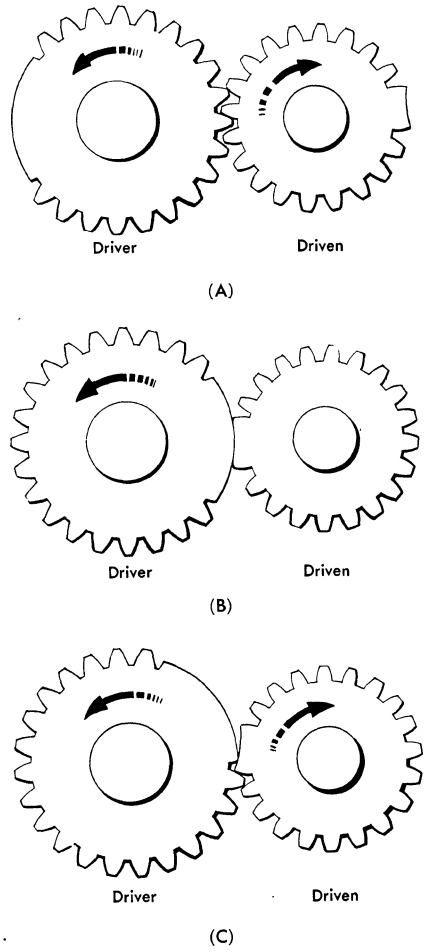


Figure 15. Intermittent Feed Roll Drive Gears

driven gear; Figure 15B illustrates the drive gear at the completion of the driving motion to the driven gear; Figure 15C illustrates the position of the drive gear where motion of the driven gear will just start. Note in Figure 15B, that when the driven gear is stationary, the toothless section of the two intermittent gears forms a lock to hold the driven gear in a fixed position.

Each of the intermittent gears has 19 active teeth. The intermittent drive gear has 19 conventional teeth while the driven gear has 18 conventional teeth plus the leading edge of the toothless or lock section, making 19 active teeth. This results in a 1:1 gear ratio between the card-picker-cam shaft and the intermittent gear shaft. Since the 1:1 gear ratio exists between the two gears, the intermittent action takes place on each revolution of the gears.

The two intermittent drive gears are not of the same diameter; the drive gear is approximately 1/2 inch larger than the driven gear. The drive gear therefore possesses a longer toothless circumference section than the driven gear. The circumference length of this section determines just how long the driven gear is stationary.

The intermittent movement, derived from the intermittent gears, drives the intermittent feed rolls with the same motion. The feed rolls move the card into the printing station, stop during printing time, then continue the card movement to the first rubber card-ejector-roll. See *Drive Housing, Type 551*, page 30.

Print Unit (Figure 16)

The printing mechanism in the Type 550 is located under the glass cover and consists basically of the following units:

1. 45 type-bars
2. Crosshead and type-bar operating mechanism
3. Zero-pawl assembly
4. Platen

Type Bar (Figure 17)

The Type 550 machine is equipped with 45 type bars, located side by side, and numbered 1 to 45 from the front to the rear of the machine. It has previously been stated that each type bar is capable of printing the numerical characters 0 through 9 plus the characters 10, 11 and 12.

The construction of the type bar can be broken down into two units: Type casing and bar. The type casing contains the 13 individual pieces of type plus a single piece of blank type. Each piece of type has an individual type spring to return and hold the type in a home position. Two different type springs are used: light-tension springs in the 13 printing positions and a heavy-tension spring in the blank position. The bar portion of the type bar is the long metal strip with 12 teeth and the step or foot in the center to operate in conjunction with the zero pawl. On the right-hand end of the bar is the type-bar pawl that operates in conjunction with the crosshead (Figure 17 insert).

The 45 type bars are positively driven left and right in a horizontal plane by the crosshead. When the type bar moves from the right to the left, it will be in synchronism with the card moving past the reading brushes, i. e., when the card is in a position for a reading brush to read a 5 hole, the type bar will be in a position to be stopped to print a 5

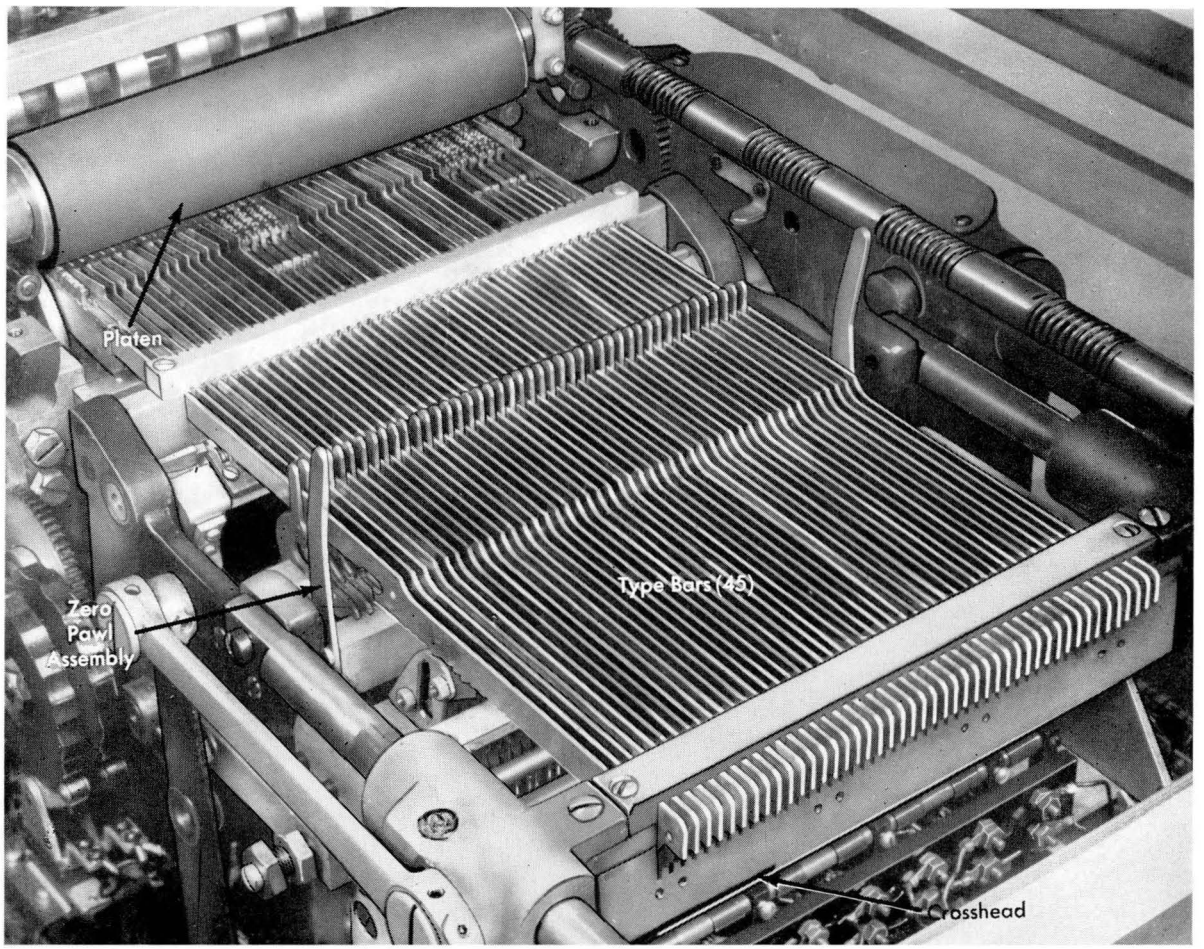


Figure 16. Print Unit

character. The left to right movement of the crosshead and type bars is the restoring action; removing the previous type-bar set-up to be ready for the next card reading cycle.

The 12 teeth in the type bar operate in conjunction with the stop pawl on the magnet unit, to stop the type bar to print any one of the following characters: 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2 and 1. There are several methods used to print a zero but the accepted method using the standard type bar as illustrated in Figure 17 will be explained first and the special cases later.

The assumption was made when the bar was designed that a blank column in the card; or the absence of an electrical impulse from the card would signify *nothing*. When this condition exists, it is sometimes required to print a zero and sometimes required to print nothing. Note in the illustration that the zero piece of type is between the 9 and blank type. The absence of an impulse from the card will fail to stop the type bar, resulting in the bar moving to the zero or the blank type position. The manual setting of the zero-pawl levers will determine the stopping position of the type bar, i. e., whether the bar will print zero or nothing. Refer to the *zero-pawl assembly* for the operation of this unit.

The wiring of the control panel has a direct effect upon the impulses that can be read by the reading brushes. If the control panel jack is wired *plug to print zero,* the reading brushes omit the 12, 11 and 0-impulses and read 1 through 9 only. In this case, the zero will be printed mechanically as described above. When the control panel jack is plugged *plug to print ten,* the reading brushes accept all the card impulses (12 through 9) and only a blank column in the card would permit a zero to print. If a zero hole is read by a reading brush, the type bar will be set up to print a 10.

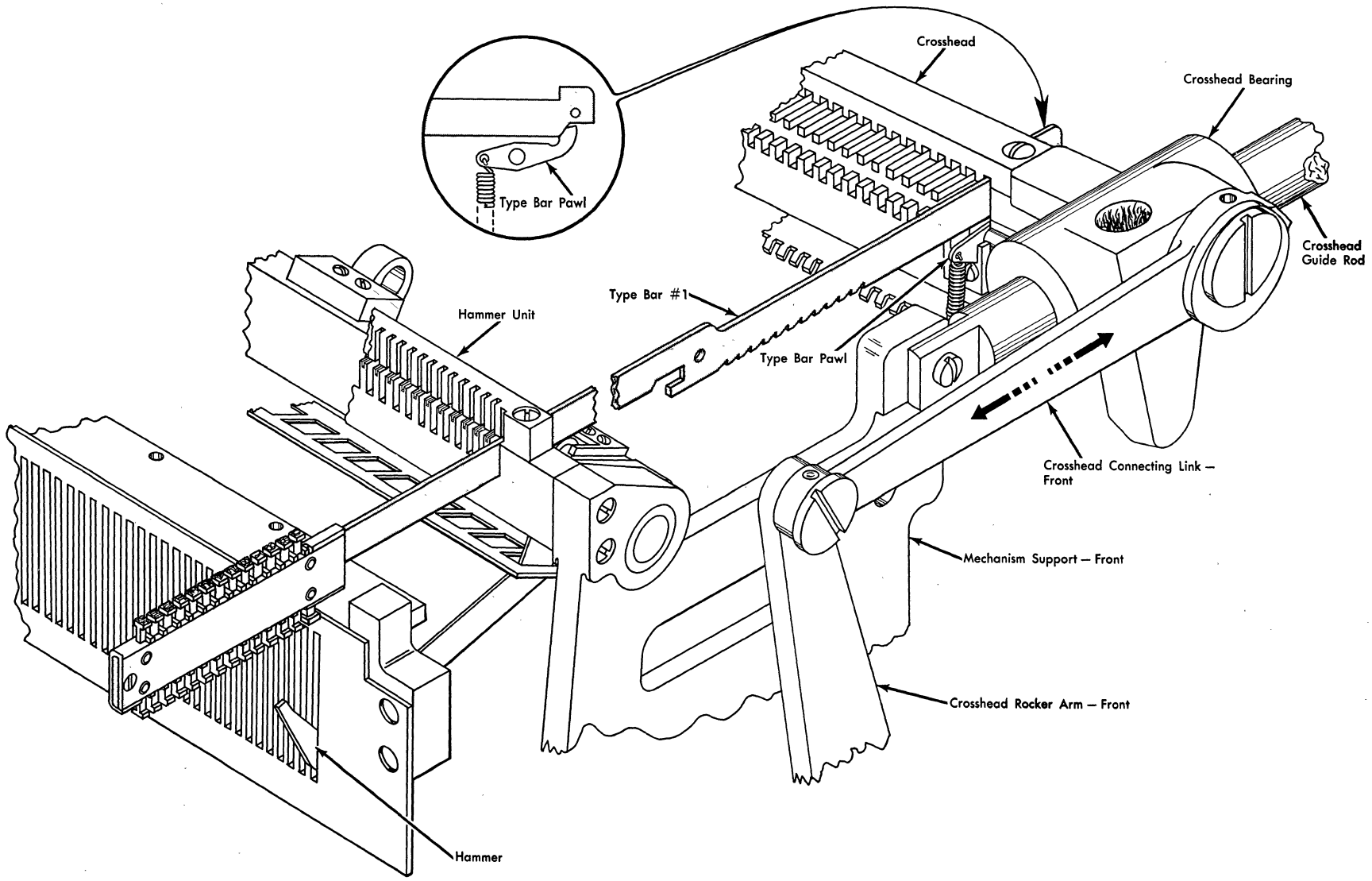


Figure 17. Type Bar and Print Unit Mechanism

It is common practice to remove the 10-type from the type-bar casing and replace it with a piece of zero type. This change permits an electrical zero set-up of the type bar. The absence of an electrical impulse to set up a type bar would then put the printing under the control of the zero-pawl levers. The lever could be set to print a mechanical zero or to print nothing.

Crosshead and Type-bar Operating Mechanism (Figures 16 and 17)

The crosshead and type-bar operating mechanisms are the units that convert the rotating motion of the crosshead cam to reciprocating motion of the type bars. The crosshead cam is located on the hammer-cam shaft which, in turn, is driven through a worm gear in the drive housing.

In the approximate middle of the machine and above the base are located the front and rear-mechanism support-assemblies. These two units function as their name implies: support the crosshead rocker-arm shaft assembly. The crosshead rocker-arm-cam roller operates in the internally-cut crosshead cam and is fastened to the rear rocker arm, thus causing a reciprocating motion to front and rear rocker arms. Both front and rear rocker arms are connected to their respective crosshead bearings by individual connecting links. The reciprocating motion of the rocker arms results in a reciprocating motion of the crosshead bearings on their respective crosshead guide-rods. The crosshead assembly is fastened to and extending between the front and rear crosshead bearings.

The crosshead assembly is the unit that conveys the reciprocating motion to the 45 type bars. When the crosshead is driven to the left, the type bars are moving in the *set-up* direction; when the crosshead and type bars move to the right, the type bar is restored. The crosshead and type bars make a complete cycle, to the left and to the right, once each card cycle.

When the crosshead and type bars are moving to the left, or in their set-up motion, the crosshead must perform two functions: (1) provide a sufficient driving force to each type bar to keep the type bars in correct relationship with the magnet-unit stop-pawls and, (2) allow any or all type bars to be stopped by their respective stop pawls. The construction of the type bars and crosshead makes this possible.

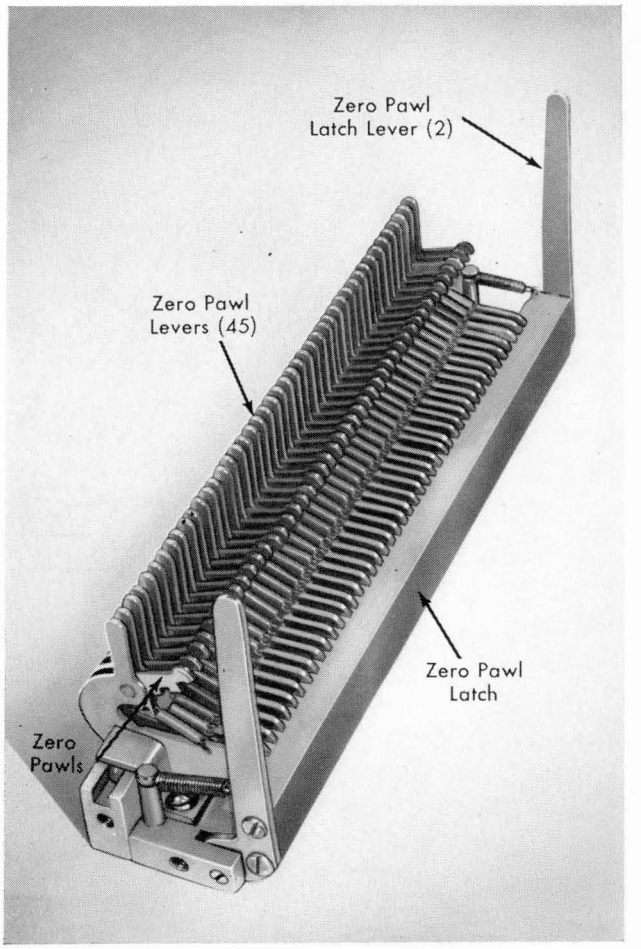


Figure 18. Zero Pawl Assembly

In the illustration of the type bar (Figure 17) note the step and foot construction on the right-hand end (Figure 17 insert). In each type bar position on the crosshead (Figure 17), a spring operated type-bar pawl is located so the foot of the pawl will operate against the step in the type bar. Sufficient spring tension is provided to the type-bar pawl to firmly hold the type bar and overcome type-bar friction. When the magnet-unit stop-pawl engages in a type-bar tooth and positively stops the movement of the type bar, the type-bar pawl will be cammed away and slide on the lower edge of the bar. The foot of the type-bar is used in the restoration action of the type bar. When the crosshead moves from left to right, the rear surface of the crosshead catches the type-bar foot and restores the bar to a normal position.

Zero-Pawl Assembly (Figure 18)

The printing unit of the Type 550 machine is composed of a single bank of 45 type bars. The zero-

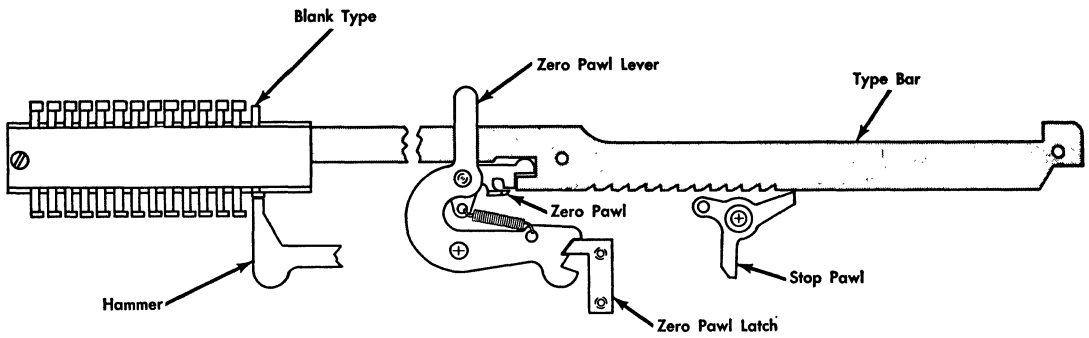


Figure 19. Type Bar Stopped by a Zero Pawl

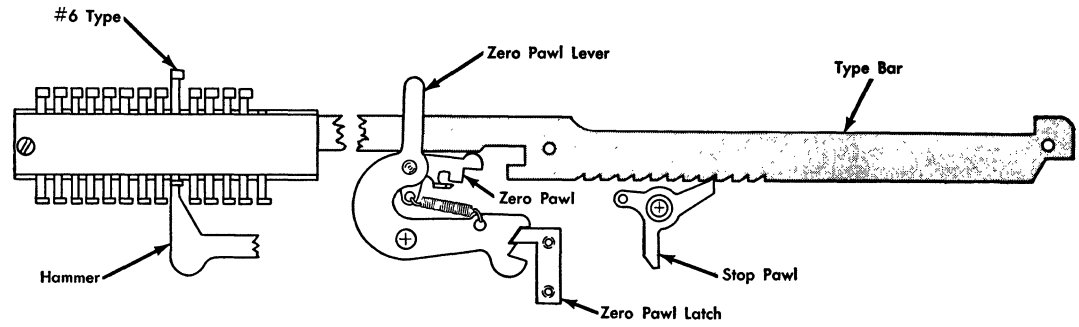


Figure 20. Type Bar Stopped by a Stop Pawl

pawl assembly operates in conjunction with the 45 type bars and provides a means whereby the type bars may be mechanically set up to print 0 (zeros) to the right of significant figures. Since it is necessary to divide the printing into columnar fields, the zero-pawl assembly provides a control of 0 (zero) printing to the right of significant figures within the columnar fields.

The zero-pawl assembly consists basically of 45 pawl levers, 45 zero pawls, a zero-pawl latch and a zero-pawl lever-support. The unit is located under the glass cover of the machine and in a position readily accessible for manual set-up. The 45 pawl levers can be individually locked in one of two positions; with the pawl lever to the right or away from the feed mechanism (this is considered the normal position) and with the pawl lever to the left or toward the feed mechanism. To change the position of any or all 45 pawl levers, hold either the front or rear zero-pawl latch-lever to the right (away from the feed mechanism), and move the pawl levers as required.

The zero pawl, attached to the pawl lever, controls the mechanism set-up of the type bars to print 0 (zeros) to the right of a significant figure. Observe the zero pawls (Figure 19) and note how they operate in conjunction with the type bars as well as their functional relationship to one another. Spring tension holds the heels of the zero pawls against the lower edge of the type bars. If a type bar is not stopped by a stop pawl, the bar will move all the way to the left and the heel of the zero pawl will drop into the U-cut of the type bar. This action positions the type bar so the hammer will strike the blank piece of type. If a type bar is stopped by a stop pawl (Figure 20), the heel of the zero pawl will be against the lower edge of the type bar, thus holding the zero pawl in a downward position as shown in the illustration.

Consider the action of the zero pawl when a type bar has been stopped by a stop pawl to print a significant figure. In this case the heel of the zero pawl would rest on the level section of the type bar (Figure 21 — Position No. 1). Note in the insert between positions 1 and 2 that zero pawl number 2 is held in the same relative position as a zero pawl number 1 by the toe of zero pawl number 2 extending under zero pawl number 1. Under this condition the flat end of the type bar, in position number 2, strikes the heel of number 2 zero pawl resulting in the type bar stopping in a position to print a mechanical zero.

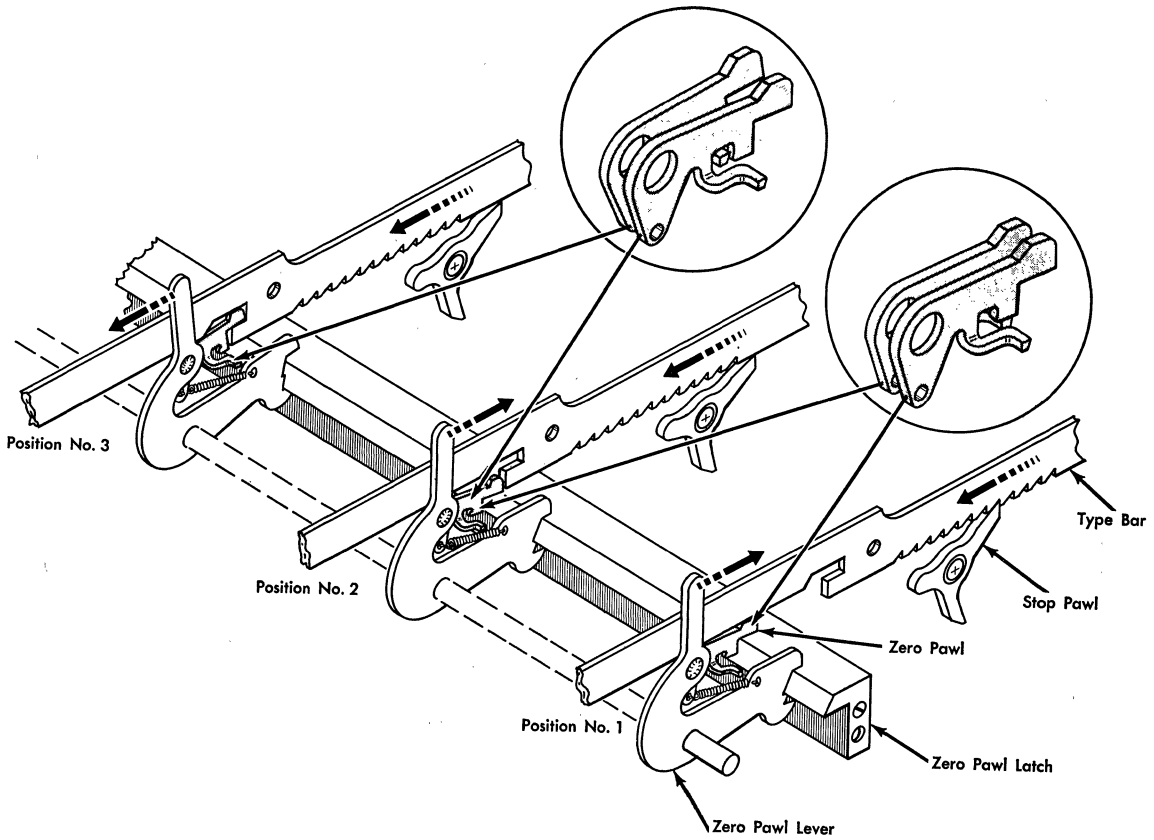


Figure 21. Zero Pawl Latch and Zero Pawl Lever

Result — a zero printed to the right of a significant figure. Consider that printing takes place when cards are face down; position number 1 will be the high order position.

The chain action of the zero pawls resulting in zeros printing to the right of significant figures, is an advantage within a given field of the card but a detriment when two or more adjacent fields are considered. It is undesirable to have a significant figure in one field cause zeros to be printed in an adjacent field. The chain action of the zero pawls can be stopped by releasing the pawl latch and moving the pawl lever in the highest order position of the field toward the feed mechanism (Figure 21 — position 3). When a pawl lever is moved toward the feed mechanism, its zero pawl will assume a new position and will not be affected by the zero pawl to the immediate left (Figure 21 — position 2). Position 2 illustrates a pawl lever and its zero pawl in the normal position. Position 3 illustrates a pawl lever that has been moved to the left. Note in the insert between positions 2 and 3 that the toe of zero pawl number 3 is not being held down by zero pawl number 2. In other words, by moving the pawl lever in position 3 to the left (toward the feed) the zero pawl chain action between positions 2 and 3 will be broken. The type bar in position 3 will move to the position where the hammer will strike the blank piece of type.

The zero pawl assembly makes it readily possible for an operator to set up the control for zero printing for any job the machine is required to perform.

When an electrical zero is used in an application, it must be considered as a significant figure and the pawl levers set accordingly.

Platen Roll Assembly (Figure 22)

The platen roll on the Type 550 machine is a rubber drum located on the right side of the feed unit and directly above the printing line of the type bars. This roll is free to rotate on two bearings and is positioned 1/8″ above the type face. Cards moving through the machine keep the roll in motion. The function of the platen roll is to provide a soft surface that will back up the card when the type face and ribbon are pressed against the front surface of the card.

Ribbon Unit (Figure 22)

The ribbon unit on the Type 550 machine is located on the right end of the feed unit and directly above the platen roll. The unit is of the ratchet-feed type, capable of reversing and feeding the ribbon in both directions.

The unit is driven by the helical-gear worm shaft through a worm-spur gear and an eccentric gear. The eccentric gear provides a reciprocating motion through a connecting linkage to the two ribbon-feed pawls. Only one of the ribbon-feed pawls will operate its ratchet wheel at any one time; one pawl feeds the ribbon in one direction while the other pawl feeds the ribbon in the opposite direction. The reversing mechanism selects which feed pawl will be active with its ratchet wheel by camming one or the other out of the operative position.

An approved ribbon for this machine must have the reversing rivets in both ends; the ribbon reversing process is dependent upon the presence of the rivets in the ribbon. When the moving ribbon completes its travel in one direction, the ribbon rivet and the kickover spring operate the overthrow lever. The transfer of the overthrow lever, in conjunction with the kick-over spring and connecting linkage raises the active ribbon-feed pawl to an inactive position and, at the same time, lowers the inactive feed pawl to an active position. This action results in the empty ribbon spool now being driven by the feed pawl causing the ribbon to travel in the opposite direction.

Magnet Unit (Figure 23)

The magnet unit on the Type 550 machine is located to the right of the center and directly below the type bars. This unit consists basically of 45 individual magnet-operated, mechanical stop-pawl and

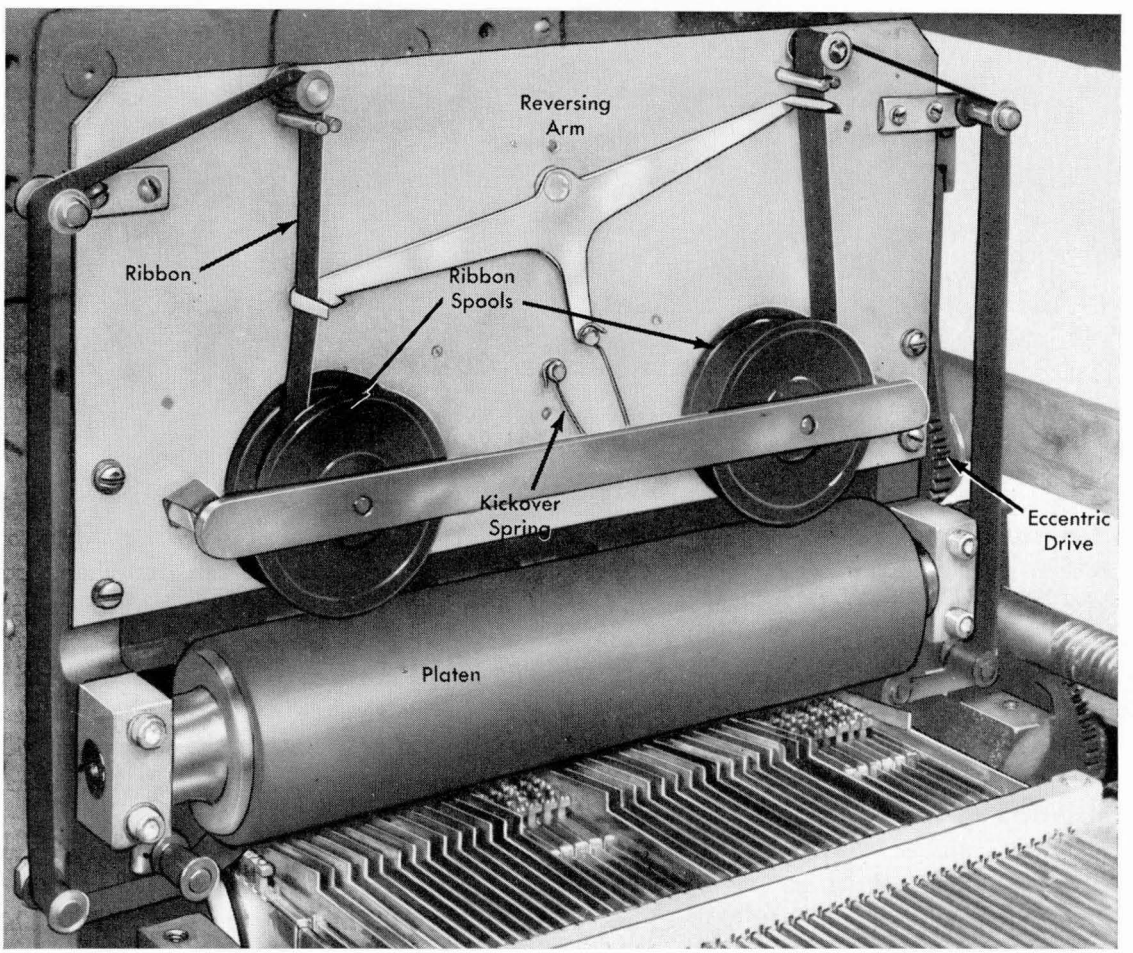


Figure 22. Platen and Ribbon Feed Mechanism

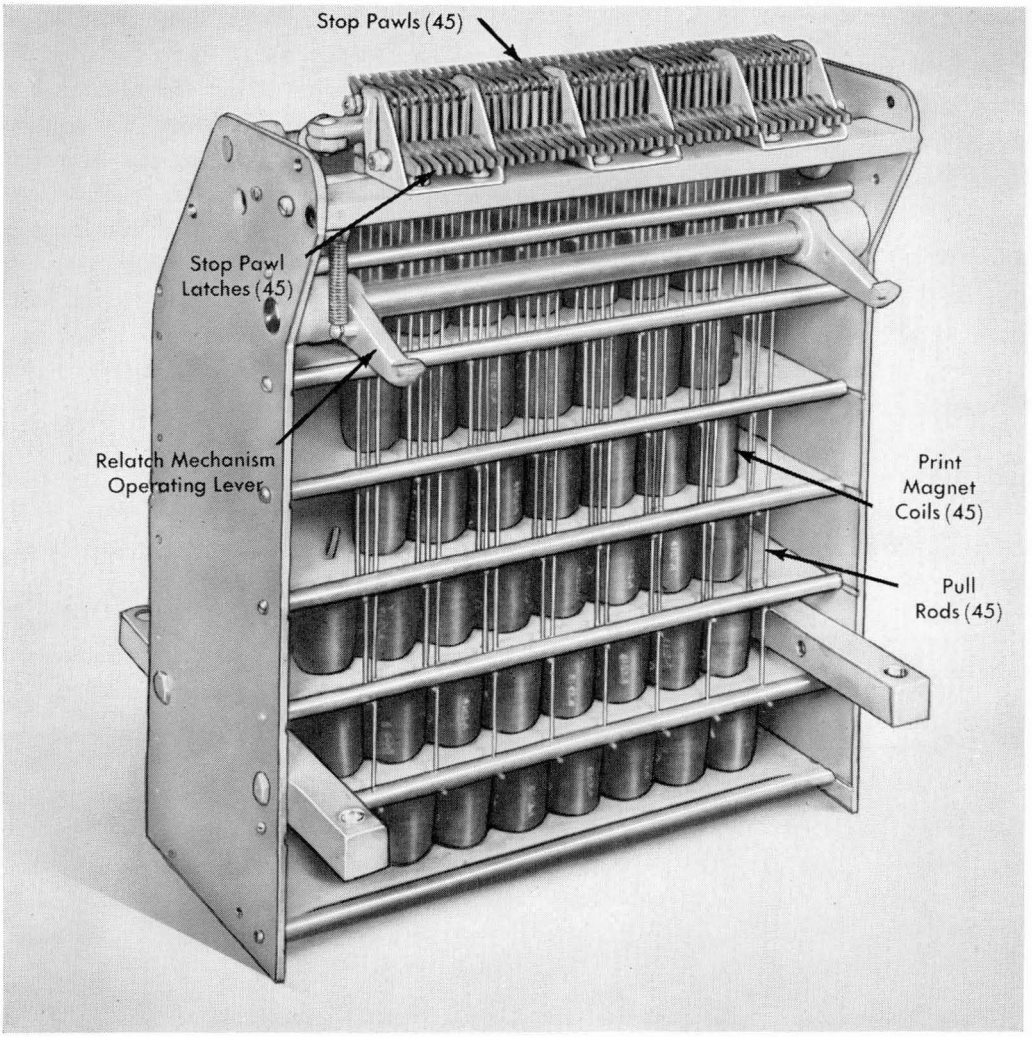


Figure 23. Type 550-551 Magnet Unit

latch assemblies, and a mechanical relatching device. Each magnet, stop-pawl latch and stop pawl operates mechanically and electrically as an individual unit.

The complete magnet unit is positioned on the machine base so the 45 stop pawls will be directly in line and .010″ to .015″ below the teeth of the 45 type bars. The electrical leads to the individual magnets are brought to the control panel where they may be readily connected to any one of the 80 reading brushes. The card impulses, read by the reading brushes, are used to energize the print magnets. An energized print-magnet will attract its armature and the pull rod and stop-pawl latch will trip the stop pawl allowing the pawl to engage in a type-bar tooth.

Mentally picture the type bars moving to the left in synchronism with the cards moving through the reading brushes. A direct relationship exists between punched holes in the card, the position of the individual type in the type bar and the teeth of the type bar; therefore when a punched hole in the card is read by a reading brush, the stop pawl will engage in the type-bar tooth stopping the bar in the selected printing position.

At the completion of the printing operation, a mechanical re-latching mechanism operates to restore the stop pawls on the stop-pawl latches. This mechanism is operated by the knock-off cam on the hammer-cam shaft. Two almost simultaneous operations

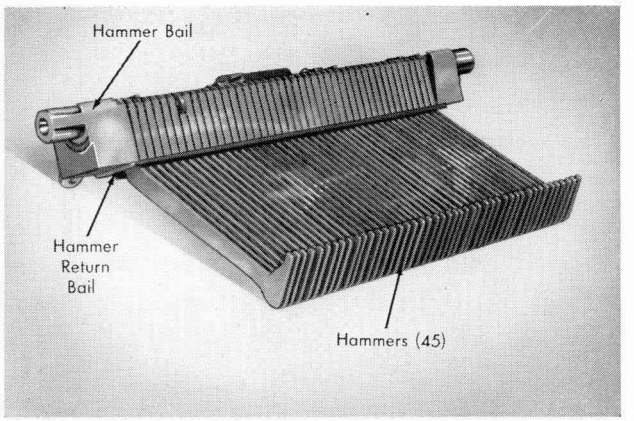


Figure 24. Hammer Unit

occur to restore the magnet unit to a normal condition. The knock-off bar operates against all 45 stop pawls, removing the pawls from the type-bar teeth, then, to assure positive latching of the stop pawls, a relatch bar operates against the stop-pawl latches restoring them to their normal position. The stop-pawl latches, being positively restored, will also remove the print magnet armatures from their magnet cores.

The print magnet unit is located on the base of the machine with adjustable mounting screws. The purpose of the adjusting screws is to provide a means whereby the magnet unit may be positioned to satisfy two conditions: the stop pawls should clear the type-bar teeth when latched by .010″ to .015″ and the stop pawls should stop the type bars so the center of the type face coincides with the center line of the platen.

Hammer Unit (Figures 17 and 24)

The hammer unit consists basically of 45 hammers, a hammer bail, 2 adjustable-tension hammer-bail springs, a hammer-return bail and guide combs. The unit is located under the type bars and to the immediate left of the zero pawl unit. The function of this unit is to fire the 45 type hammers at a specified

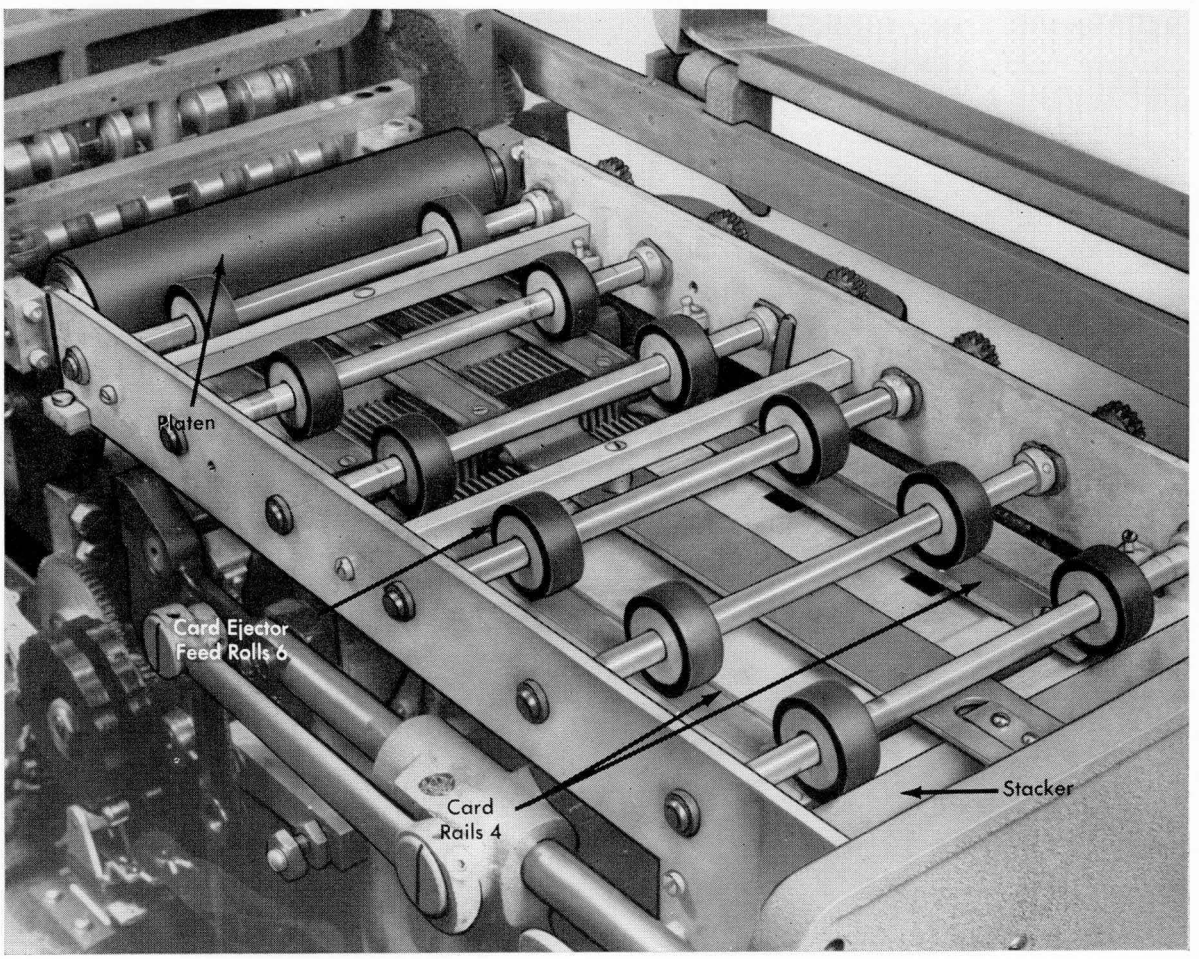


Figure 25. Card Ejector Roll Unit

time each card cycle so the characters, set up in the type bars may be printed on the card.

All of the mechanical energy used to operate the hammer unit originates at the hammer cam on the hammer-cam shaft and in the two hammer springs. The hammer cam provides the restoring motion to the hammers and hammer bail while the two hammer-bail springs provide the force to drive the hammers to the type tails.

The hammer-bail is fastened to the hammer-cam follower assembly which consists of a roller guide, a roller and a cam follower. As the hammer cam revolves, the hammer-cam roller raises the hammer-cam follower which in turn rotates the hammer bail in a counter clockwise direction (Figure 17). This action stretches the hammer-bail springs and positions the hammer-cam follower on top of the hammer-trip cam. As the hammer cam continues to rotate, the trip cam slips off the cam follower allowing the hammer-bail springs to exert their force to drive the hammer bail and hammers in a clockwise direction. This action throws the hammers against the type tails to cause the printing impression.

The hammer cam continues to rotate, repeating the restoring and firing of the hammers each card cycle.

Card Ejector Roll Unit (Figure 25)

The card-ejector roll unit is located immediately under the glass top of the machine and its purpose is to remove the printed card from the printing station and deliver it to the card stacker. This unit consists basically of six gear-driven rubber feed-rolls and four card rails mounted in two side frames. The feed rolls are driven by six worms cut in the helical-gear worm shaft. The intermittent feed rolls deliver the printed card to the first of six rubber feed-rolls.

The revolving rubber feed-rolls, working in conjunction with the card rails, move the card from the printing position to the card stacker. The adjustable card rails are positioned to allow the feed rolls to provide sufficient friction to slide the card over the card rails: CAUTION: too close a clearance between the feed roll and rail slide will mark the card and too wide a clearance will cause irregular or poor card feeding.

The card-ejector-roll unit may be removed from the machine as a complete unit without altering the card rail adjustments.

CHECK WRITING INTERPRETER

Type 551

The Type 551 Check Writing Interpreter resembles the Type 550 Automatic Interpreter in appearance, functional principles, mechanical principles and circuit operation. This section of the manual has been written with the understanding that the customer engineer has a thorough knowledge of the Type 550 machine and only the additions and differences between the two machines will be discussed. The functional and mechanical principles of the Type 550 machine can be found starting on page 5.

FUNCTIONAL PRINCIPLES

THE TYPE 551 Check Writing Interpreter was designed to print check amount on the face of the IBM Card Check (Figure 26). The machine may also be used to interpret numerical data on the face of the IBM card.

The added check-writing feature on the machine was made possible by a design change in two units: the type bar and the drive housing. The type bar was changed by removing the standard type characters and replacing with pin-point type characters. The drive housing was changed, giving the operator a control dial whereby any one of five horizontal printing lines can be selected (Figure 27).

FEATURES

THE TYPE 551 Check Writing Interpreter is capable of printing 45 card columns simultaneously if the machine is equipped with standard type bars. Special pin-point type for check writing requires type of double the width of the standard type. For every pin-point type bar installed in the machine, one standard type bar position will be sacrificed.

The special check-writing type bar is equipped with the ten numerical pin-point characters (0 through 9) and the option of a large pin-point asterisk in the blank position (Figure 28). The pin-point type char-

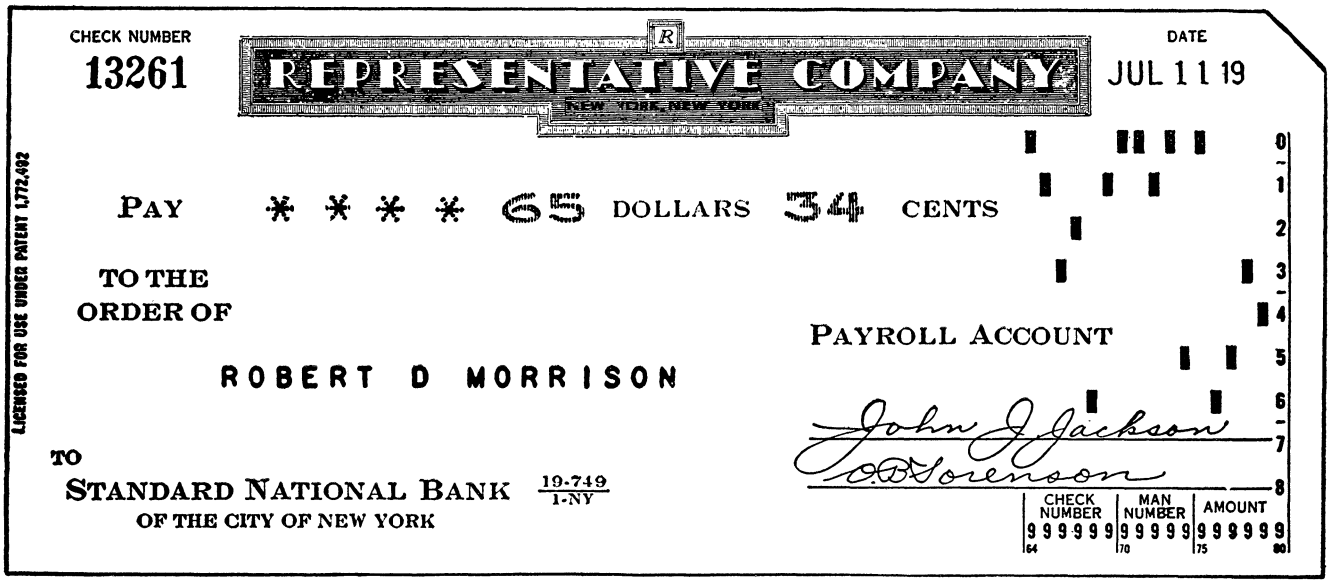


Figure 26. IBM Card Check

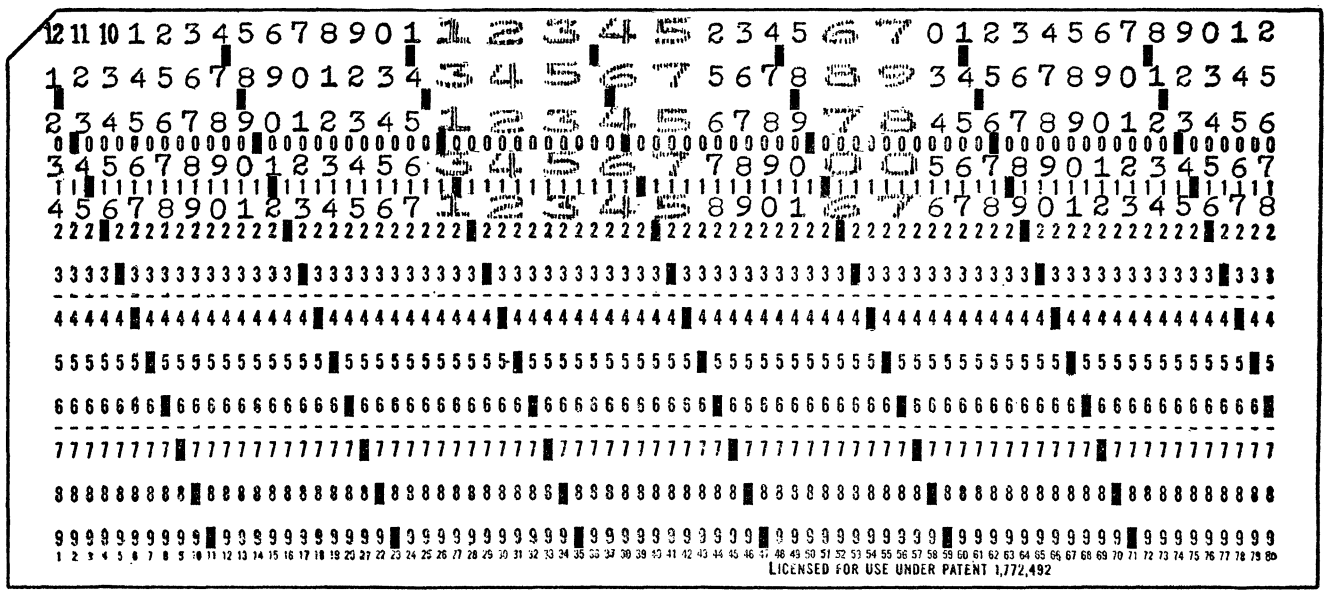


Figure 27. Five Printing Positions

acters are 5/16″ in width as compared to 5/32″ for standard type; both types of characters are 1/8″ in height. The pin-point asterisk type in the blank position of the type bar assures that every type bar in the amount field will print some character. Therefore asterisks will automatically print to the left of the first significant figure, thus properly filling the amount space on the face of the check. The check writing type bars can be arranged in the machine to meet the job requirements of the customer. All the remaining type bars are the same as used in the Type 550 machine.

Card feeding, control panel arrangement, switches, power requirements, dimensions and zero suppression are the same as for the Type 550 Interpreter. The speed of the Type 551 machine has been changed to 60 cards-per-minute.

The printing can be located in any one of five horizontal positions on the card as indicated in Figure 27. The first position is at the top of the card where it is visible for filing and general work and the lowest position is on a line 1 3/16″ from the top of the card, which is the check-writing position. Between these two printing lines are three additional horizontal printing positions located between the punching positions of the card. The desired printing line is controlled by the operator setting the printing-position control dial located on the back of the machine (Figure 29) in any one of five index numbers (1, 3, 5, 7 or 9). These index numbers represent the number of eighths of an inch from the top of the card at which the center of printing will appear.

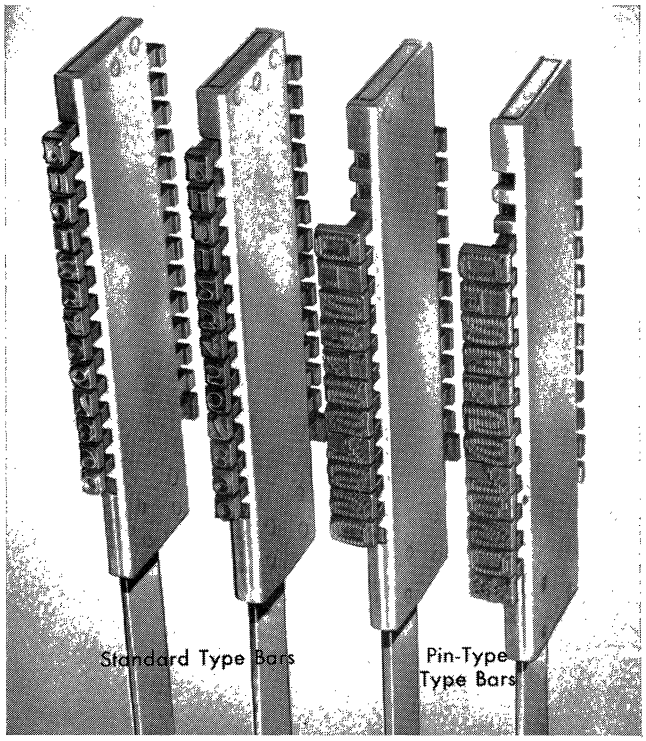


Figure 28. Pin-Type Type Bars

THE PRINCIPAL UNITS of the Type 551 Check Writing Interpreter are located in the same relative position as the comparable units of the Type 550 Automatic Interpreter. In fact, the two machines are almost identical in appearance.

This section of the manual will explain only the units in the machine that have been changed to accomplish the check-writing feature.

MACHINE UNITS

Index (Figure 30)

The Type 551 machine uses the same index as the one used in the Type 550 machine. It can be stated that there are two different Type 550-551 machine index dials now in operation. The two index dials appear identical but differ only in the distance between index markings. Older machines operate on 28 points-per-cycle while the newer machines operate on 32 points-per-cycle. One sure way to detect a 32 cycle-point machine is to check the crosshead cam (Figure 31). The outer circumference of a 32 cycle-point crosshead-cam is round while a 28 cycle-point crosshead-cam is oblong. *Do not use* the elec-

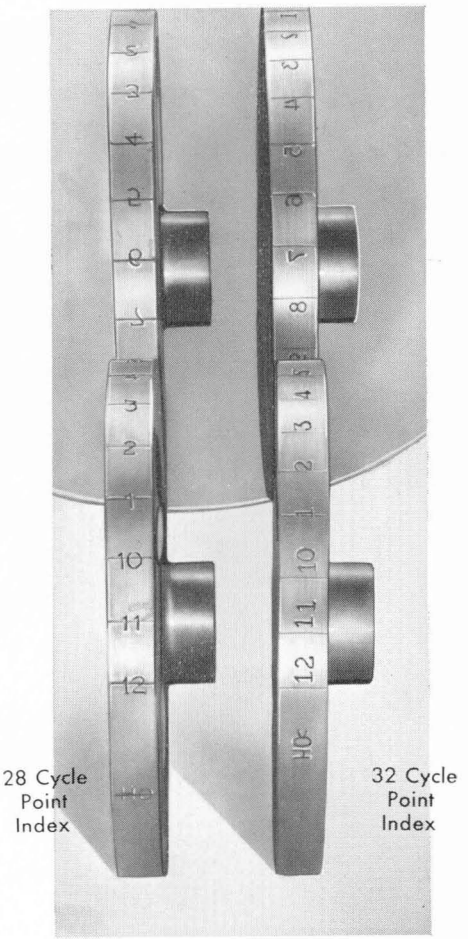


Figure 30. 28 and 32 Cycle Point Index

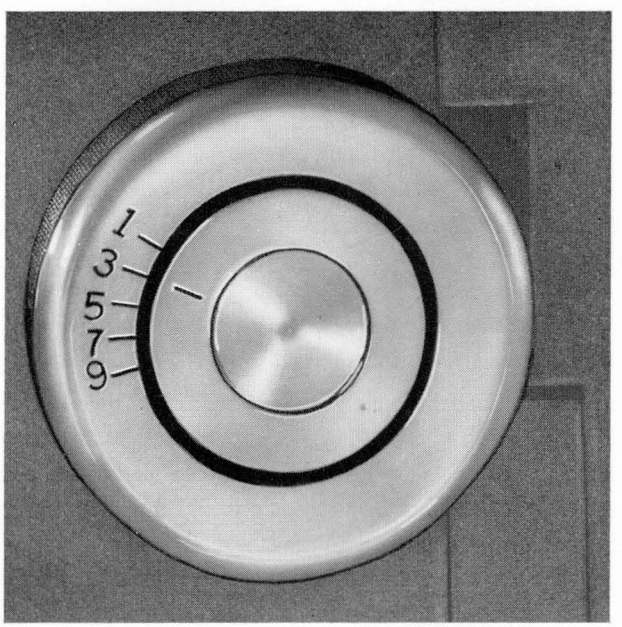


Figure 29. Printing Position Control Knob

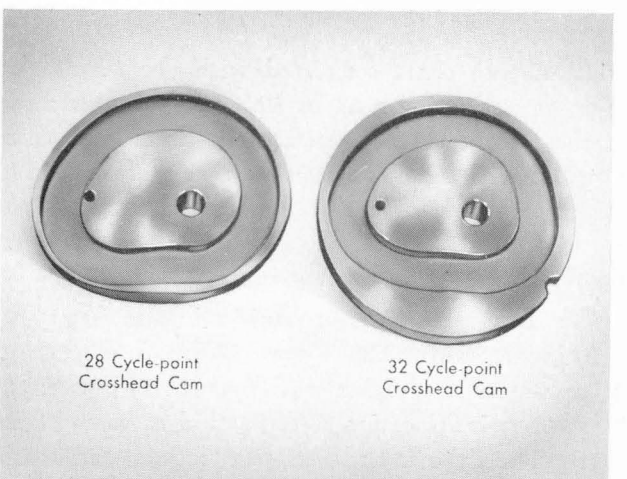


Figure 31. 28 and 32 Cycle Point Crosshead Cams

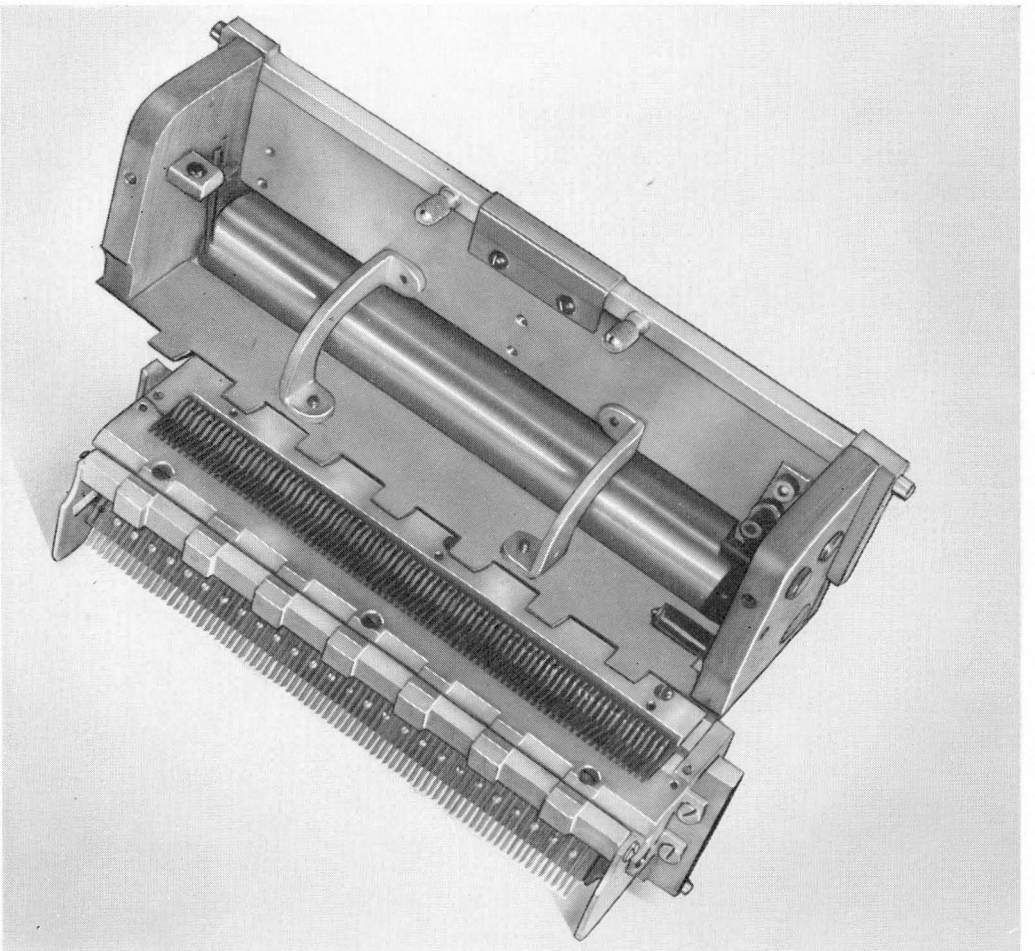


Figure 32. Type 551 Contact Roll and Brush Slide

trical timing chart associated with the wiring diagram to determine a 28 or 32 cycle-point machine; at the present time 32 cycle-point timing charts are supplied with all Type 550 and 551 machines. This timing problem will be covered under circuits.

Contact Roll and Brush Slide — Type 551 (Figure 32)

The brush reading mechanism in the Type 551 machine resembles the Type 550 brush mechanism in appearance, location and operation, but differs in the physical location and material of some of the parts. The Type 550 and 551 contact-roll and brush-slide assemblies are not interchangeable. The change was necessary when the five printing-line feature was added to the machine. For the mechanical principles of this unit see *Contact Roll and Brush Slide — Type* 550, page 13.

Drive Housing — Type 551 (Figure 33)

The drive housing on the Type 551 machine is located in the same relative position as the comparable unit on the Type 550. The outward appearance of the two units is very similar, with the exception that the Type 551 drive housing is equipped with a printing-position-control dial. This dial is provided so an operator may select any one of five printing lines.

To accomplish the selective line printing, the intermittent drive gear and the intermittent worm wheel was redesigned (Figure 34). Note the five teeth on intermittent worm-wheel ring and the single tooth

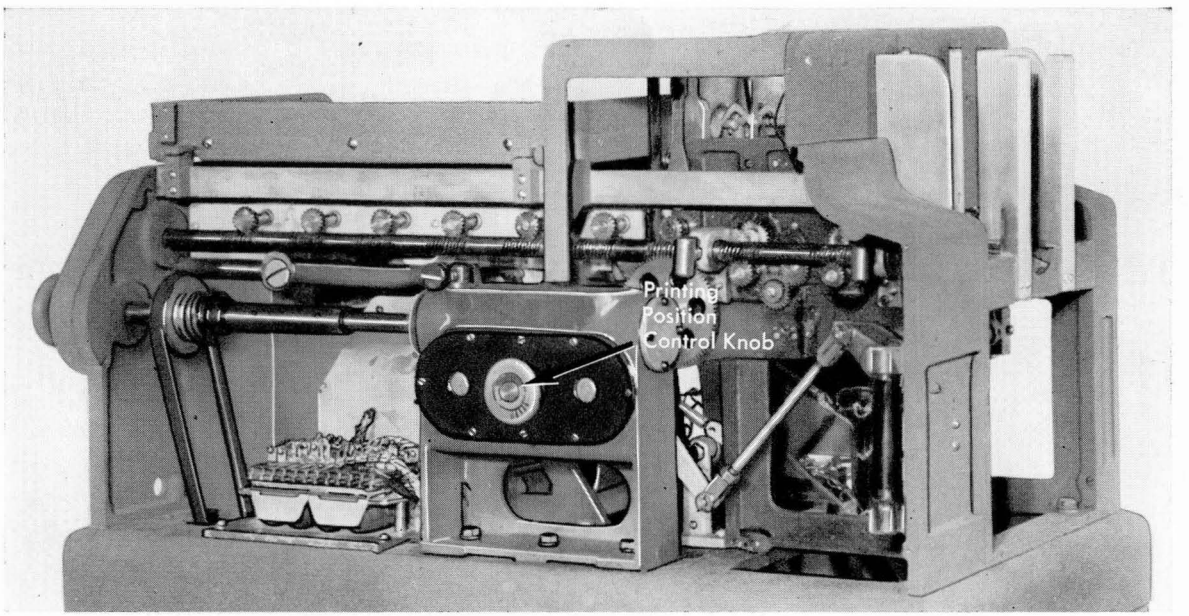


Figure 33. Drive Housing — Type 551

on the intermittent drive-gear. Now it is possible to have five different relationships between the worm-gear and the intermittent drive gear. Note that any manual change between the two gears will also change the inner intermittent-gear and the intermittent-gear-feed rolls, thus changing the stopping time of the card for printing.

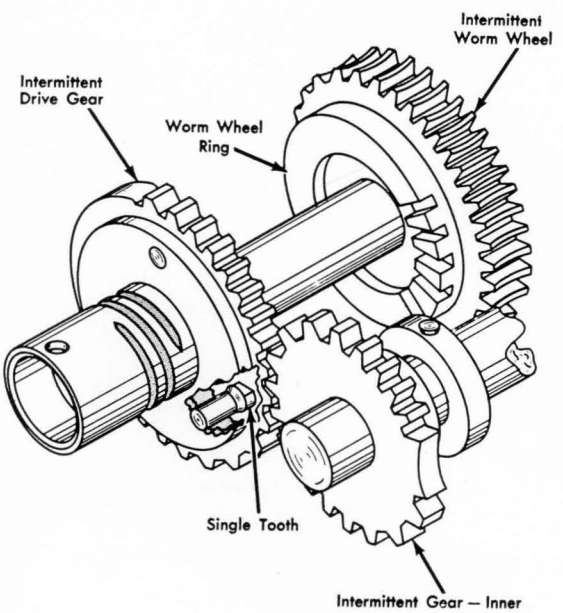


Figure 34. Intermittent Drive Gear (Type 551)

Some Type 550 machines have been built with the selective-line-drive housing, and in these machines the unit is set for the upper-line printing and the printing-position control knob is removed.

Type Bar — Type 551 (Figure 28)

In addition to the type bar used in the Type 550 machine, the Check Writing Interpreter can be equipped with special type bars to print large pin-point characters on the face of a card check. The construction of the special bar is the same as the standard bar with the exception of the large pin-point type characters. A piece of pin-point asterisk type can be installed in the blank type-bar position which will automatically print the asterisk to the left of a significant digit.

The special pin-point type is twice as wide (5/16″) as the standard type (5/32″) and the same height (1/8″). Due to the added width of the pin-point type, it is necessary to remove the type from the bar to its immediate left (printing position). In other words, one pin-point type-bar requires the space of two standard type-bars. Standard pieces of type can

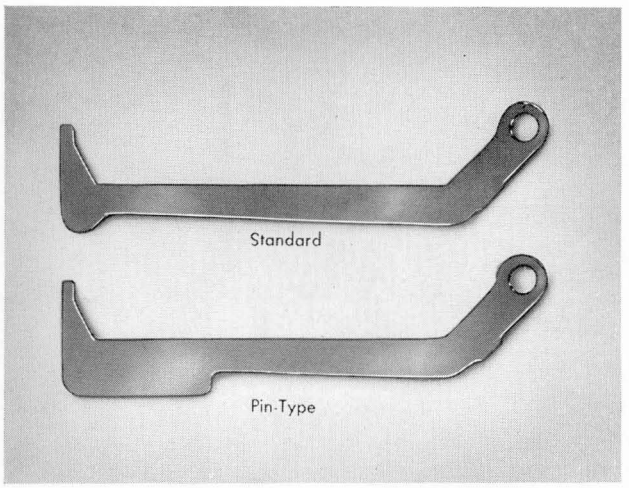


Figure 35. Standard and Pin-Type Hammers

be installed in the 10, 11 and 12 positions of the special bar.

The pin-point type bars are installed in type-bar positions to fit the card check.

Hammer Unit — Type 551 (Figure 35)

The Types 550 and 551 hammer units are identical with the exception of the positions using the special large pin-point type. A heavier type-blow is required to produce a satisfactory printing impression of the pin-point type; therefore a weighted hammer is used. In the adjacent type-less type-bar position the standard hammer is removed.

Power Supply

The main line switch on the Types 550 and 551 Automatic Interpreters is a standard DP-ST push-button switch and is located below the base and to the left of the control panel. This switch is the on and off control for the external power supply. Behind the main-line switch and connected in the incoming power circuit are two standard-type cartridge-fuses of the following ratings: 115V AC, 230V AC and 115V DC — 2 - 6 amp fuses: 230V DC — 2 - 3 amp fuses. AC powered machines equipped with a selenium rectifier require 2 - 3 amp fuses in the rectifier primary circuit. A third wire in the line cord has been provided to ground the machine frame to the ground of the building's electrical system. It is very dangerous to operating personnel for some machines to be grounded and some not grounded.

Selenium Rectifier

The selenium rectifier (power pack) is the device used on the Types 550-551 machines to change the AC input power supply to a suitable 115 volt DC source of power for relay and magnet-coil operation. Machines operating on a DC supply source do not require the selenium rectifier. *The Customer Engineering Reference Manual on Meters and Test Devices* contains the necessary information required to service the selenium rectifier.

Wiring Diagram — 102179J

The wiring diagram for the Types 550-551 machines is drawn showing all contacts as they would be with the power turned off.

Because there are only four relays, three cam contacts and two circuit breakers, the units have not been numbered similar to other IBM machines. This should not create a handicap because the units are well titled and perform similar functions in other IBM machines. The older form of cam-contact timing is used, i. e. 3/14 zero cam-make 3/4 point after zero-interpreted—this means that the zero cam is open, for 3/14 of the cycle and should be timed to *make* 3/4 after zero (3/4 of an index marking after 0). The cover-interlock cam (cam 10/14-break at 9 3/4) should read: a cam contact made for 10/14 of the cycle and its breaking time is 3/4 of an index marking after 9. The motor cam (12/14 motor cam-break at 4) should read: a cam contact made for 12/14 of the cycle breaks at index marking 4.

This machine is also equipped with two cover-interlock switches to protect the operating personnel. The contact-roll cover and the control-panel cover must be closed before the machine can be operated.

The majority of Types 550 and 551 machines operate on a 28 cycle-point basis, but at the present time some machines are built to operate on a 32 cycle-point basis. The wiring diagram and electrical sequence chart referred to in this manual (102179-J) was drawn for a 32 cycle-point machine but is used on a 28 cycle-point machine as well. Note that 3/14, 10/14 and 12/14 cams are used on the 32 cycle-point machines and that 14 is a multiple of 28. This point bears out the fact that cam timing is not extremely critical. When the circuits and their functions have been studied, it will be very apparent that this condition does not create a problem.

Refer to Index — Type 551, page 29 for a method of determining a 28 or 32 cycle-point machine.

The cut of the circuit-breaker cams is different for 28 and 32 cycle-point machines and they are not interchangeable. Note in the timing chart that the circuit-breaker impulses make at the line on the index. Therefore it can be assumed the 32 cycle-point circuit-breaker impulses will be shorter in time duration than 28 cycle-point circuit-breaker impulses.

In December 1952, engineering changed the specifications of the resistor in the print-magnet circuits. All machines, 28 and 32 cycle-point, operating with an AC rectifier will use an 1100-ohm resistor in the print-magnet circuits.

Circuits — WD102179-J

To start the machine, the operator must turn on the main-line switch and depress the start button. Under these conditions the drive motor will run and

operate the machine as long as the start-key is depressed provided the cover-interlock switches are electrically on.

When the main line switch is turned on, the circuit is completed to the selenium rectifier (power pack) which provides 115V DC power to terminal posts 1 and 2: positive potential at post 1 and negative potential on post 2. For the following circuit description, it will be assumed that 115V DC power is available at terminal posts 1 and 2.

Cover-Interlock-Relay Circuit: Post 1, contact-roll and control-panel safety-contacts, cover-interlock relay and post 2.

Motor-Relay Circuit: Post 1, 3A fuse, cover-interlock relay-point (A) N/O, start-key contact, stop-key contact, motor relay and start-interlock relay in parallel, to card-lever relay as a terminal, cover-interlock relay (B) N/O and post 2.

Motor Circuit: One side of main line switch, 6A fuse, motor-relay contacts, motor, 6A fuse, to the other side of the main-line switch. The machine will continue to operate as long as the start-key contact is held closed. When cards are placed in the card-feed hopper, the following circuits become operative.

Card-Lever-Relay Circuit: Post 1, 3A fuse, cover-interlock relay (A) N/O, card-lever contact, 1500 ohm resistor, card-lever relay, cover-interlock relay (B) N/O, post 2.

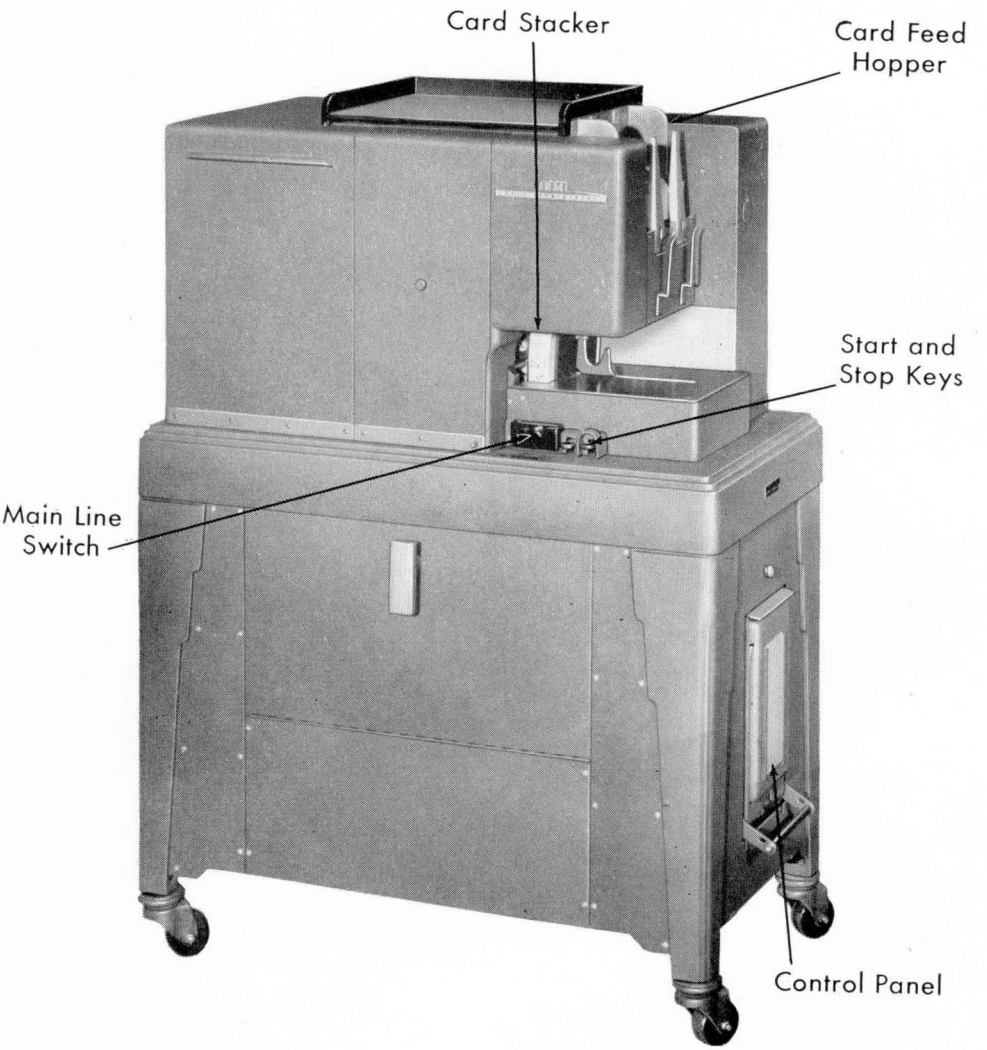
Motor Relay and Start-Interlock-Relay Hold-Circuit — 2 Circuits: Post 1, 3A fuse, cover-interlock relay (A) N/O, start-interlock relay (A) N/O, card-lever relay (A) N/O, stop key, motor relay and start-interlock relay, card-lever relay as a terminal, cover-interlock relay (B) N/O, post 2. When the motor-cam contact is closed, a parallel circuit is present from the card lever relay (A) N/O, through the motor-cam contact, to the motor relay and start-interlock relay.

Cover-Interlock-Relay Hold-Circuit: Purpose — a circuit to hold the cover-interlock relay energized during card-reading time if the pick circuit is opened by a cover-interlock switch. Post 1, 3A fuse, cover-interlock relay (A) N/O, start-interlock relay (B) N/O, cover-interlock-cam contact, cover-interlock relay, post 2.

Card-Reading Print-Magnet Circuit (plugged to print 10, 11, 12): Post 1, cover-interlock relay (A) N/O, card-lever contact, 2 circuit breakers in series, contact-roll common brush, contact roll, through hole in card to reading brush and reading-brush hub, by plugwire to type-bar-plug hub, 1100 ohm resistor, print magnet, *common-plug hub,* by jack plug to *plug to print 10 hub,* cover-interlock relay (B) N/O, and post 2.

Card - Reading Circuit — Print - Magnet Circuit (plugged to print 0): Same circuit as above to the *common-plug hub,* by jack plug to *plug to print 0,* zero-cam contact, cover-interlock relay (B) N/O, and post 2.

Note the circuit-breaker cams make two revolutions per card cycle. This fact does not create a circuit problem inasmuch as the card-lever contact is closed only for the card-reading portion of the cycle.



ALPHABETICAL INTERPRETER

Type 552

ALPHABETICAL INTERPRETER

Type 552

FUNCTIONAL PRINCIPLES

THE IBM CARD, which is the operating unit of the IBM accounting method, is widely and variously used in the business world. Many of the card's applications require that trained and untrained personnel rapidly read the punched hole information. The Type 552 Alphabetical Interpreter is capable of translating the IBM alphabetical and numerical punched hole code into printed characters on the face of the card. Punched and interpreted cards provide a source document which can be used by untrained personnel without affecting the intended use of the cards in the automatic accounting machines.

A few good examples of punched and interpreted cards used as source documents are: insurance premium notice cards, special payroll deduction cards, attendance time cards, and inventory cards.

FEATURES

THE TYPE 552 Alphabetical Interpreter is capable of printing up to sixty columns of information at the rate of sixty cards per minute. The operator may select either one of two lines on the card where the printing will be placed. The upper line prints between the top edge and the 12 hole and the lower line prints between the 12 and X holes in the card (Figure 36). To print two lines of information from one card, or to print more than sixty columns of information from one card, two passes of the cards through the machine and two control panel wirings are required.

The print unit consists of sixty type bars, each capable of printing the twenty-six alphabetical characters, the ten numerical characters, and two optional special characters. Various optional special characters such as the diagonal (/), ampersand (&), asterisk (*), dollar sign ($), etc., may be installed in combinations to satisfy special types of applications.

The unique feature of the Type 552 Alphabetical Interpreter is the single set of 80 reading brushes, capable of reading alphabetical and numerical information from all 80 columns of the card. The contact roll, operating with the single set of brushes, performs a threefold function; it acts as a contact roll, a feed roll, and a platen.

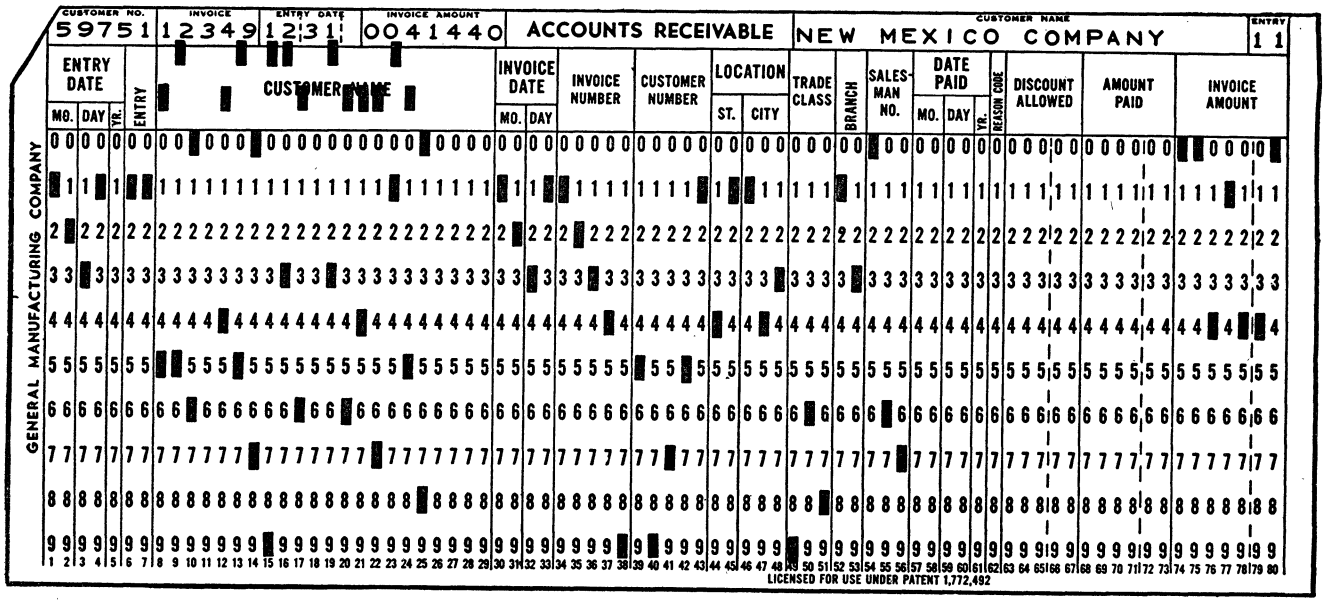
The Type 552 Alphabetical Interpreter is available for operation from any standard source of electrical power. The machine is equipped with a drive motor plus either a transformer and rectifier or a motor generator set. The transformer and rectifier or motor generator set supplies 40 volts DC for relay and magnet operation. The following table shows the machine's running current for the standard supply voltage and its weight and outside dimensions.

LINE VOLTAGE	RUNNING CURRENT	OUTSIDE DIMENSIONS	WEIGHT
115V 60 Cycle AC	8.0 Amp.		
115V DC	4.8 Amp.	Length 34"	
208V 60 Cycle AC	4.4 Amp.	Width 20"	725 lbs.
230V 60 Cycle AC	4.0 Amp.	Height 51"	
230V DC	2.6 Amp.		

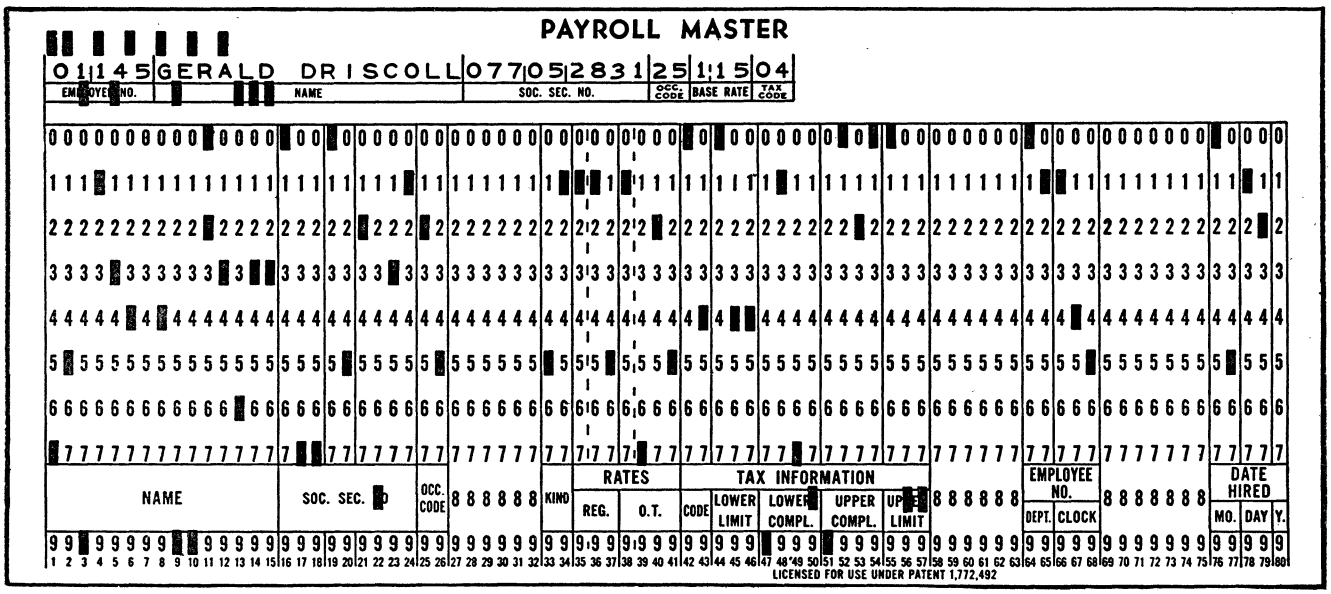
OPERATING PRINCIPLES

Main Line Switch

The main line switch is located in the center on the front of the machine and controls all of the input supply line power to the drive motor and the motor generator or rectifier. This switch is of the thermal overload type and automatically opens the circuit if the internal machine circuits become overloaded. When the switch has been opened by an overload, remove the line plug and move the switch handle to the OFF position. Check the machine to find the cause for the overload before attempting to restart.



IBM Card Interpreted in Upper Position



IBM Card Interpreted in Lower Position

Figure 36.

Signal Light

When the machine is functioning normally and the main line switch is ON, a jeweled signal light in front of the main line switch will glow signifying that the internal 40-volt DC power is available for machine operation.

Start and Stop Key

The start and stop keys are located on the front of the machine to the right of the main line switch. The two keys start and stop the feeding of cards. The start key is shielded and is only accessible from the front while the stop key is readily accessible from all positions. It is necessary to hold the start key depressed for four cycles (until the first card has reached the stacker) before the automatic card-feeding operation takes place. Card feeding may be stopped at any time by depressing the stop key. It

is not necessary to hold the stop key depressed to stop the machine. After the stop key has been depressed, the power to the machine drive motor is cut off after the next printing operation has been completed and the machine coasts to approximately 275°.

Stacker Stop Switch

The machine is equipped with a stacker contact switch which prevents the machine from operating with a full stacker. The start key is inoperative if the stacker is full of cards.

Printing Line Selection Control (Figure 37)

Printing line selection is controlled by a small knob projecting out of the rear of the machine. By pulling out and turning the control knob, one of two scribed lines (labeled U and L) may be lined up with a third scribed line on the center shaft. When the scribed line labeled "U" lines up with the scribed line on the shaft, printing will take place on the upper line. When the scribed line labeled "L" lines up with the scribed line on the shaft, printing will take place on the lower line.

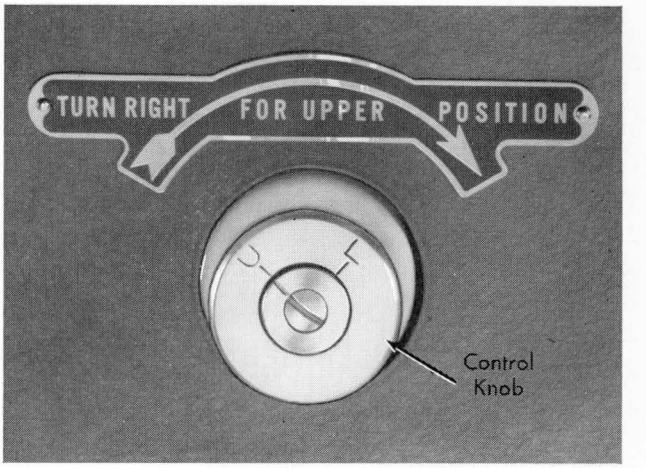


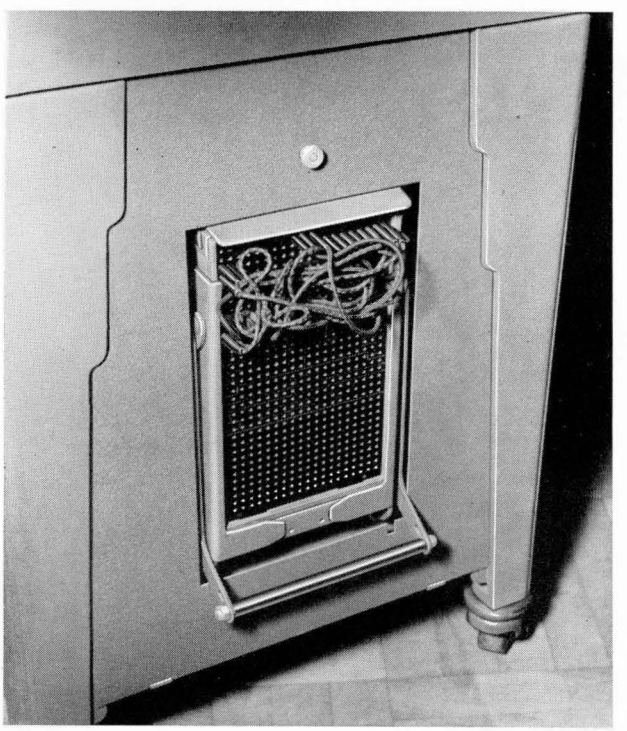
Figure 37. Printing Line Selection Control

Card Feed

The Type 552 Alphabetical Interpreter is equipped with a horizontal feed very similar to the feed of the Type 80 Sorter. Cards are placed in the feed hopper *face up with the 12-edge toward the throat.* The machine operates at the rate of 60 cards per minute.

Control Panel (Figure 38)

The Type 552 Alphabetical Interpreter control panel is the automatic, single panel type and is located on the right end of the machine. The make-up of the control panel consists of 5 distinct groupings.



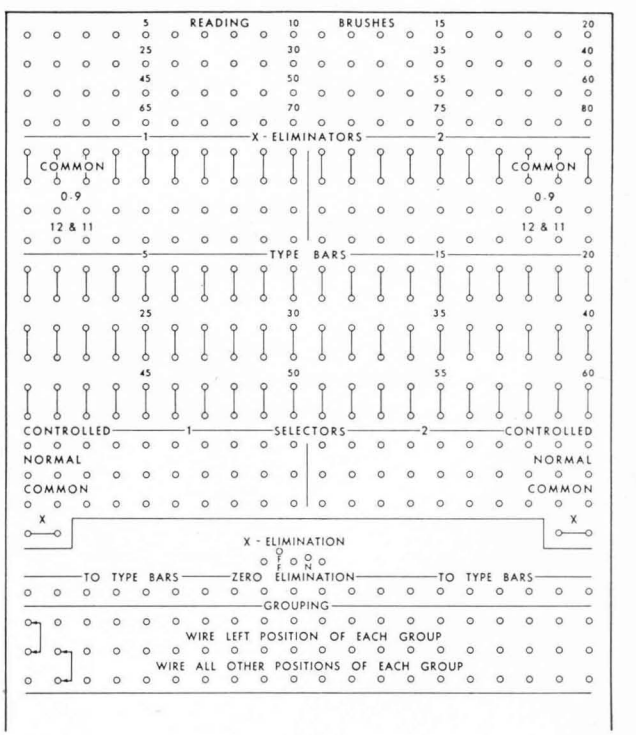


Figure 38. Control Panel, Alphabetical Interpreter

1. 80 reading brush hubs
2. 60 double sets of type bar hubs
3. Two 10 position X-eliminators (optional)
4. Two 10 position selectors (optional)
5. Zero elimination (optional)

When interpreting either alphabetic or numeric information, wire from the reading brush hubs to the type bar entry hubs.

To eliminate alphabetic printing caused by an X or 12 punch above a numerical field, wire from the reading brush hub to the common of the X-eliminator and from the corresponding 0-9 hub to the type-bar entry hub. The X-elimination switch must be wired ON to perform this operation.

MACHINE OPERATION

THE TYPE 552 Interpreter employs a unique method of positioning the type bars, which eliminates the need for any auxiliary units for the storage of zone information. The card codes for the twenty-six alphabetic characters, ten numeric digits and two special characters are shown in Figure 39. Each alphabetic code consists of one *zone* (12, 11, 0) punch and one numeric (1-9) punch. The numeric and special characters each consist of a single punch. All these characters can be divided into four classes:

1. Those with a 12 zone punch
2. Those with an 11 (or X) zone punch
3. Those with a zero zone punch
4. Those with no zone punch

The printing types are consequently grouped into four zone groups on the type bar. These type bars are latched in their highest position at the start of a printing cycle.

The cards are fed so that the zone punches are read first. As the zone punches are read, the type bars are unlatched and moved rapidly downward. During the zoning portion of the cycle, the card moves slowly and the type bars move rapidly. At the end of the zoning portion of the cycle, the type bars have moved varying distances to bring the proper group of types opposite the selecting pawls.

The card now moves forward at a faster rate and the type bars are lowered more slowly while the numeric punches are read from the card. The numeric punches cause the selecting pawls to stop the type bars at the proper point within the zone group of type.

After the card has passed the brushes it is positioned in line with the row of selected type. The card now stops while the type makes an impression through the inked ribbon to print on the card.

Character		Punching Code	Character		Punching Code
A	—	12-1	Blank or		
B	—	12-2	Special	—	0-1
C	—	12-3	S	—	0-2
D	—	12-4	T	—	0-3
E	—	12-5	U	—	0-4
F	—	12-6	V	—	0-5
G	—	12-7	W	—	0-6
H	—	12-8	X	—	0-7
I	—	12-9	Y	—	0-8
Optional	—	12	Z	—	0-9
J	—	X-1	1	—	1
K	—	X-2	2	—	2
L	—	X-3	3	—	3
M	—	X-4	4	—	4
N	—	X-5	5	—	5
O	—	X-6	6	—	6
P	—	X-7	7	—	7
Q	—	X-8	8	—	8
R	—	X-9	9	—	9
Optional	—	X	0	—	0

Figure 39

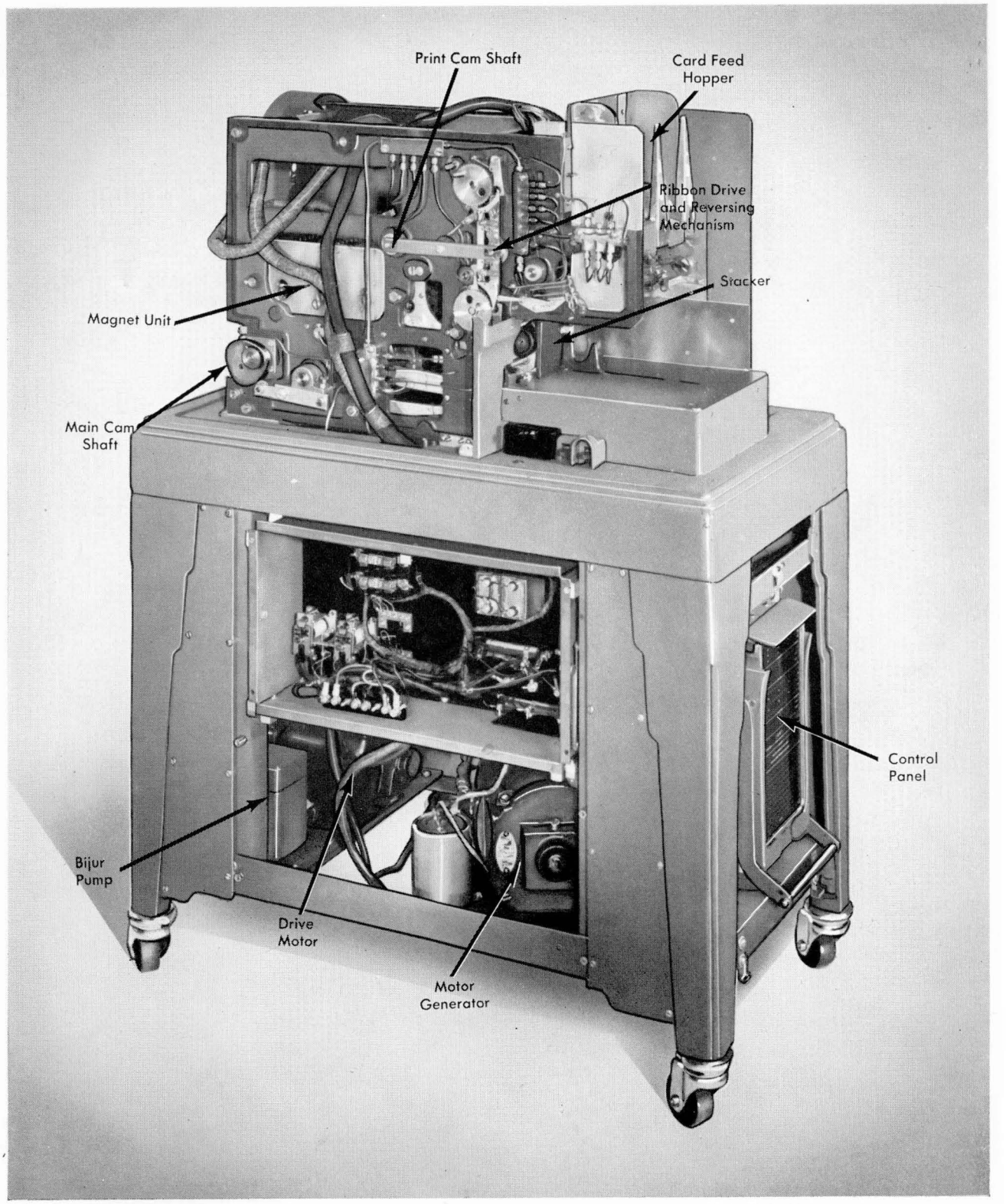


Figure 40. Type 552 — Front View

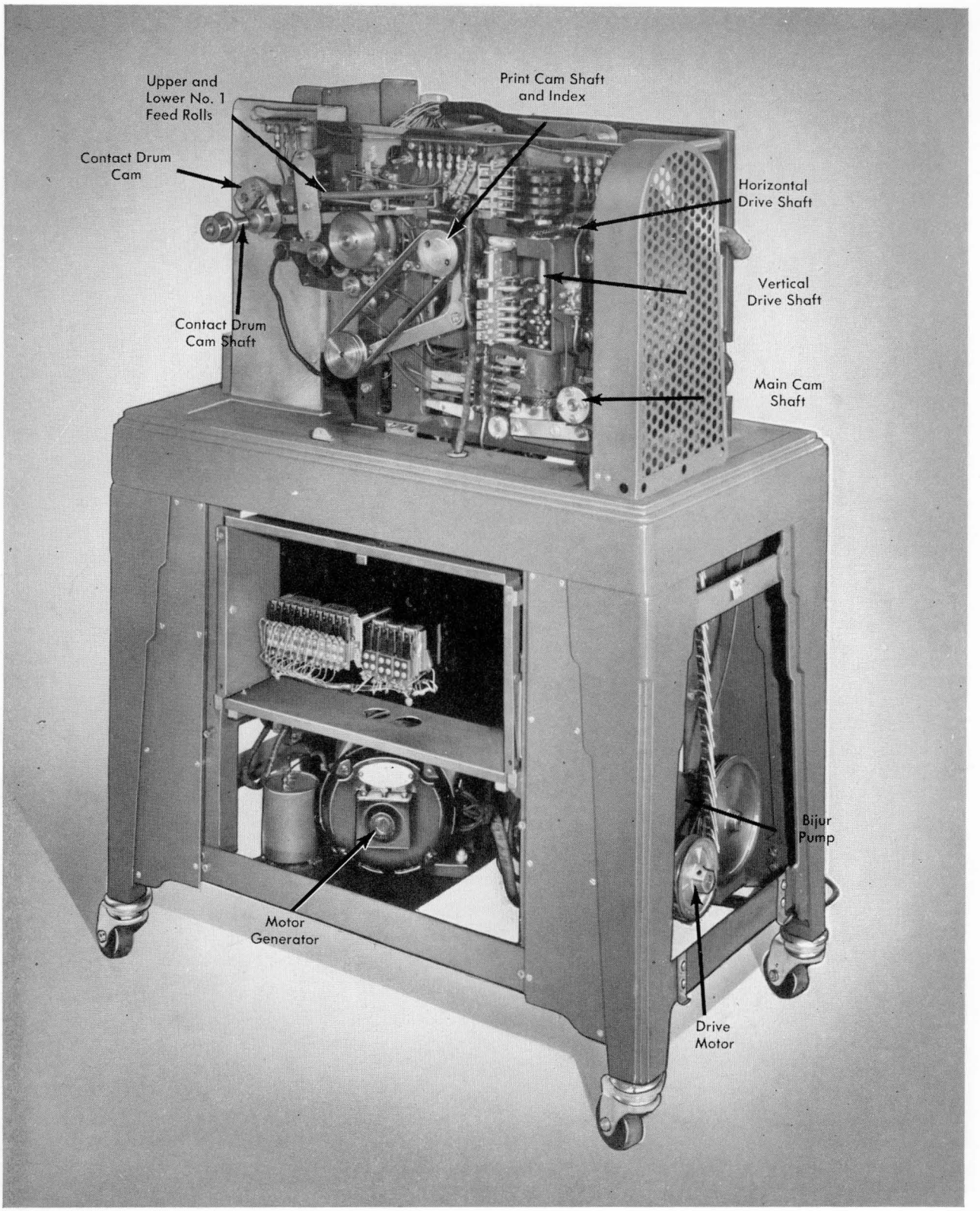
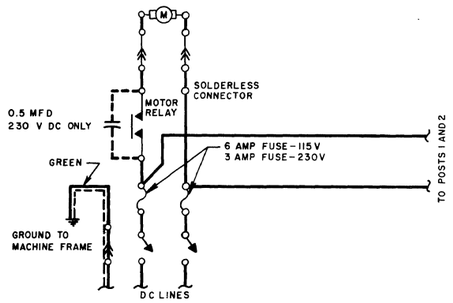
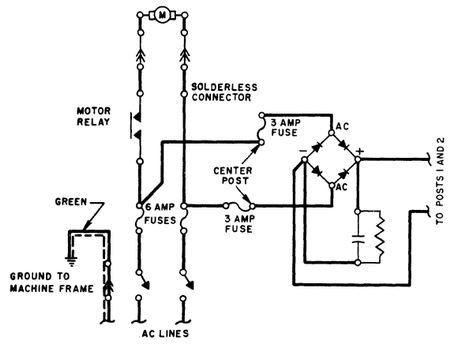


Figure 41. Type 552 — Rear View

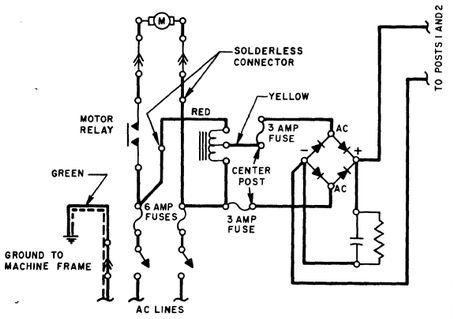
115V – 230V DC

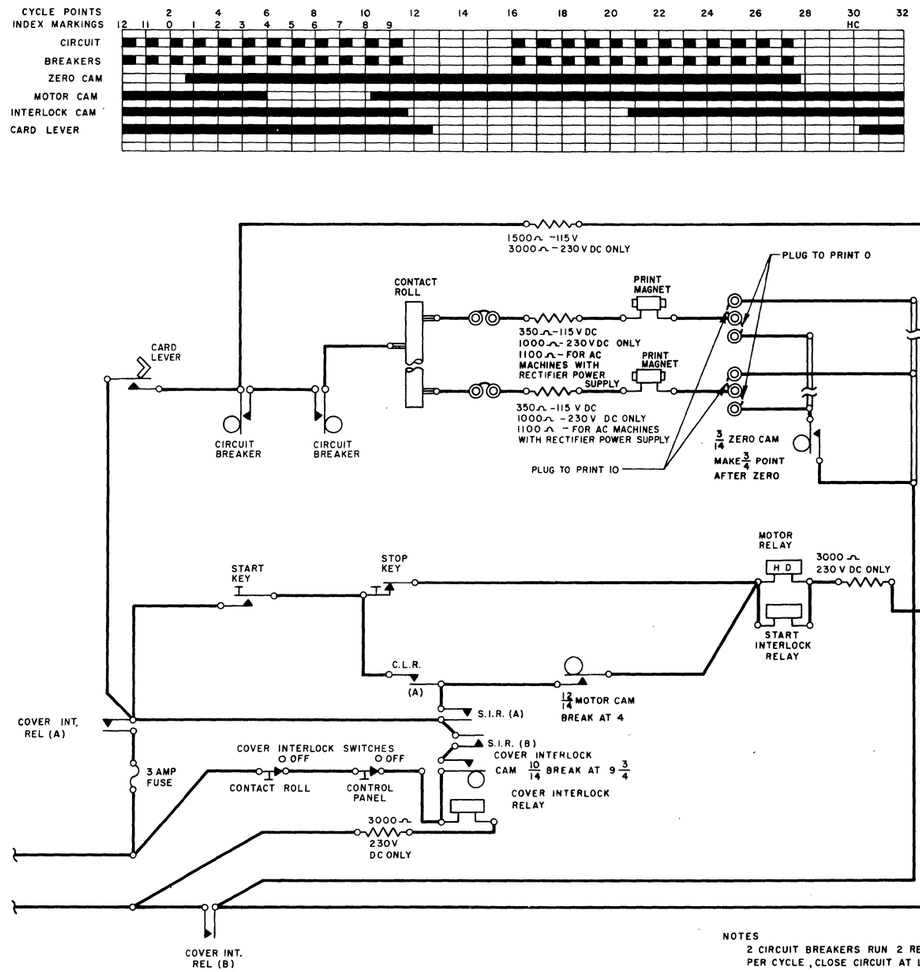


115 V – 50/60 CY – 1PH



230 V – 50/60 CY – 1PH





NOTES

2 CIRCUIT BREAKERS RUN 2 REVOLUTIONS PER CYCLE, CLOSE CIRCUIT AT LINE OF INDEX

==== WIRING FOR GROUNDED MACHINES ONLY

INSTRUCTIONAL WIRING DIAGRAM

AUTOMATIC INTERPRETER – 550-551

5-5-53

THE LOCATIONS of the principal units of the Type 552 Alphabetic Interpreter are shown in Figures 40 and 41. Figure 42 schematically illustrates how the mechanical power is transmitted from the drive pulley to all of the units on the machine. This schematic illustration is intended to be used in conjunction with the machine photographs (Figures 40 and 41).

Mechanical Power Supply

A study of the means of transmitting the mechanical power from the 1/4 H.P. drive motor (Figure 40 and 41) to the various units should be first. Starting at the drive motor, link V-belts, in conjunction with a speed reduction step pulley on some machines, turn the drive pulley and the horizontal drive shaft (Figure 42).

Looking at the rear of the machine from *right* to *left* (Figures 41 and 42), the first mechanical power take-off from the horizontal drive shaft is the vertical drive shaft which carries nine circuit-breaker cams. The vertical drive shaft rotates once for each machine cycle while the horizontal drive shaft makes six revolutions per machine cycle. The nine electrical cams on the vertical drive shaft provide timed electrical impulses for machine operation. Two addi-

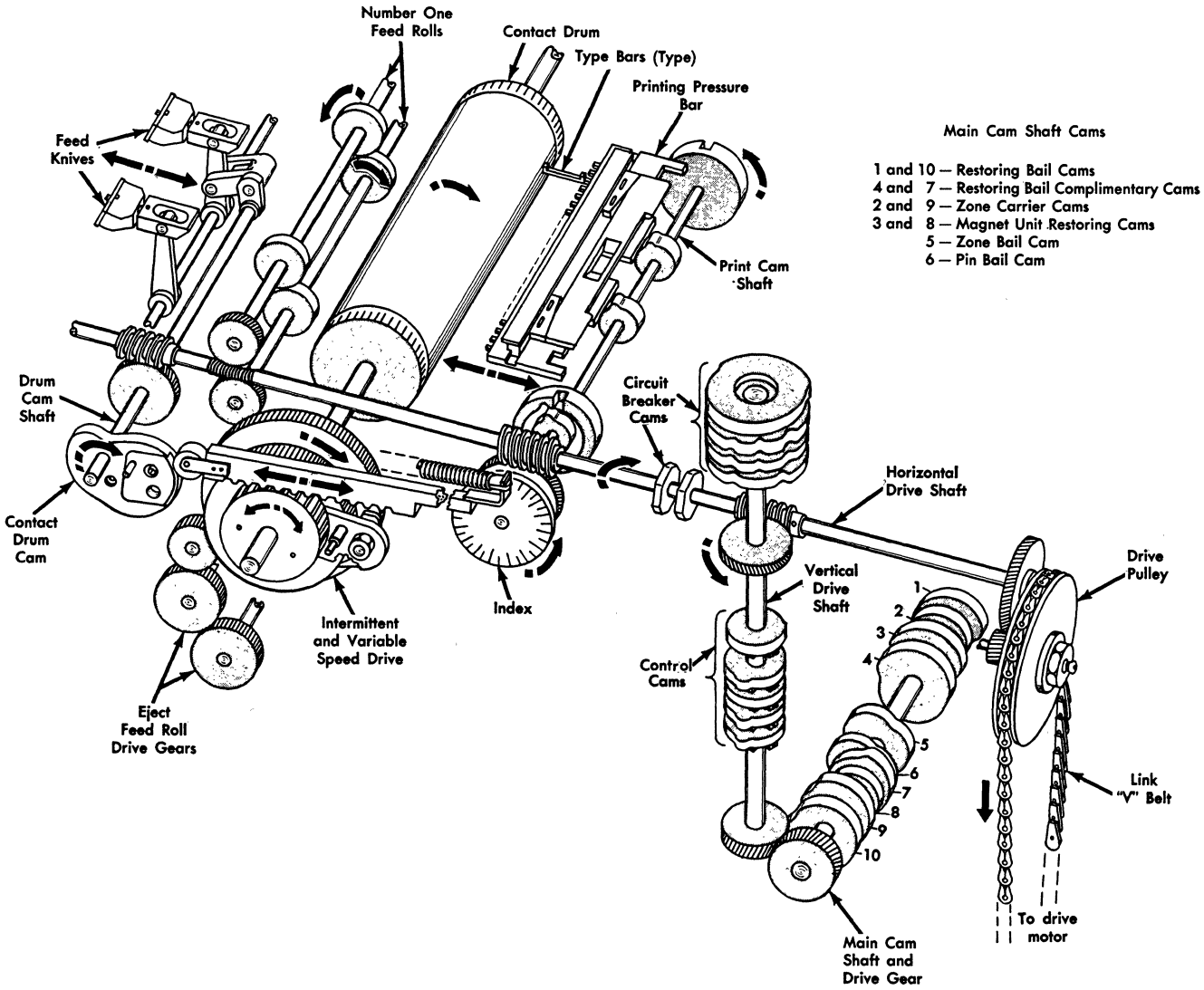


Figure 42. Schematic of Mechanical Power

tional cams are mounted on the circuit breaker unit but operate from cams located on the horizontal drive shaft. These cams provide short impulses needed for stopping the type bars at the proper position.

Keyed to the lower end of the vertical drive shaft is the main cam shaft drive-gear. The main cam-shaft receives its mechanical energy through the vertical circuit-breaker cam-shaft.

Attached to the main cam-shaft are ten cams which impart mechanical motion to the type bar unit and the print magnet unit. Figure 42 illustrates and identifies each cam. The functions of the ten cams will be studied in conjunction with the mechanical principles of the print unit and the magnet unit.

Referring to the horizontal drive shaft in Figures 41 and 42, the second mechanical power take-off (counting *right* to *left)* is the print-cam shaft. This shaft is equipped with five cams whose principal function is to operate the printing-pressure bar and the zoning-pawl restoring-lever in the print unit. The machine index is located on the rear surface of the print-cam shaft spiral-gear, and is visible from the rear of the machine. Mechanical energy to operate the stacker mechanism is taken from the print cam shaft. Figure 42 does not show the stacker mechanism but it will be discussed later in the mechanical principles section.

The upper and lower number one feed rolls are the third mechanical power take-off from the horizontal drive shaft. These feed rolls accept the card from the feed knives and deliver it to the contact drum.

The fourth and last mechanical power take-off from the horizontal drive shaft is the drum-cam shaft. This drum shaft provides mechanical energy to perform two distinct machine functions; furnishing the reciprocating motion of the card-feed knives, and rotating the contact-drum cam. Rotating the contact-drum cam results in intermittent and variable speeds of the contact drum.

FEED UNIT (Figure 43)

THE FEED UNIT of the Type 552 Alphabetical Interpreter mechanically resembles the feed unit of the Type 080 Sorter. Cards are placed in the Type 552 feed hopper face up and 12-edge toward the throat; they feed at the rate of 60 cards per minute.

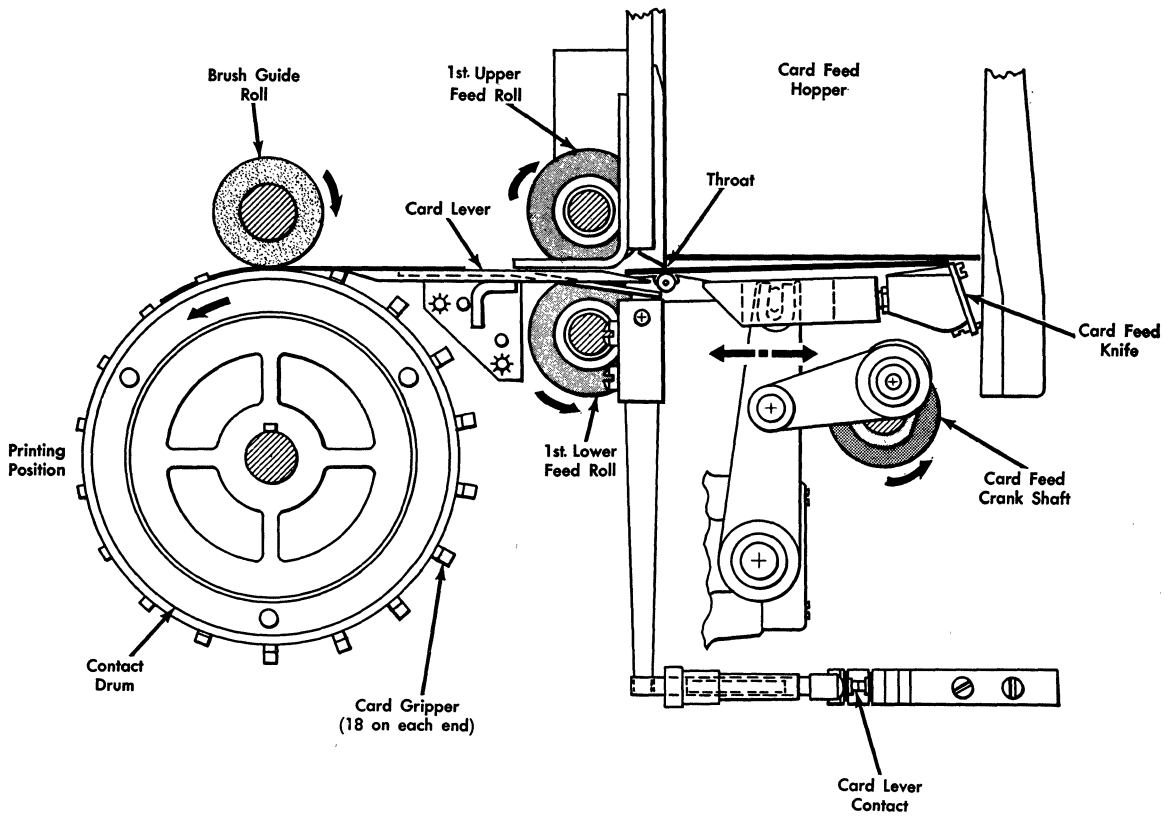


Figure 43. Feed Unit

Figure 43 is a cut-away front view of the feed hopper, first upper and lower feed-rolls, and the contact drum. The card-feed crank-shaft is a continuation of the contact-drum cam-shaft, and is mechanically driven from the horizontal drive-shaft. The rotating motion of the card-feed crank-shaft is converted into reciprocating motion of the card-feed knife.

At a fixed time in each card-cycle, a pair of feed-knives comes into contact with the edge of the card and moves it through the throat to the first set of feed rolls. The throat is adjusted to prevent more than one card feeding during any one card-feed cycle. The first set of feed-rolls, under spring tension, moves the card to the brush guide roll and contact drum station.

The card-lever contact mounted under the hopper bed is operated mechanically by a card moving from the first pair of feed-rolls to the contact drum. This contact recognizes that a card is approaching the brush reading station and is used to establish circuits to the reading brushes. As long as cards are feeding, the card-lever contact will be closed and the card-reading brush-circuit will be established.

The card moves from the hopper bed through the first pair of feed rolls to the contact drum at a constant rate of speed because both the card-feed crank-shaft and the first pair of feed rolls are directly geared to the constant speed horizontal drive shaft.

CONTACT DRUM (Figures 44 and 45)

THE CONTACT DRUM is a steel cylinder with plastic ends, approximately 4 inches in diameter and approximately 1/2 inch longer than the width of the card. Equally positioned around both ends of the outside circumference of the contact drum are eighteen, spring-operated cam-controlled, gripper fingers (Figure 44). These fingers firmly grip the card to the contact drum and carry it to the printing position.

The contact drum in the Type 552 performs three basic functions:

1. It operates in conjunction with the brush-guide roll as a card-feed roll.
2. It operates in conjunction with the 80 reading brushes to read, electrically, the punched holes in the card (contact roll).
3. It operates in conjunction with the type bars and the ribbon as a platen.

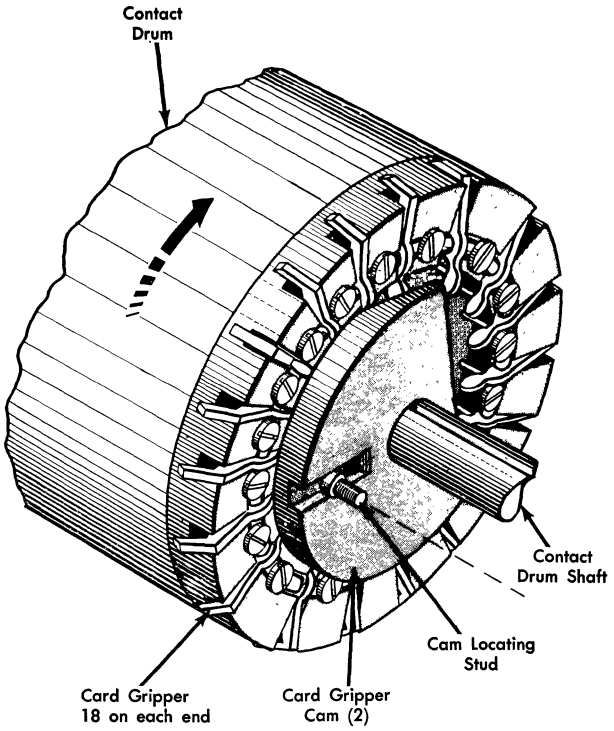


Figure 44. Contact Drum and Gripper Fingers

As previously mentioned, the Type 552 is capable of reading the two-hole IBM card punching code with one set of eighty reading brushes. The contact drum is required to turn at one speed during zoning time and at a faster rate of speed during selection time. The contact drum also functions as a platen; therefore, during printing time, the drum must be stationary.

Two stationary card gripper cams (Figure 44) located on either end of the contact drum open and close the gripper fingers at the correct time. As the contact drum revolves, the individual gripper fingers operate against the cams. The fingers are open to accept the card from the first feed rolls, then close to carry the card to the printing position and the stacker rolls.

Contact-Drum Drive Mechanism (Figure 45)

The contact-drum cam is located on the rear of the contact-drum cam-shaft and revolves at a constant speed. Looking at the exploded view of the machine, Figure 45, the revolving contact-drum cam drives the operating rack to the right and turns the contact-drum driving gear and ratchet-pawl in a

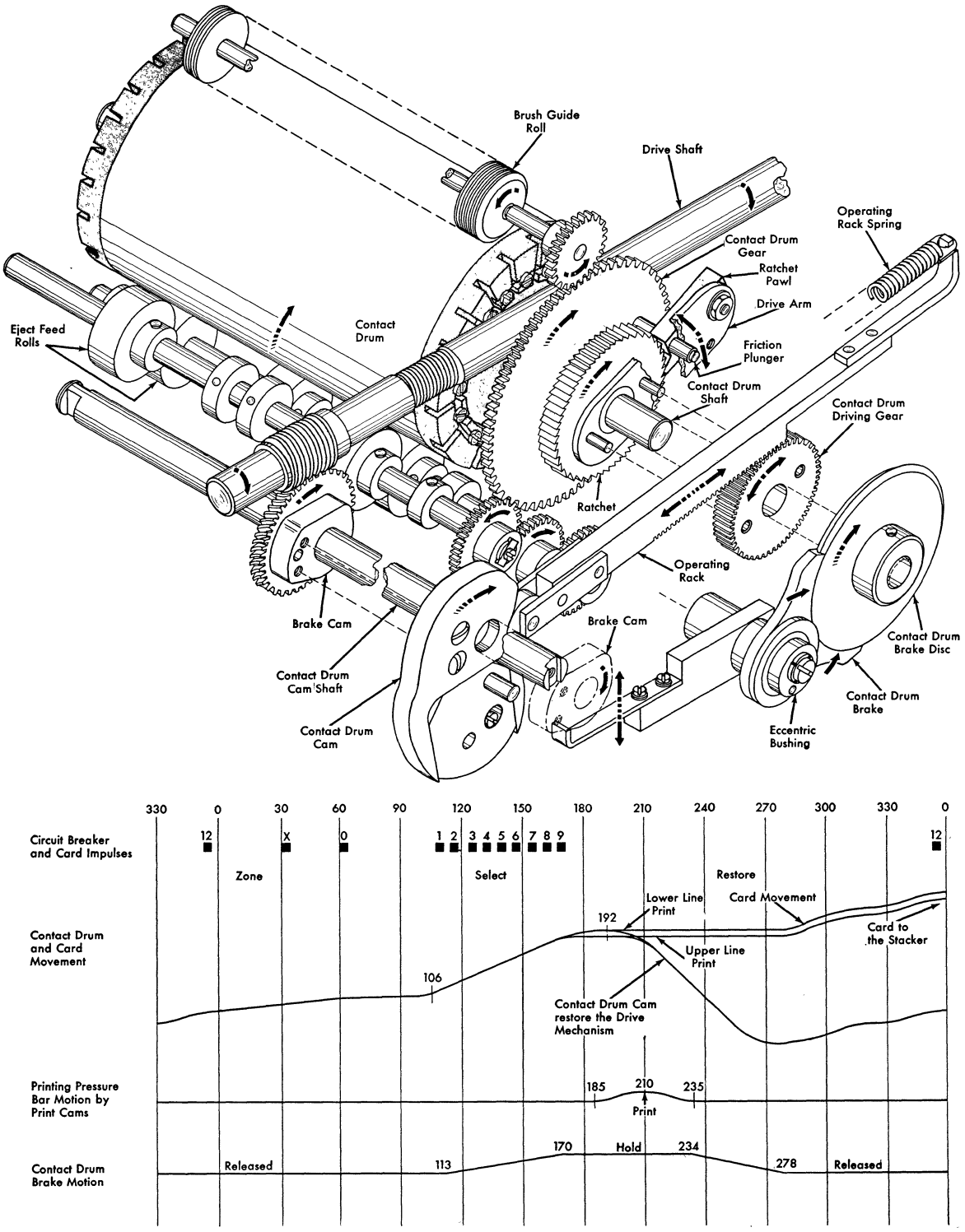


Figure 45. Contact Drum and Drive Mechanism

clockwise direction. The revolving ratchet-pawl will turn the ratchet, contact-drum gear and contact-drum in a clockwise direction. The speed at which the contact-drum turns depends upon the cut of the contact-drum cam. When the contact-drum cam has driven the operating arm to the completion of its travel, the contact-drum stops. Spring tension holds the operating-rack cam roller against the contact-drum cam, causing the operating rack to move to the left, the contact-drum driving-gear and the ratchet-pawl to revolve in a counter-clockwise direction. The contact-drum driving-gear is free on its shaft and the ratchet-pawl slides over the teeth of its ratchet.

A double friction-plunger device is mounted on the contact-drum drive-arm. The two spring-loaded friction-plungers operate against the contact-drum brake-disc and the contact-drum gear. When the contact drum is turning, the contact-drum arm and its friction-plunger device and ratchet-pawl turn in the same direction and at the same speed. As the contact-drum cam slows down its driving effort, the contact-drum drive-arm also slows down, but the contact drum has a tendency to run ahead, sometimes allowing the ratchet to engage in the next tooth. The friction plungers tend to stabilize this action in keeping the drum with the arm and ratchet pawl.

Contact-Drum Brake (Figure 45)

The contact-drum brake is a cam-operated mechanism that prevents overthrow of the contact-drum before printing, thus insuring correct travel of the card. The brake also firmly holds the contact-drum during printing time. The contact-drum brake operates in conjunction with the brake-disc which is pinned on the contact-drum shaft.

The brake cam is located on the contact-drum camshaft, and, as the brake-cam revolves, the brake-shoe assembly pivots on the eccentric bushing, thus delivering a brake action to the brake-disc. The eccentric bushing is adjustable and provides a means to secure correct brake action. The mechanical timing chart, graphically illustrates the contact-drum brake-action in relation to the contact-drum and card movement and printing time.

Contact-Drum Sliding Cam (Figure 46)

The Type 552 is capable of printing on either of two lines, determined by the printing-position control-knob. The manual operation of the control-knob positions the contact-drum sliding-cam within the contact-drum cam. When the control-knob is set for the lower line, the sliding-cam changes the contour of the contact-drum cam, resulting in increased rotation of the contact-drum just before printing occurs. This action causes printing to take place on the lower line of the card. Note: Figure 45 shows how the contact-drum and card will be moved the additional distance when the printing-position control-knob is set for the lower line printing. Also note the mechanical timing relation between the zone and selection impulses, contact-drum movement, printing time, and contact-drum brake-action.

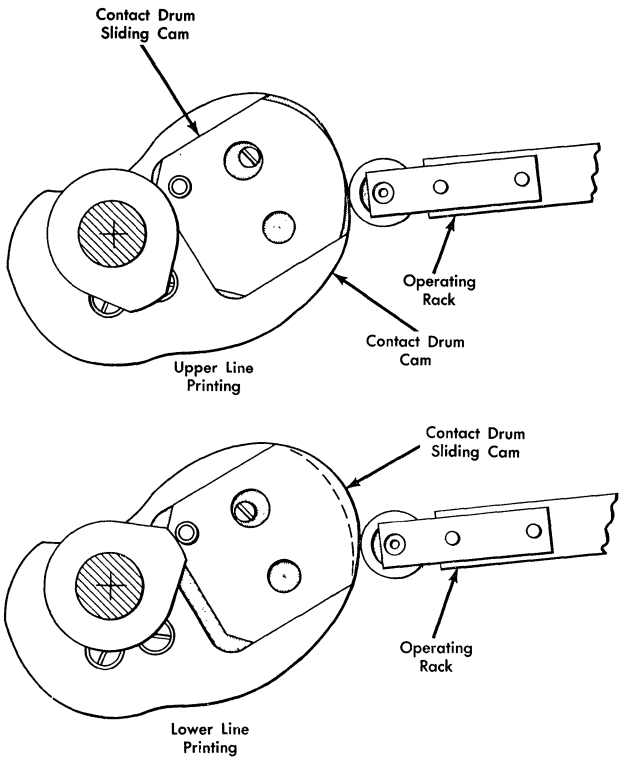


Figure 46. Contact Drum Sliding Cam

Figure 45 contains a schematic mechanical timing chart illustrating the various speeds that the contact-drum cam will turn the contact-drum. This chart also shows card movement, because at 340° the contact-drum picks up the card and controls it until delivered to the stacker rolls.

Starting at approximately zero degrees, the upward pitch of the line represents a constant speed of the contact-drum to 60°. Between 60° and 106° the

straight line represents a stationary contact-drum. The increased slope of the line from 106° to 192° represents an increased speed of the contact drum. The two horizontal lines from 192° to 284° represent the stationary contact drum while the rack assembly and ratchet pawl is being restored for another cycle. Note that the print cam operates the printing-pressure bar at 210°, during the period of time that the contact-drum and card are stationary. The brake cam also operates the contact-drum brake, firmly holding the contact-drum while printing is taking place.

BRUSH UNIT (Figures 47 and 48)

THE TYPE 552 Alphabetical Interpreter brush unit is made up of the following basic parts:

1. Front and rear side-frames
2. Brush-holder block holding 80 reading brushes
3. Brush-guide roll and bearings
4. Card-feed guide-plate
5. Brush-unit locking-bar

This unit is located between the two machine side-frames and in a position so that the brush-guide roll is directly above the contact-drum. This roll, operating in conjunction with the contact drum, receives the card from the first pair of feed rolls and holds it in position to be gripped by the gripper fingers. The brush-guide roll also separates all of the 80 reading brushes. Adjustments have been provided so the reading brushes may be correctly positioned in relation to the contact drum.

The complete brush-unit assembly pivots on the brush-unit shaft and is locked in operating position with the brush-unit locking-bar.

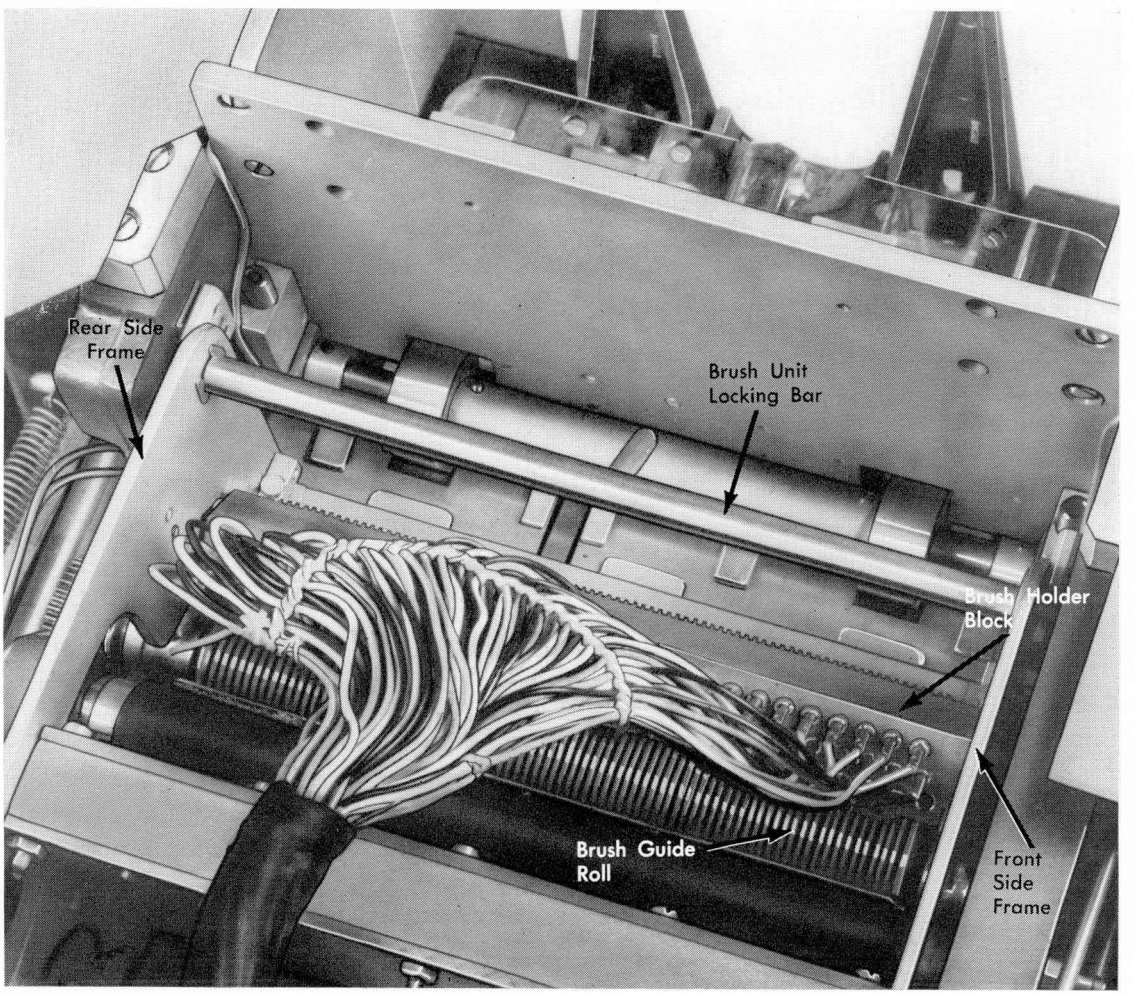


Figure 47. Brush Unit — In Operative Position

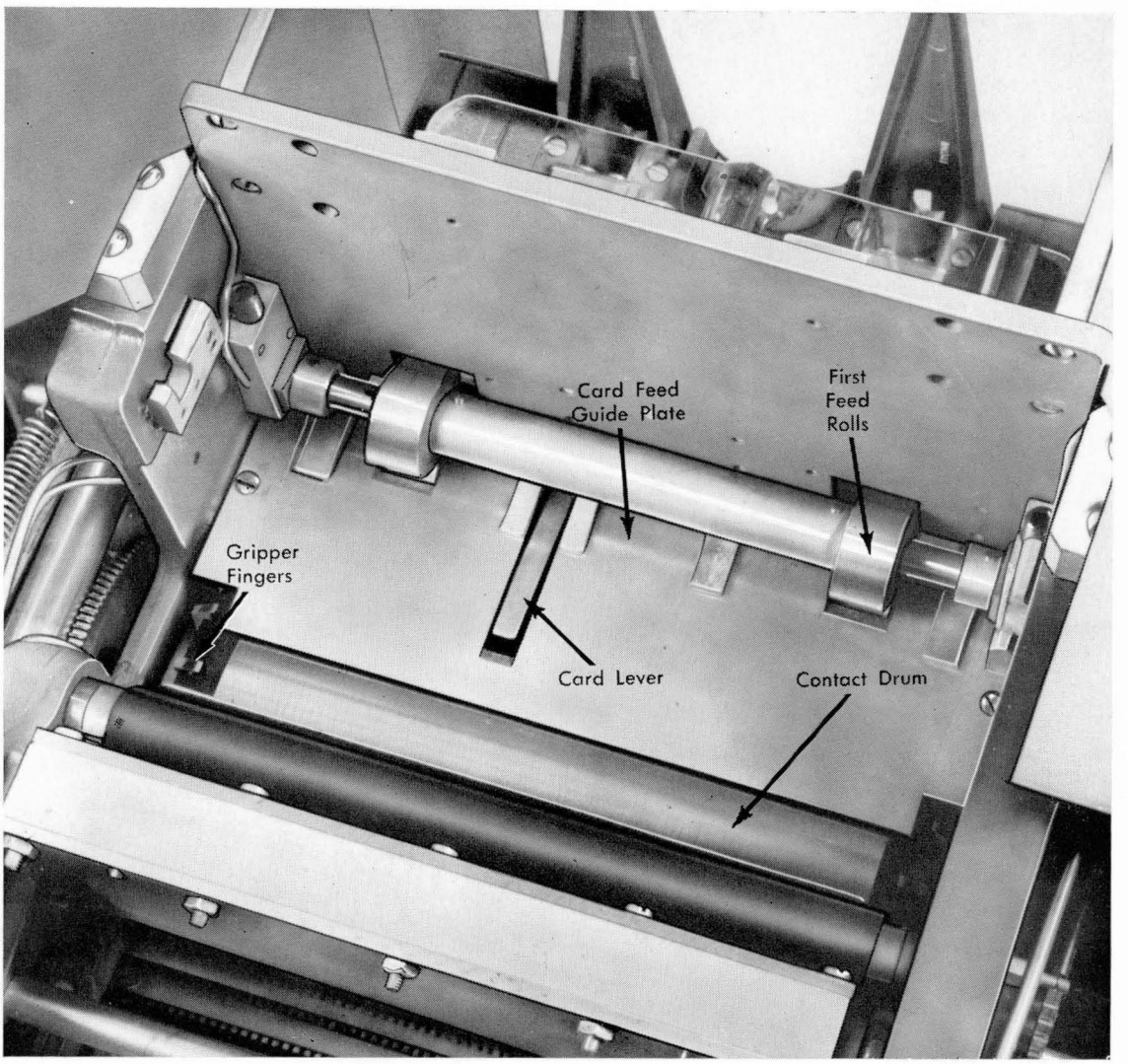


Figure 48. Brush Unit — Raised Out of Operative Position

PRINT UNIT (Figures 49 and 50)

THE PRINT UNIT consists basically of 60 type bar assemblies, their individual zone and select pawls, and the zone-pawl restoring-mechanism. The 60 type-bar assemblies are driven up and down by two sets of complementary cams, two cam-followers, two restoring bail levers and a restoring-bail. Working in conjunction with the print unit is a printing-pressure bar consisting of 60 printing-plungers; one for each type-bar. The printing-pressure bar is cam-driven toward the print-unit so that the 60 printing-plungers will depress the selected type to create the printing impression on the card.

When the cam-operated restoring-bail is driven upward, all of the type bars are restored to their "home" position. During the type-bar zone and selection set-up portion of the machine cycle, the restoring bail is cam-driven in a downward direction.

The 552 Type Bar (Figure 50)

The Type 552 type-bar is capable of printing the 26 alphabetical characters, numerical characters 1 through 9, plus a 0 (zero), and two optional special characters. A thorough knowledge of the type-bar, its construction and principles, should be mastered before the principles of printing are undertaken.

For instructional purposes, the type-bar may be divided into three functional groups.

1. Friction slide (split springs).

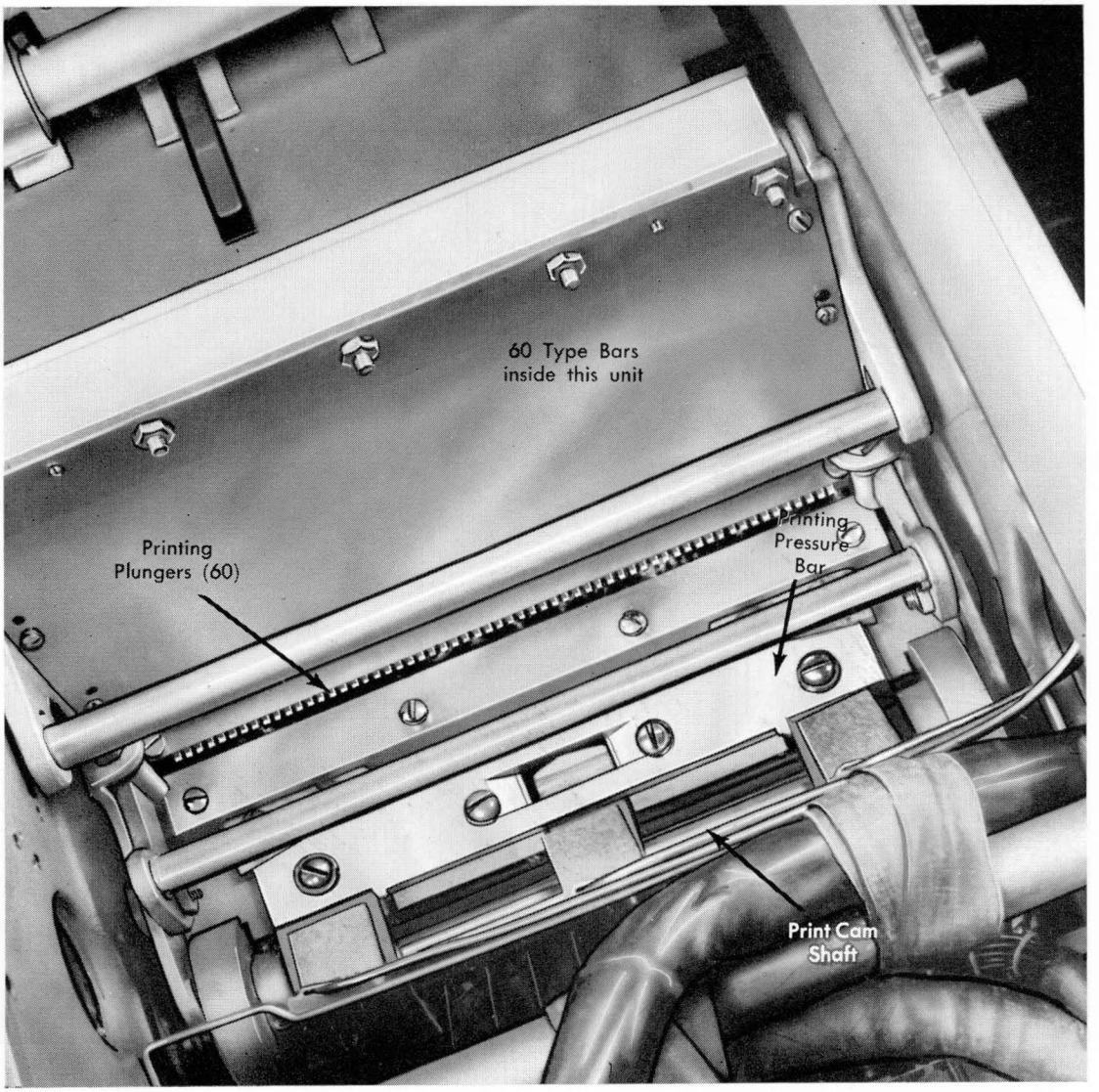


Figure 49. Print Unit

2. The type casing section consisting of 38 individual pieces of type, divided into 4 groups.
3. The toothed-rack section consisting of four groups of type-bar teeth. Note that this section resembles the type-casing section in type of grouping and dimensions.

Friction Slide (Figure 50)

The friction-slide is a flat piece of spring steel, split about one-half its overall distance with the two split ends spread outward (see insert, Figure 50). The lower end of the friction-slide is attached to the friction-slide carrier, and in turn to the restoring bail. The split ends of the friction-slide are pinched together and fit inside a grooved slot in the lower portion of the type-bar. The friction-slide provides sufficient friction to operate an unobstructed type-bar in an upward and downward direction. During a type-bar set-up operation, the select pawl will stop the moving type-bar. When this occurs, the type-bar will become stationary and the friction-slide will slip in its type-bar groove.

Type-Bar Type-Casing (Figure 50)

The type-casing is divided into four zone groupings of type that correspond to the four zone groupings of the punched card: 12 or R-zone, 11 or X-zone, 0-zone, and the numerical zone. The groupings are:

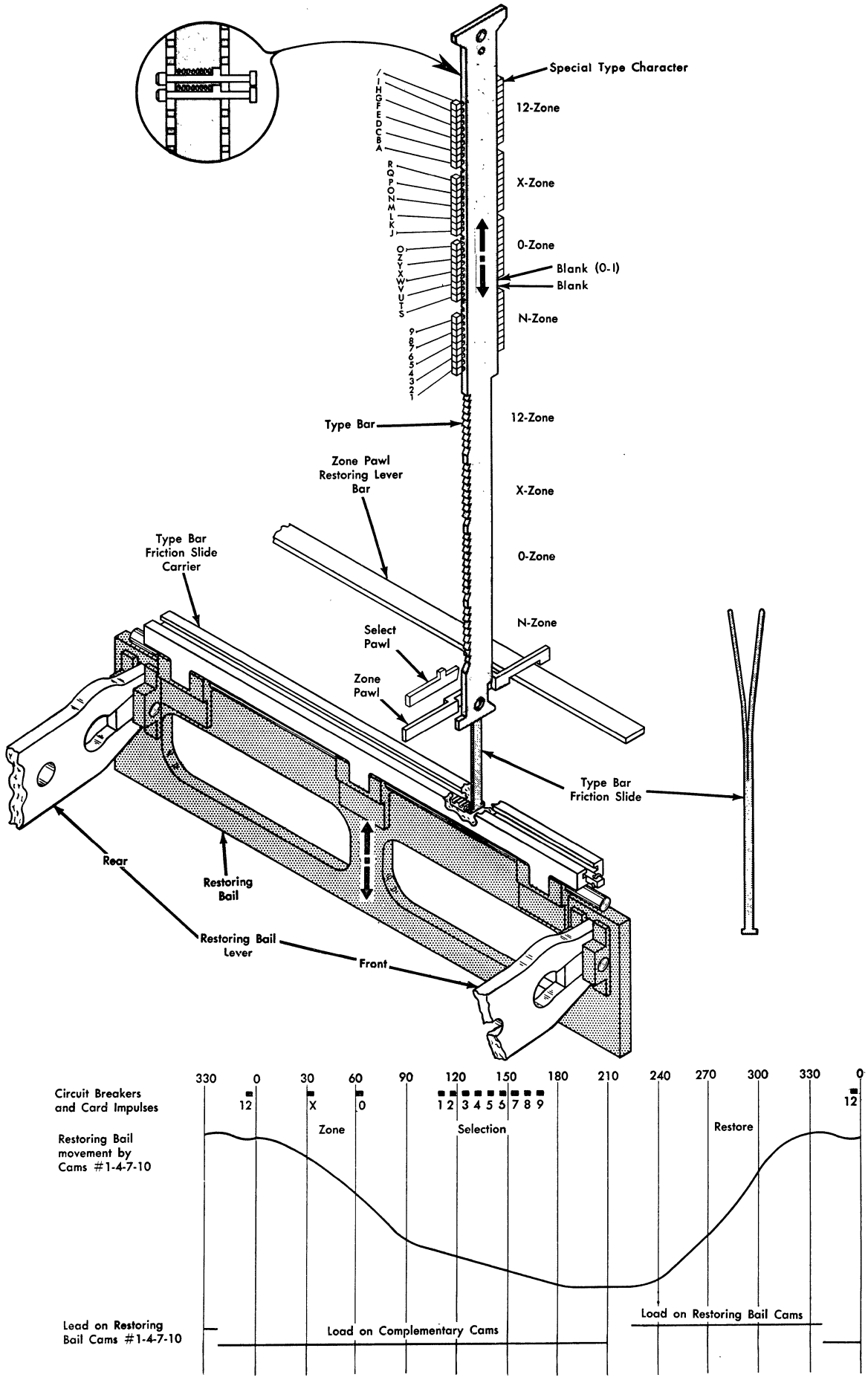


Figure 50. Type Bar and Restoring Bail

12-zone, letters A through I; X-zone, letters J through R; 0-zone, letters S through Z; and the numerical zone, figures 1 through 9. Note that the 0 (zero) type is located immediately above the Z in the 0-zone group, and the two special character pieces of type are located immediately above the I and R type in the 12 and X-zone groups, respectively.

Toothed-Rack Section (Figure 50)

Directly below, and part of the type-bar is the toothed-rack section. The teeth are grouped in the four zone groups, just like the zone-groupings of the type above. Note that there is a type-bar tooth for every piece of type plus a tooth for the blank position just below the "S" type (0-1). This tooth and blank-type position will be used in conjunction with the zero-elimination device and its use will be described later.

During the type-bar set-up portion of the cycle, the type bars will be traveling in a downward direction. When a selection punch hole (1-9) is read by

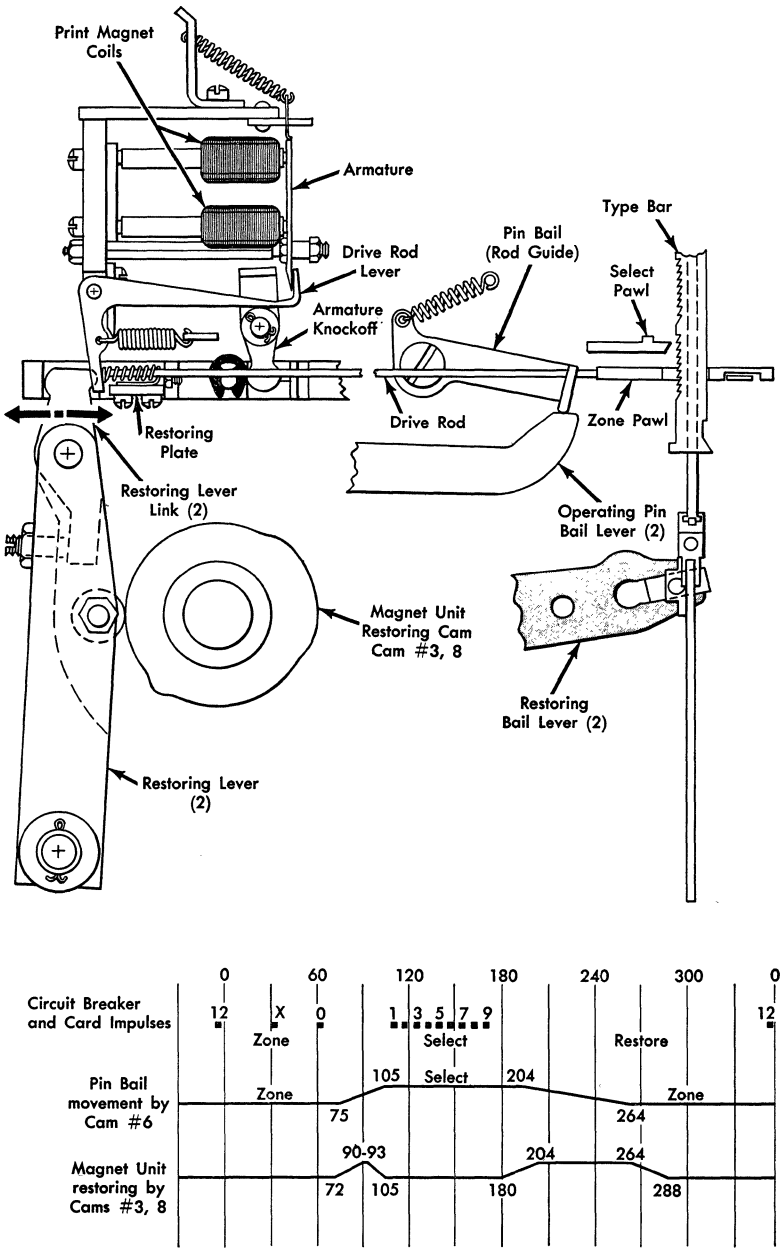


Figure 51. Magnet Unit and Pin Bail

the reading brushes, the print magnet will be energized, thus releasing a drive-rod that will push the select-pawl into the type-bar tooth. The type-bar will be stopped and the friction-slide will slip downward within the bar. At printing time (approximately 210°) the printing pressure bar and its printing-plungers will be cammed toward the type-bar to depress the selected piece of type.

The notch cut in the lower right-hand corner of the type-bar operates in conjunction with the zone pawl. The foot on the type-bar, just below the notch, operates in conjunction with the zone bails. The notch and foot in the type-bar will be completely explained under *Zoning*.

MAGNET UNIT (Figure 51)

THE MAGNET UNIT is located to the left of the print-unit and between the front and rear vertical side castings. The unit is made up of the following parts:

1. 60 pairs of magnet coils, one for each type-bar position and grouped in four rows of 15 coils each.
2. 60 magnet-coil armatures, their drive-rod levers and drive-rods.
3. A drive-rod lever restoring and an armature knock-off mechanism.
4. A pin-bail and pin-bail operating-arm.

The individual magnet energizes and attracts its armature when it receives an impulse from the reading brush. When the armature is attracted, Figure 51, the drive-rod lever will be rotated by an individual spring, resulting in the drive-rod moving to the right and operating the zone-pawl or the selection-pawl.

Pin Bail (Figure 51)

The pin-bail is the unit that makes it possible to operate the zone-pawl and the select-pawl from the same magnet. During zoning time (354° to 64°) the pin-bail will direct the drive-rods toward the zone-pawl, and during selection-time (106° to 173°) the pin-bail will direct the drive-rods toward the selection-pawls. The pin-bail is lifted from the zone-pawl level to the selection-pawl level by cam #6. Spring tension holds the pin-bail cam-follower on the surface of the cam. Refer to the sequence chart in Figure 51 and associate the pin-bail action with that of the zone and selection card impulses.

Magnet Unit Relatch Mechanism (Figure 51)

The magnet-unit is equipped with a drive-rod-lever relatch, and an armature knock-off mechanism. This mechanism operates twice during the cycle; once after zoning (90° to 93°) and a second time after selection (204° to 264°) by cams #3 and #8.

Note: the drive rod levers are relatched during the time the pin-bail is changing the drive-rods from the zone-pawl to the select-pawl. This is accomplished by a linkage and cam #6 on the main cam shaft.

ZONE BAILS (Figure 52)

THE ZONE-BAILS and the zone-bail carrier are located under the contact drum and to the right of the lower end of the type-bars. This unit consists of four bails titled 12, X, 0, and numeric zone bail. These individual bails are mounted on the zone-bail carrier which is cam operated in an up and down direction. The numeric, X, and 0-zone bails are movable on the zone-carrier, and will pivot in an arc to the left to a position to catch the toe of a numeric, X, or 0-zoned type bar. The 12-zone bail is fastened solidly to the zone-carrier in such a position that a 12-zoned type-bar will always rest on the bail.

The sequence chart associated with Figure 52 shows that the zone-bail carrier is stationary during zoning time and the movable zone-bails are cammed in at 71° to 83°. The zone-bail carrier will move downward during selection time with the type-bars resting on the zone-bails. The restoring bail moves faster than the zone-bail carrier.

PRINTING OPERATIONS

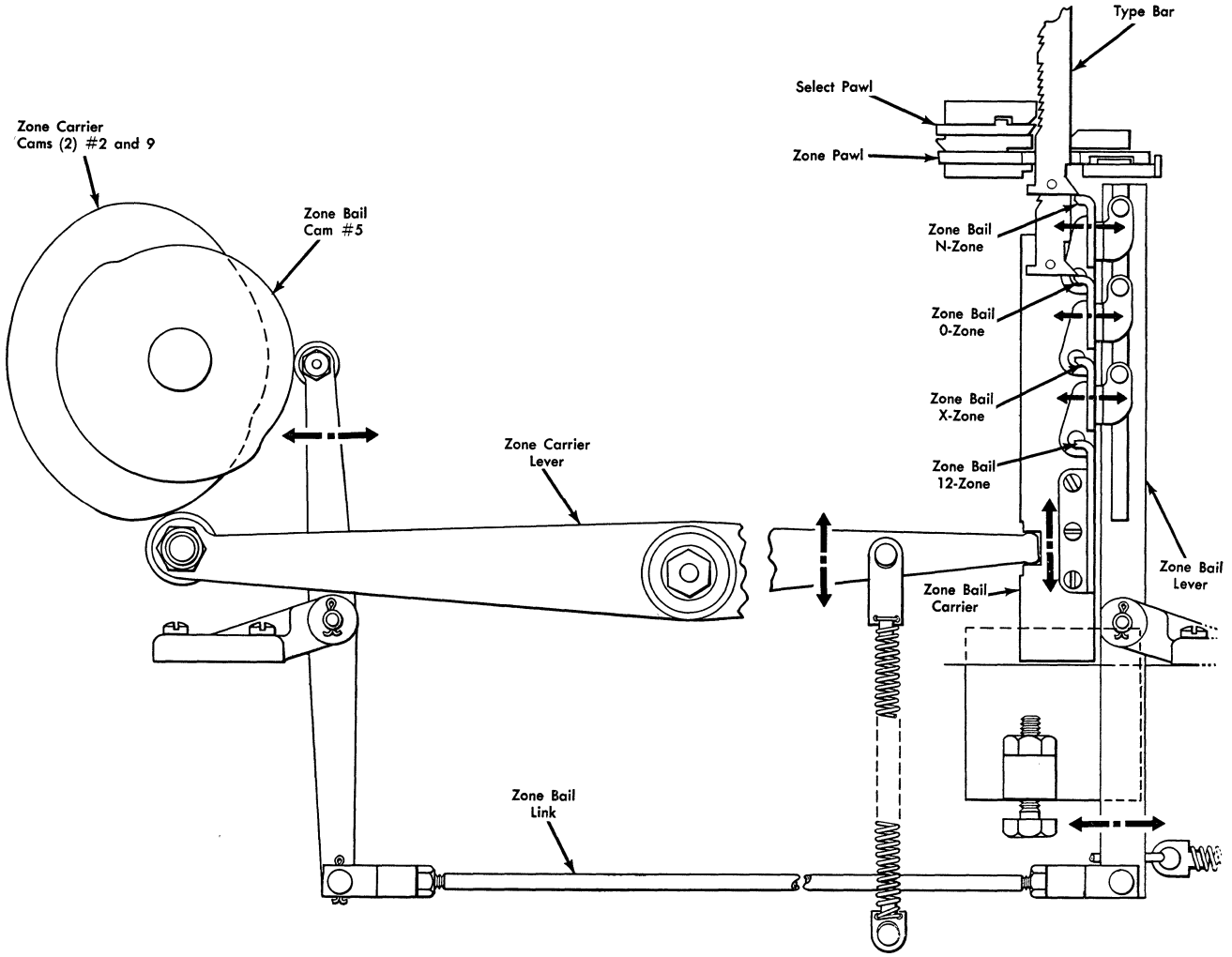
Zoning (Figures 53, 54, 55)

To zone a Type 552 type-bar, several units must function in synchronism. To explain this operation, consider the following conditions on the machine:

1. The machine index starts at approximately 320°.
2. Cards are placed face-down, 12-edge first in the hopper with a card under the control of the contact-drum and the brush-guide roll.

When the machine turns to 343°, two conditions exist:

1. The restoring-bail complementary cams #4 and #7 and their restoring-bail levers have raised the restoring-bail and type-bars to their extreme upward limit (Figure 53).



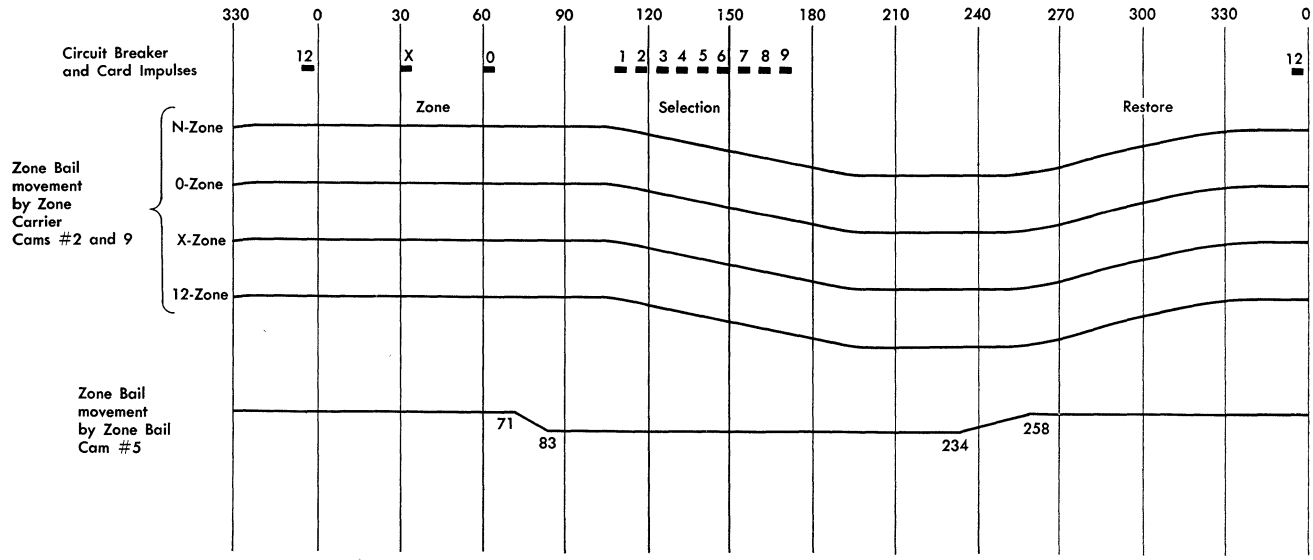


Figure 52. Zone Bails

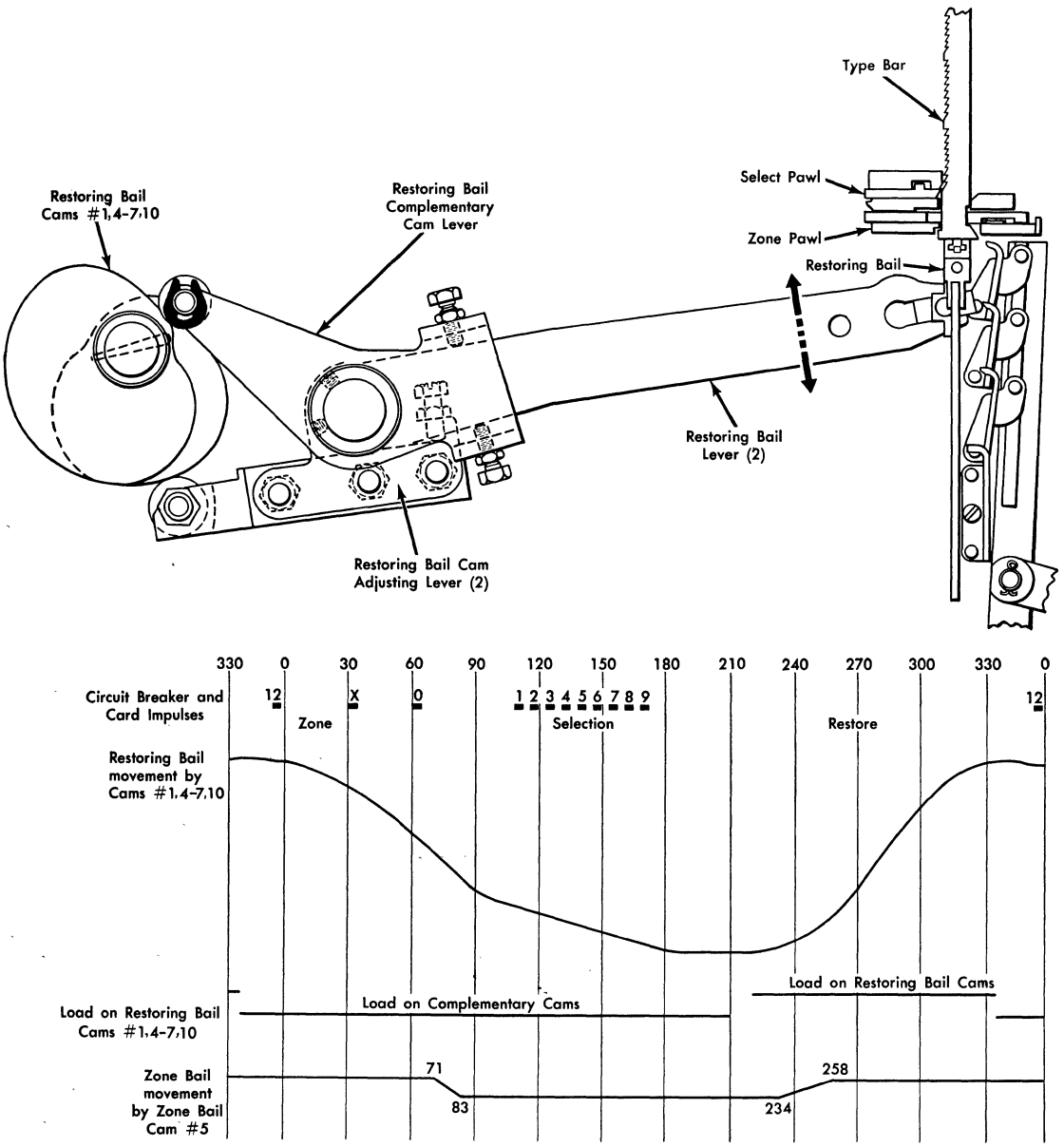
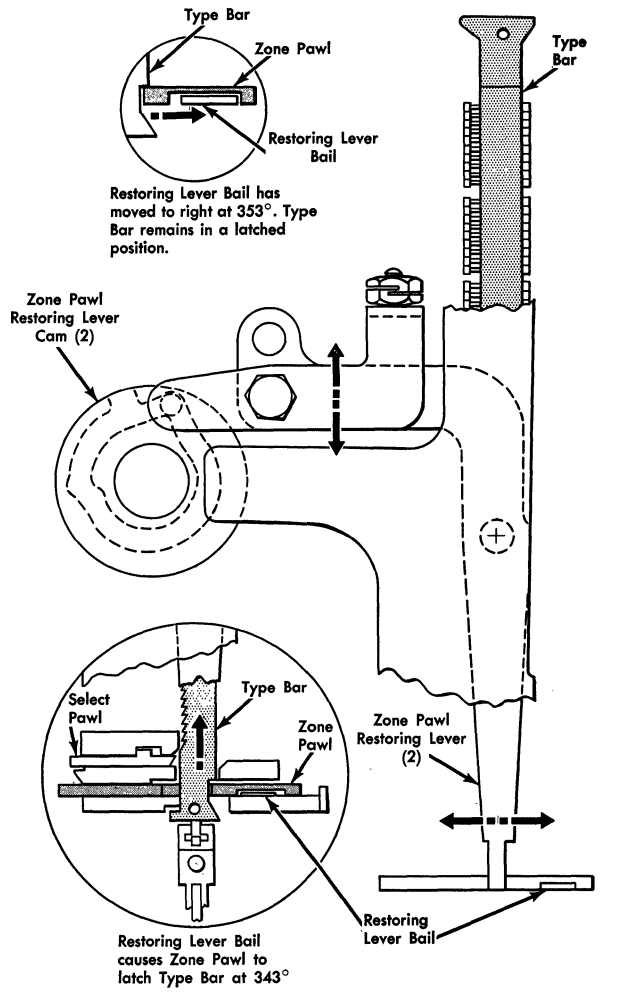


Figure 53. Restoring Bail and Cam

2. The zoning-pawl restoring-lever cams on the print-cam shaft have driven the restoring-lever bail to the left (Figure 54), resulting in the zone pawls moving to the left and latching the type-bars. By 353° the restoring-lever bail will have moved to the right, still leaving the type-bars latched on the zone pawls.

At approximately 0°, the restoring-bail starts downward, but due to the fact that the zone-pawls have latched the type-bars, the type-bar friction-slides will slide within the bar. It will be recalled that the pin-bail has positioned the drive-rods in front of the zone-pawls during zoning-time. When a zone impulse energizes a print-magnet, its drive-rod will strike the zone-pawl, thus releasing the type-bar to allow the bar to move downward under the control of the restoring-bail.

Consider four type-bars operating in a machine, each bar to be positioned in a different zone, 12, X, 0, and numeric (Figure 55). At 354° the 12-zone



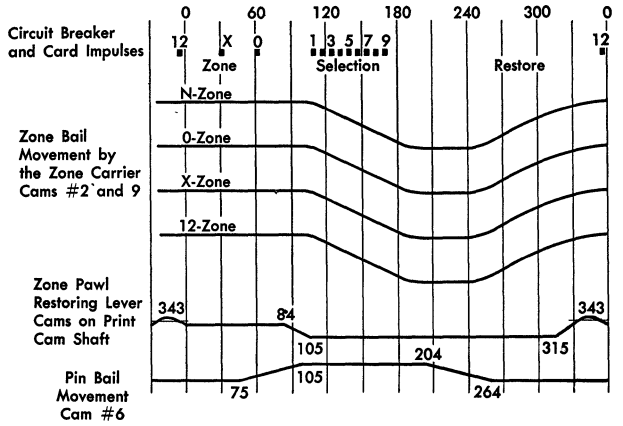


Figure 54. Zone Pawl Restoring

impulse will energize the print magnet and its drive-rod will release the zone-pawl from the type-bar. When the restoring bail starts down at 0°, this type-bar will move with the bail. The remaining three bars are still latched by their zone-pawls and their friction-slides will slip. As the restoring bail continues to move downward, at 30° the X-zone impulse will energize the second print-magnet and its drive-rod will release the zone-pawl from the second type-bar. At this time the second bar will start downward following the restoring-bail. At 60° the 0-zone impulse will energize the third print magnet and its drive-rod will cause the zone-pawl to release the third type-bar. The 12, X and 0-zoned type-bars are now moving downward and positioned at different levels, and the fourth type-bar held by its zone-pawl.

At 77° the movable zone-bails will pivot to the left to a position to catch the toe of the X, 0, and numeric zoned type-bars. The 12-zone bail is stationary and will always catch the toe of a 12-zoned type-bar. The restoring bail will continue its downward travel and the 12, X, and 0-zoned type-bars will rest on their respective zone-bails.

Between 84° and 105°, the zone-pawl restoring-lever bail will operate and release all of the zone-pawls not previously released by their drive-rods. All of the type-bars released in this manner must be considered as being in the numerical group and the toe of these bars will rest on the numeric zone-bail. The fourth bar, illustrated in Figure 55, can be included in this group.

Note that the zoning operation started at approximately 343° and was completed by 105°. At this point the type-bars are zoned and resting on their respective zone-bails.

In Figures 51 through 54 the schematic mechanical sequence charts are to be used to tie together the mechanical motions of the various units during zoning time. These charts will indicate basic timings as well as speed relations. Note that a straight horizontal line represents a stationary object and the slope of a line would represent speed. A change in the slope of a line would represent a change in speed. The greater the slope, the greater the speed. These charts show the timing and speed relationships between the following units.

1. Circuit Breaker and Card Impulses.
2. Restoring Bail.
3. Zone-Pawl Restoring-Lever.
4. Zone-Bail and Zone-Bail Carrier.
5. Pin-Bail.
6. Print-Magnet Restoring.

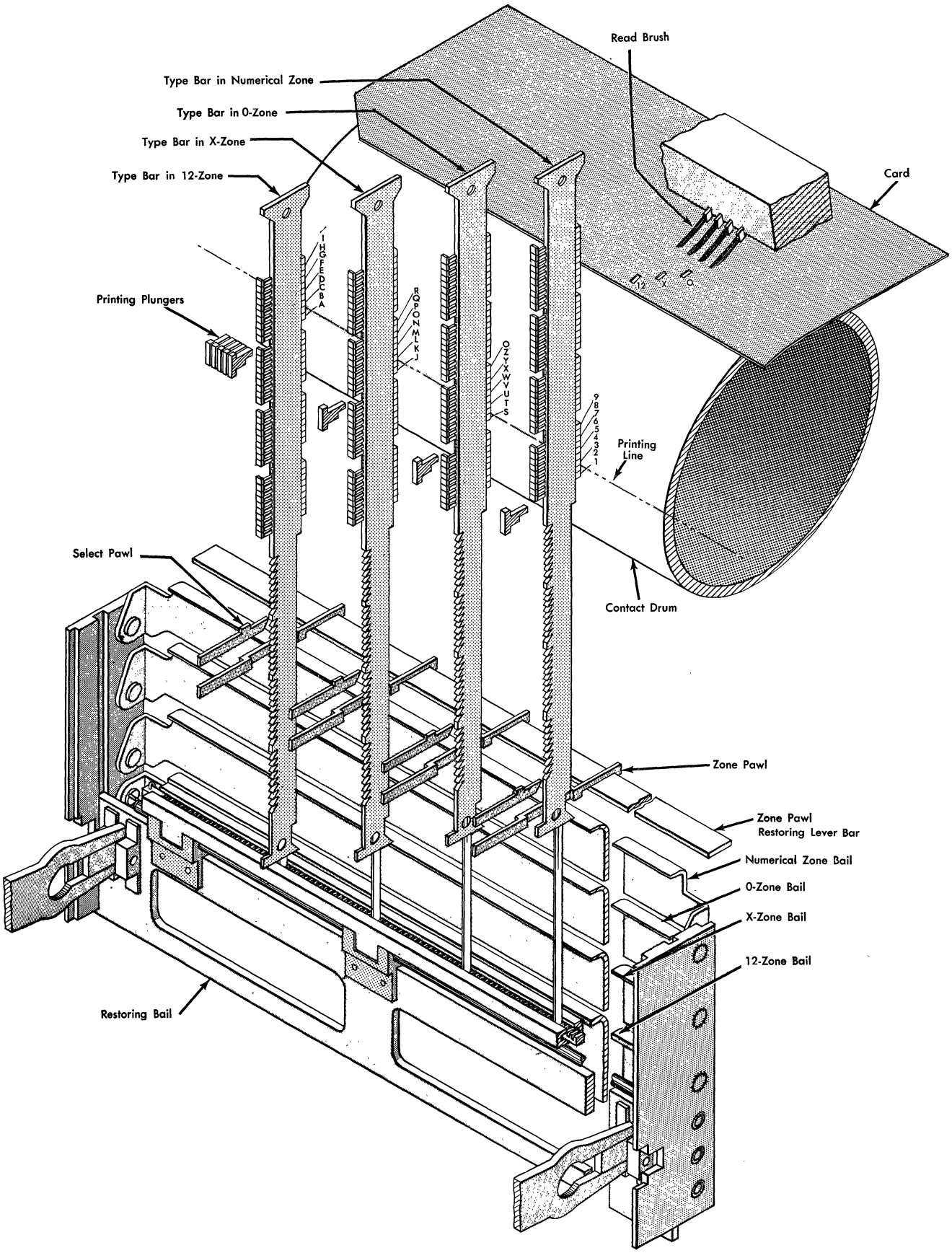


Figure 55. Schematic Drawing of Interpreter Type Bars

Selection

Selection is the process whereby the downward movement of a type-bar is stopped by the energization of a print magnet with a numerical impulse (1-9). The term *selection time* may be explained as the period of time, in degrees (106° to 173°), when the numeric impulses (1-9) occur. The majority of units and parts that perform the zoning of the type-bar will continue to function and perform the selection of the type-bar. An individual type-bar being zoned and selected will result in the type-bar being set up to print an alphabetical character.

Figure 55 illustrates the position of four zoned type-bars at the completion of the zoning operation and can be considered as the position of the bars at the beginning of the selection operation. Figures 51 through 54 contain schematic sequence charts that can be used to tie together the mechanical operation of the various units during *selection time* as well as *zoning time.*

CB's 4, 5 and 6 provide the machine with nine four-degree impulses that are used to read the 1 through 9 digit holes punched in the card. The "1" impulse will occur between 108° and 112° and the "9" impulse will occur between 168° and 172°. All nine digit-impulse timings can be determined from the sequence charts.

The restoring-bail and the zone-carrier bail (Figures 52 and 53) work in conjunction with each other to move the type-bars in a downward direction. By comparing the slope of the lines representing the restoring-bail and the zone-carrier bail, it can be seen that the restoring-bail moves faster than the zone-carrier bail. This action keeps the toe of the type-bar resting firmly on the restoring-bail. Note that the slope of the line representing the downward speed of the restoring-bail is less during selection time than it was during zoning-time. This signifies that the downward speed of the type-bars is less during selection-time than during zoning-time. The movable pin-bail (Figure 51) makes it possible for one print-magnet to receive a zone impulse and a selection impulse, and to operate the zone-pawl and the select-pawl, respectively. The illustration and sequence chart (Figure 51) shows the position of the pin-bail and drive-rods during zoning time. Note that the pin-bail cam raises the pin-bail and drive-rods between 75° and 105°, this time being between the 0-zone impulses and the 1-selection impulse.

Figure 51 also illustrates the print-magnet restoring-mechanism which latches the drive-rod lever on its armature. The sequence chart shows that this mechanism operates twice in one cycle: after zoning (90°-93°) and after selection (204°-294°).

The downward movement of the type-bars during selection time is under the control of the zone-carrier cams, #2 and #9 (Figure 52). The zone-carrier cam-followers, on either side of the unit, pivot on adjustable, eccentric bearings. These eccentric bearings provide a means whereby the correct vertical relationship between the tooth of the type-bar and the toe of the select-pawl can be established at brush-reading time.

As the type-bars start downward at the beginning of selection time, the following machine conditions will exist (Figure 55).

1. Previously zoned type-bars will be positioned and firmly held on their respective zone-bails by the faster moving restoring-bail.
2. The drive-rod levers will be latched on their print-magnet armatures.
3. The pin-bail will have the drive-rods aimed at the select-pawls.
4. The contact-drum and the card will move in synchronism with the type-bars.

Circuit Breakers 4, 5 and 6 provide a timed impulse for every one of the selection digits (1-9). When the brush reads a selection hole in the card, the print-magnet is energized, its armature is attracted, and its drive-rod strikes and depresses the select-pawl. Note in Figure 55, that the construction of the select-pawl is such that, when depressed, it engages the tooth of the type-bar and stops its downward movement. When the type-bar has been stopped and the restoring-bail and zone-carrier bail continues its downward travel, the friction-slide will slide within the type-bar.

The card movement and type-bar movement are synchronized; when a brush reads a 5 hole in the card, the select-pawl stops the type-bar in the 5th tooth of its respective zone. The combination of a zoned and selected type-bar automatically positions the type-bar to print the desired character.

The absence of a zone impulse and the presence of a selection impulse, positions the type-bar in the selected digit position of the numeric zone.

The absence of a zone and selection impulse would

signify a blank column of the card, or an unwired type-bar position. This condition would position the type-bar on the numeric zone-bail and in the blank type position above the nine type characters resulting in no printing from this bar.

Zero Printing

The type-bar is set up in the zero-zone only to print the zero character. Note in Figure 55 that the zero-zone group of type consists of the alphabetical characters S through Z, plus the zero, also that the (0-1) type position is blank.

When a brush reads a zero hole in the card, the type-bar will be positioned on the zero zone bail during the zoning operation. Due to the absence of a selection hole (1-9) punched in the card, the zero-zoned type-bar will remain on the zero-zone bail during selection time. This operation positions the zero type in front of the printing-plunger.

Special Character Printing

The Type 552 is capable of printing two special characters, such as the $, *, /, \, #, etc. These individual pieces of type are placed in the blank position above the I and the blank position above the R.

When a brush reads an X-hole or a 12-hole in the card, the type-bar is zoned and positioned on the X or 12-zone bail. With the absence of a selection hole (1-9) punched in the card column, the 12 and X-zoned type-bars remain on their respective zone-bails during selection time. This operation positions the special type characters in front of the printing-plunger.

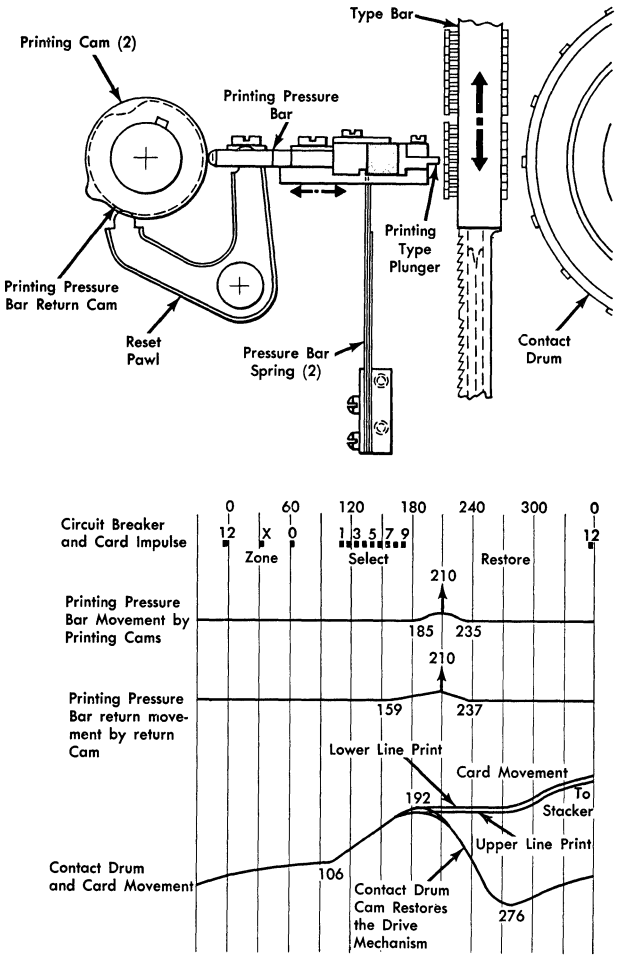


Figure 56. Printing

Printing (Figure 56)

Printing is accomplished in the Type 552 machine by the pressure method of printing. At a fixed and definite time in the cycle of operation, two printing cams, mounted on the print-cam shaft, operate against the camming surface of the printing-pressure bar, moving it toward the type. On the bar are 60 individual printing-type-plungers, one for each of the 60 type-bars. All of these plungers are backed with a thick rubber thrust-strip, to assure an even pressure of the plungers against the type. Effectively, the type is pressed against the inked ribbon, and the ribbon against the card to produce the printing. The large contact-drum serves as a platen as well as a feed-roll.

The printing-pressure bar is equipped with a cam-operated positive-return mechanism (Figure 56). This mechanism prevents the printing-plunger from being in contact with moving type-bars. There are two flat springs that assist in moving the pressure-bar away from the type after printing. Note the two slots in the printing-pressure bar for the insertion of the return springs.

In conjunction with the illustration of the printing-pressure bar (Figure 56) mechanical motion sequence charts are provided to show the pressure-bar action in relation with the card movement. Note that printing takes place after zoning and selection and at a time when the contact-drum and card are stationary.

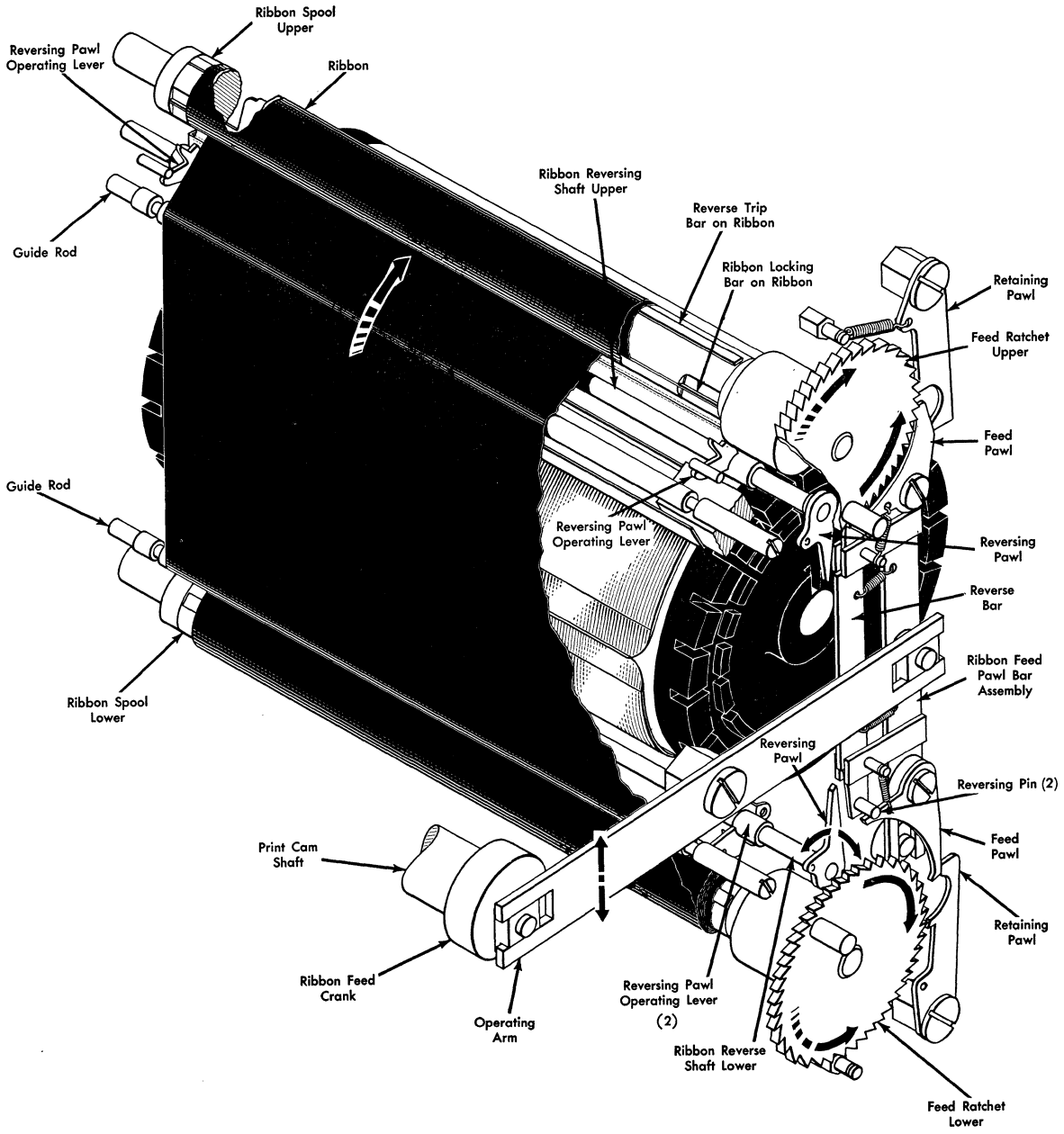


Figure 57. Ribbon Unit

RIBBON UNIT (Figure 57)

THE RIBBON FEEDING and reversing unit mechanism is located on the front of the vertical machine casting. The two ribbon spools and reversing controls extend horizontally between the front and rear vertical machine castings; one set above and one below the contact-drum. The ribbon used on the Type 552 machine is as wide as the card and moves vertically between the contact-drum, ribbon-shields and the type-face. The ribbon rolls from one spool to the other, reverses and rolls back. On either end of the ribbon are located two light metal bars; the ribbon-locking bar, and the reverse-trip bar. The ribbon-locking bars anchor the ends of the ribbon in the ribbon spools and the reverse-trip bars operate the reversing mechanism.

All of the mechanical motion that operates the ribbon-unit mechanism originates from the ribbon-

feed crank on the front end of the print-cam shaft. This cam operates the ribbon-feed operating arm which, in turn, causes a vertical up-and-down motion of the ribbon-feed-pawl bar-assembly. Attached at either end of the feed-pawl bar are the two ribbon-feed pawls which operate the upper and lower ribbon-feed ratchets respectively. These two feed-ratchets are located on the front ends of the ribbon spools. One of the two feed-pawls will always be engaged to operate its ribbon-feed ratchet.

When the ribbon has reached the end on one spool, the reversing-trip bar operates against the reversing-pawl operating-lever, causing the ribbon-reversing pawl to position itself in line with the reversing mechanism on the ribbon-feed-pawl bar. The next up or down movement of the ribbon-feed-pawl bar will trip the reverse bar, which reverses the feed-pawls to cause the ribbon to wind on the empty spool.

To trace the operation of the ribbon-feeding mechanism, assume that the upper feed-pawl is engaged to drive the feed-ratchet and feed the ribbon upward. With this condition on the unit, the reversing bar

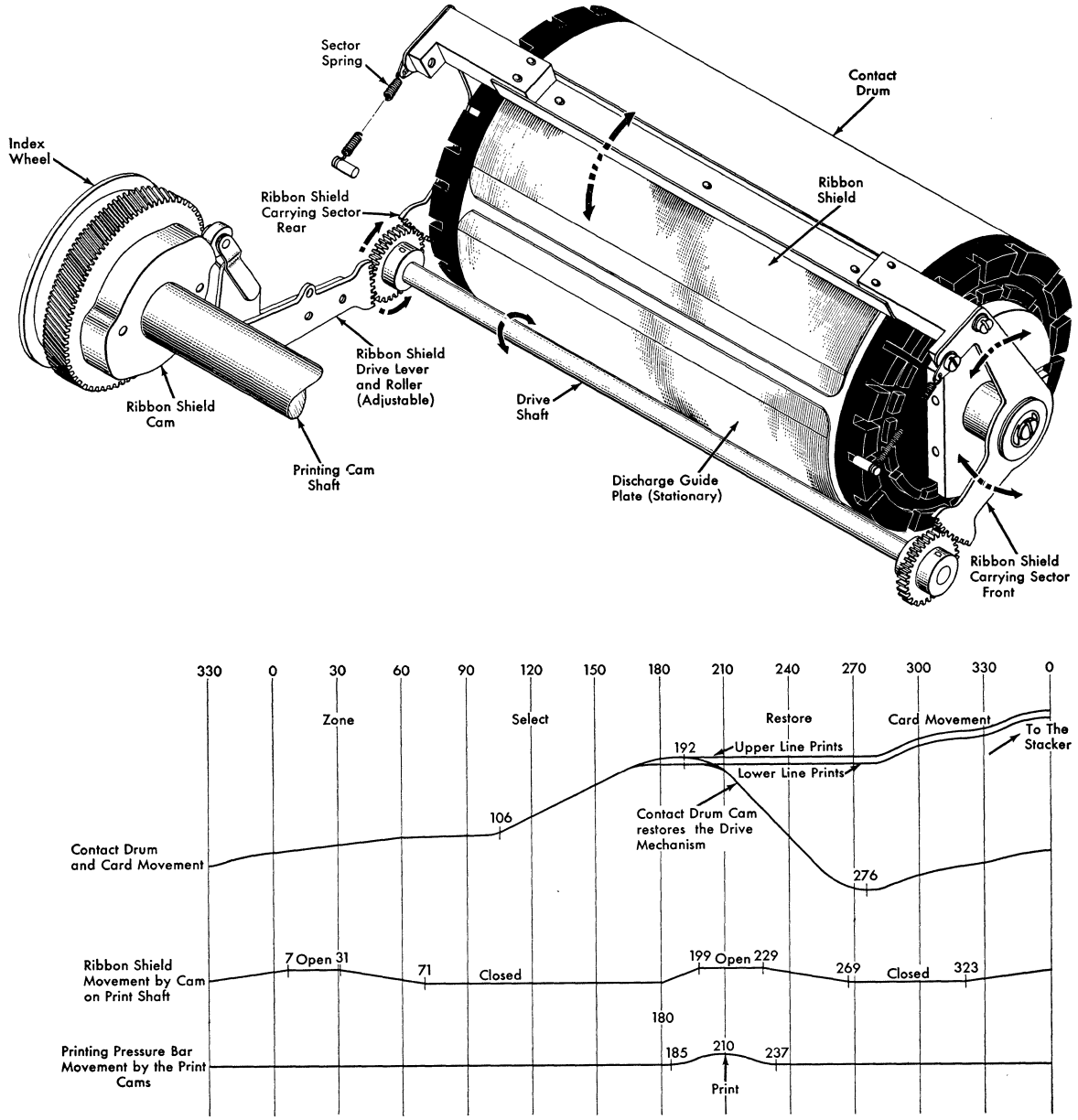


Figure 58. Ribbon Shields

and the lower reversing pin hold the lower-feed-pawl and retaining-pawl away from the lower feed-ratchet.

Each machine cycle the print-cam shaft and the ribbon-feed crank will turn one complete revolution. The ribbon-feed operating-arm will pivot on its center stud and complete an up and down motion of the ribbon-feed-pawl bar. On the downstroke of the ribbon-feed-pawl bar, the lower feed-pawl will slide past a tooth on the lower ratchet; on the upstroke, the upper feed-pawl will engage in the tooth of the ratchet wheel and move the wheel and ribbon the distance of one tooth. The ribbon-feed retaining-pawl holds the ratchet wheel in a fixed position until the next cycle when the operation repeats itself.

The operation of feeding the ribbon downward and winding it on the lower spool is identical except that the lower feed-pawl turns the lower feed-ratchet and the ribbon is advanced on the downstroke of the ribbon-feed bar.

Ribbon Shields (Figure 58)

Located between the type-unit and contact-drum are two curved ribbon-shields. These two shields serve as a card guide and also protect the card from actual contact with the inked ribbon. The lower ribbon-shield or discharge guide-plate is located in a fixed position so its upper edge is below the printing line. The upper ribbon-shield is movable and its action is controlled by springs and the ribbon shield cam located on the print-cam shaft. The two sector springs close the ribbon-shields and the cam action opens them. This cam action causes the ribbon-shield to open twice during each machine cycle; once during printing time (199° to 229°) and the second time when the card moves under the upper edge of the ribbon-shield (7° to 31°). The opening of the ribbon-shield increases the clearance between the upper edge of the shield and the contact-drum at the horizontal card line.

Figure 58 illustrates the ribbon-shields, their operating mechanism and a mechanical action sequence chart.

CIRCUIT BREAKER UNIT (Figure 59)

THE CIRCUIT-BREAKER unit, located on the rear vertical machine casting, performs two machine functions.

1. The vertical shaft connects the horizontal drive-shaft with the main cam-shaft.
2. The vertical shaft and its nine individual cams and breaker points provide timed electrical impulses for machine operation.

Note that the circuit-breaker unit will run at a constant speed because it is being driven by the constant-speed horizontal drive-shaft.

Looking at the circuit breaker unit from the rear of the machine, circuit breakers 1 through 4 are located on the shaft projection above the unit casting. Circuit-breakers 5 and 6 are located to the left of circuit-breakers 1 through 4, and are operated by the two cams on the horizontal drive-shaft. The five circuit-breakers, located within the circuit-breaker unit, are called C-cams (continuous or control). There is space provided for 8 circuit-breakers in this unit. The upper two circuit-breaker positions, C1 and C2, are used when the machine is equipped with class selectors. C4 is an unused circuit-breaker position.

The older type 552 machines used contact-fingers instead of circuit-breakers for the continuous or control cams.

Circuit breaker and C-cam impulse timings can be found in the electrical timing chart, associated with the wiring diagram.

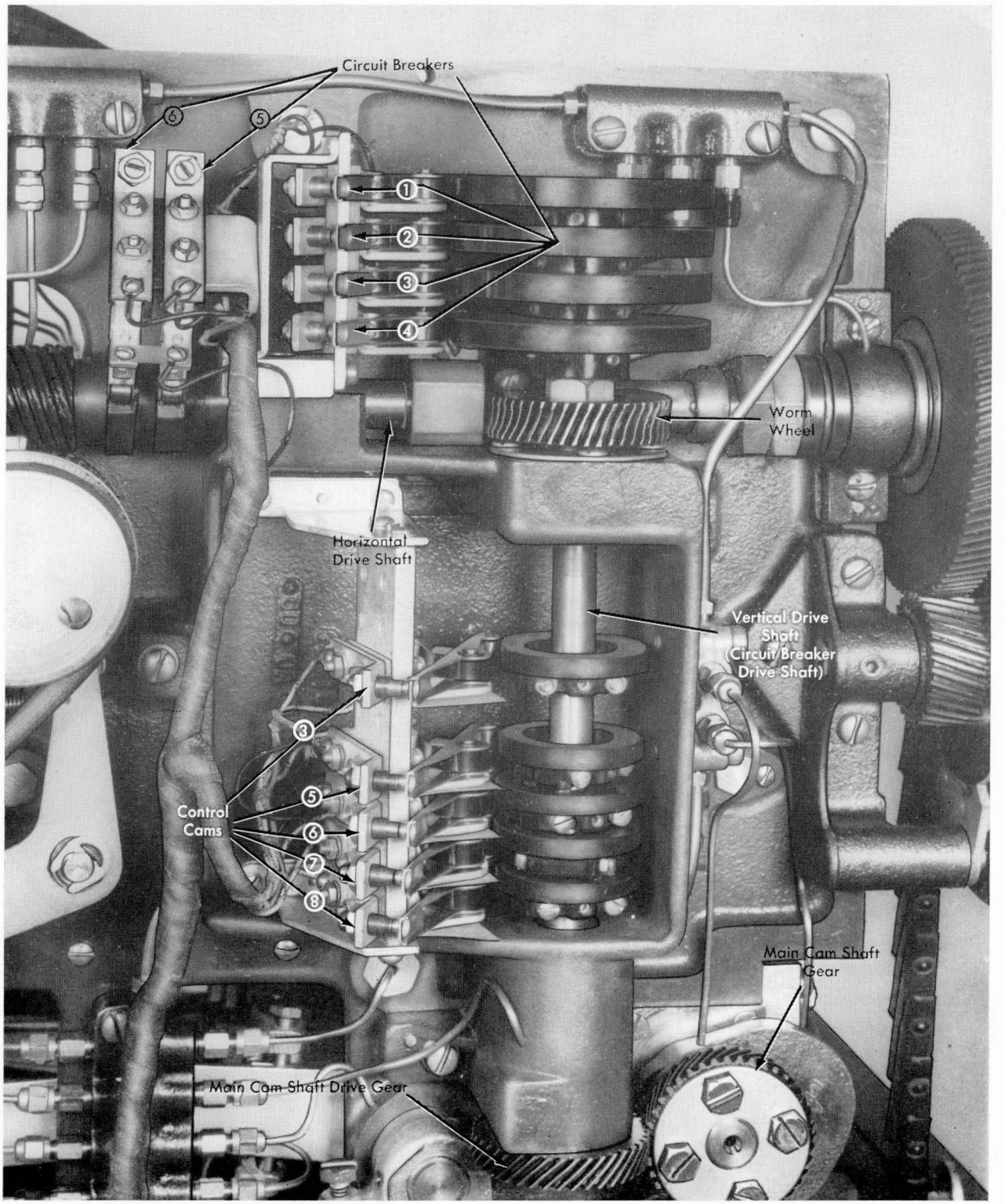


Figure 59. Circuit Breaker Unit

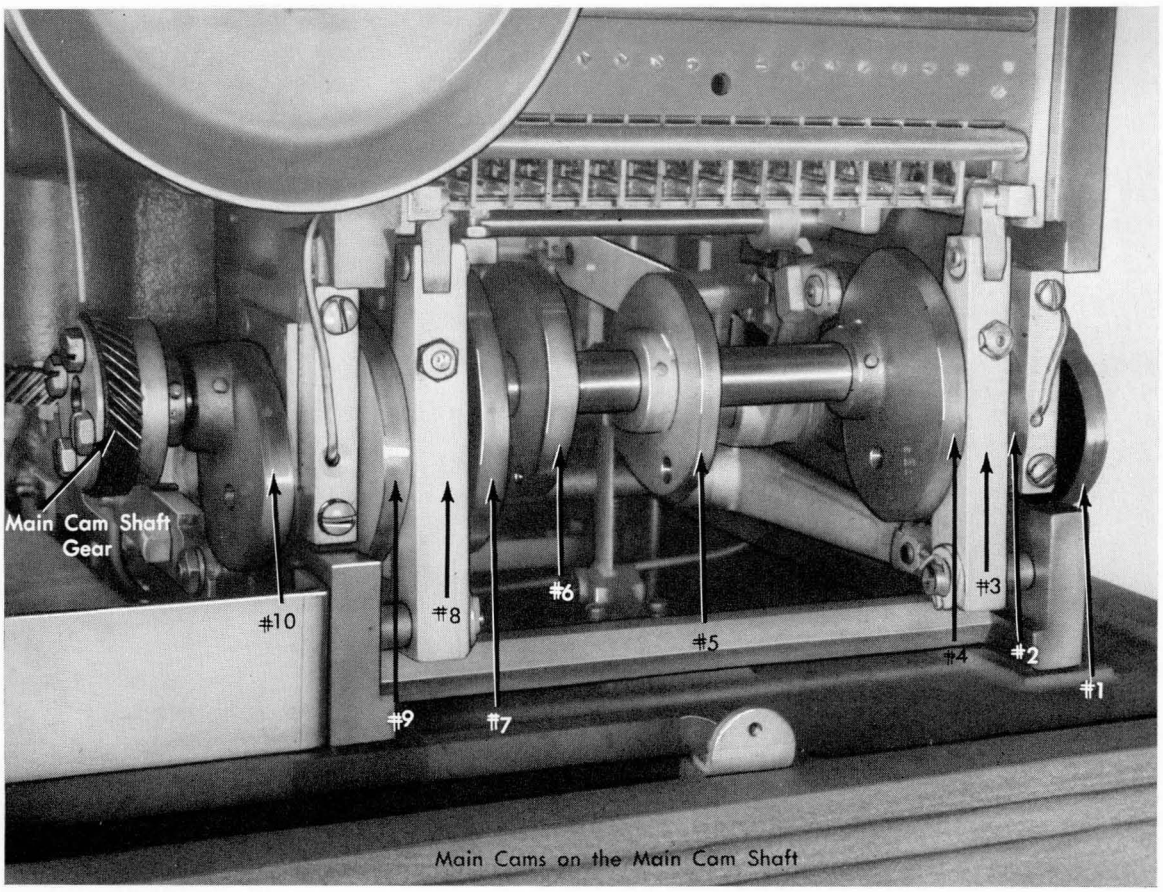


Figure 60. Main Cam Shaft

MAIN CAM SHAFT (Figure 60)

THE MAIN CAM-SHAFT is located on the left side of the machine and extends between the front and rear vertical machine castings. This shaft is gear driven from the lower end of the circuit-breaker or vertical drive shaft. Located and pinned on the main cam-shaft are ten cams. Numbering the cams from the front to the rear of the machine, the ten cams and their purposes are as follows:

1 and 10 Restoring-Bail Cams. These cams restore or raise the type-bars to their normal position.

4 and 7 Restoring - Bail Complementary - Cams. These cams govern the downward travel of the restoring bail. The downward rate of travel of the type-bars during zoning time is controlled by the restoring bail.

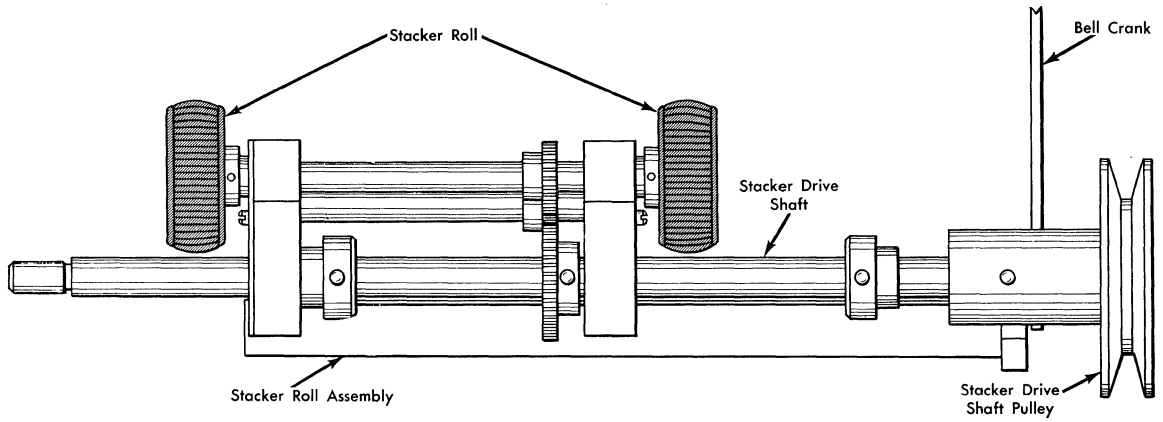
2 and 9 Zone-Carrier Cams. These cams govern the downward travel of the zone-bails during selection time.

3 and 8 Magnet Unit Restoring-Cams. These cams restore the magnet-unit to its normal latched position twice in each cycle; once after zoning and once after selection.

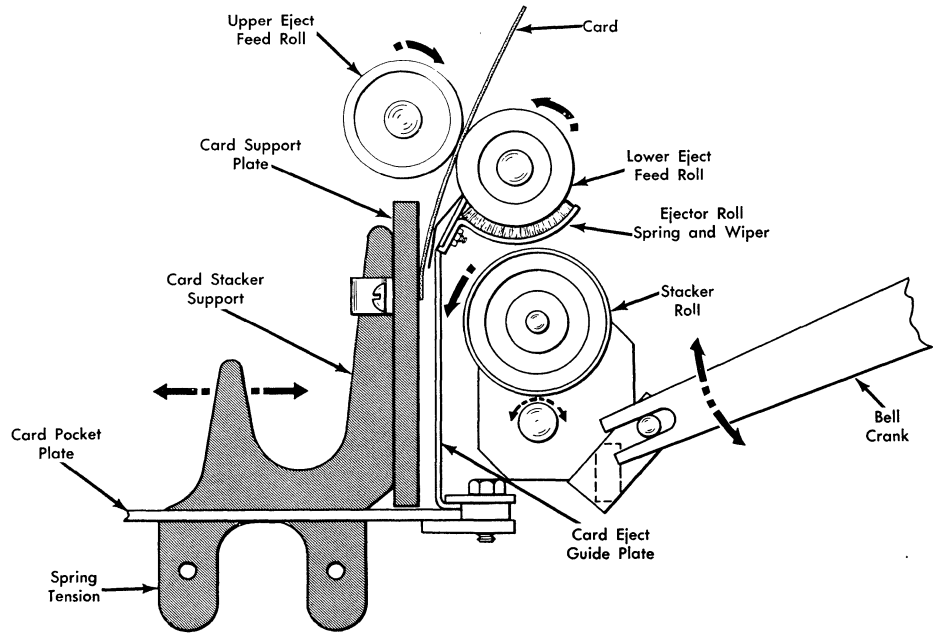
5 Zone-Bail Cam. This cam controls the IN and OUT movement of the zone-bails; IN — under the toe of the type-bars, OUT — clear and free from the type-bars.

6 Pin Bail Cam. This cam operates the pin-bail, placing the drive-rods in their UP selection position or DOWN (zone) position.

Note that the main cam-shaft is driven from the horizontal drive-shaft through the vertical drive-shaft. This will result in the main cam-shaft rotating at a constant speed for all machine operations.



Right End View



Rear View

Figure 61. Stacker Unit

STACKER UNIT (Figures 61 and 62)

INTERPRETED CARDS are stacked in the stacker unit which is located under the card-feed hopper. The stacker unit consists of the stacker-roll assembly, card-eject-guide plate, card-pocket plate, and the card-support plate. The stacker-rolls friction-feed the printed cards between the eject-guide plate and the card-support plate. As the printed cards increase in number in the stacker, the spring-operated support-plate moves to the left, but always holds the cards in a neat stack. The machine operation is under the control of a stacker-contact that will stop the machine when the stacker is full.

After the card has been printed and the contact-drum starts to turn (approximately 282°) the gripper-fingers on the contact-drum release the card as it is fed into the eject feed-rolls. These rolls turn with the contact-drum and will continue the card movement into the stacker. The eject feed-rolls do not feed the card to its final stacked position.

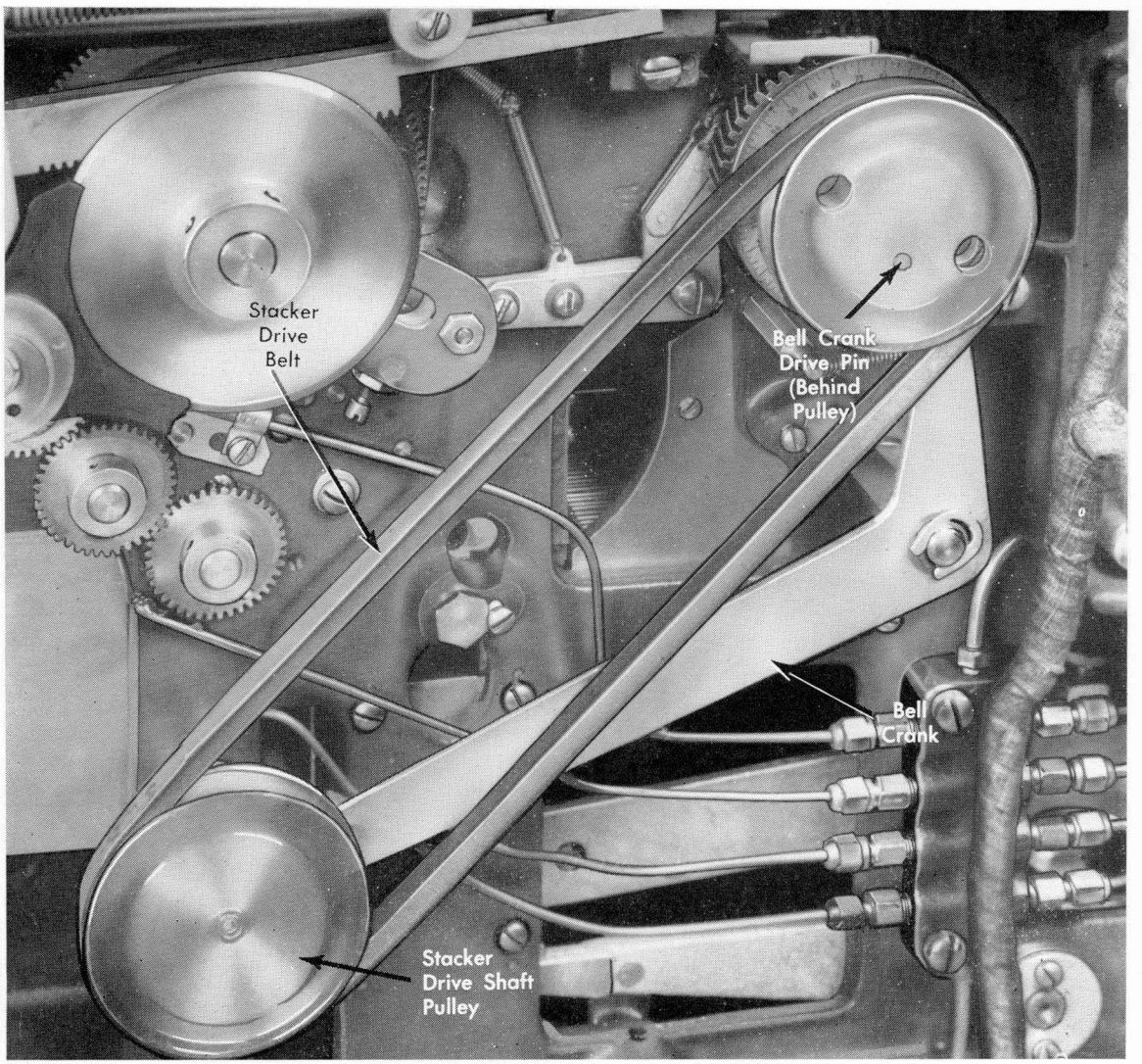


Figure 62. Stacker Drive Mechanism

When the card is fed into the stacker, the stacker-feed-roll assembly has been positioned to the left and away from the card (front view). The stacker rolls turn continuously because they are driven by a V-belt from the print cam-shaft (Figure 62). Once each cycle, the bell-crank drive-pin on the print cam-shaft strikes against the bell-crank, which in turn causes the stacker assembly and stacker feed-rolls to pivot to the left (rear view). The revolving stacker feed-rolls now strike the card and, with friction, drive the card into the stacker. The bell crank then pivots back to its normal position allowing the stacker feed-rolls to pivot to the right and away from the card.

CARD JAM CONTACT (Figure 63)

THE CARD JAM CONTACT can be located in one of two places; under the card-feed hopper on older machines and on the front side frame to the immediate right of the ribbon-feed mechanism on later machines. This contact — a transfer contact — is mechanically operated by cards moving through the eject-roll station, i. e. the upper contact-points will be closed by the presence of a card and the lower contact-points will be closed by the absence of a card. An interlock circuit functions in conjunction with the jam contact to keep the machine in continuous operation as long as cards move correctly through the eject-roll station and into the stacker.

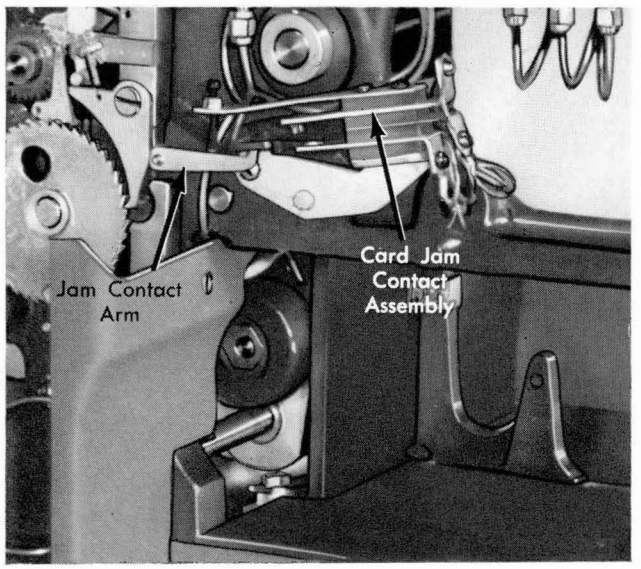


Figure 63. Card Jam Contact

In the circuits section of this manual, page 68, a combination mechanical-electrical sequence chart illustrates the electrical function of the jam contact.

BIJUR LUBRICATION SYSTEM (Figure 64)

THE TYPE 552 Alphabetical Interpreter is equipped with one of two types of Bijur Lubrication Systems, automatic or manual. Earlier machines are equipped with a manually operated Bijur pump, while later machines are equipped with an automatic Bijur pump. Both systems supply lubricating oil through a network of copper tubing to the majority of lubrication points on the machine. Each branch oil-line in the tubing network contains a metered plug: metered to the extent that only a given quantity of oil will pass for each pump operation. Large, heavy bearings should receive more lubrication than a small, light-duty bearing; therefore the metered plug should be selected to suit the job.

The automatic Bijur pump supplies lubrication in a direct ratio to machine operation. The manual Bijur pump requires a periodic manual operation of the pump handle. The question is always asked, How often should I pull the Bijur pump plunger? Suggestion: Try pulling the plunger every time the machine ribbon is changed. Watch for over or under-lubrication and govern accordingly. The ribbon-changing operation should be close to a direct ratio to machine operation.

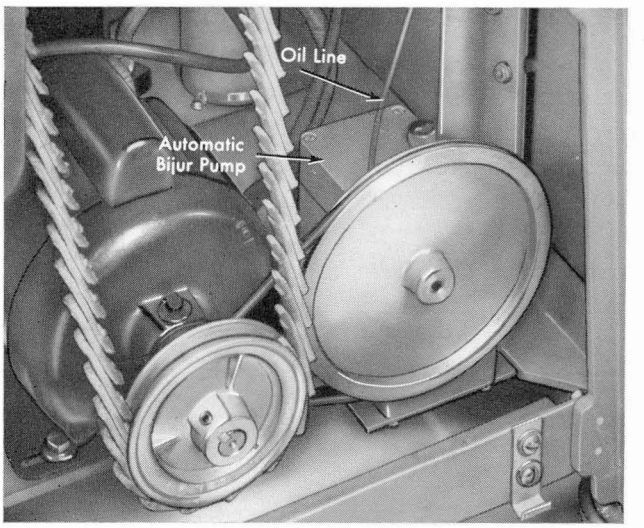


Figure 64. Bijur Lubrication System

CIRCUIT DESCRIPTION

Wiring Diagram — 161561T

THE CIRCUITS for the Type 552 Alphabetical Interpreter can be classified as follows:

1. Power circuits
2. Start and running circuits
3. Read and print circuits
4. X-Elimination circuits
5. Dynamic braking circuit

Power Circuits (Assume a 115 volt AC — 60 cycle machine)

Ground (1A). The power cable contains three wires; two for power and one to ground the machine frame to the electrical system of the building. The ground wire (green) is connected to the machine frame. It is possible to remove the grounding feature for testing and service work by removing the thumb screw in the power cable. Never leave a supposedly grounded machine ungrounded as a very serious accident might result.

Transformer (2A). When the main line switch is turned ON, a circuit is completed from power binding post 5 through the main line switch, thermal element, power post 8, extractable rectifier fuse, power post 6, transformer primary winding, power post 7, main line switch, power post 4, to the other side of the line.

The step-down transformer produces approximately 33 to 35 volts AC at the secondary winding, which will be changed to 46 ± 2 volts DC by a selenium rectifier and filter. The primary winding is tapped to provide the customer engineer with a means of regulating the DC output voltage of the rectifier when a small AC line voltage variation is discovered. Some transformers provide a tapped secondary instead of a tapped primary winding.

Rectifier and Filter (2A). The Type 552 Alphabetical Interpreter is equipped with a full-wave selenium rectifier to convert the AC voltage supplied by the transformer to 46 ± 2 volts DC with no load on the machine. Connected across the DC output leads of the rectifier are two 8,000 mfd capacitors to provide filter action. Also connected across the DC output of the rectifier is a 100-ohm, 25-watt resistor which discharges the capacitors when the machine is turned OFF and provides a constant electrical load to improve the regulation.

The negative terminal of the DC supply is connected to post 3 of the 40-volt terminal block and through a 6-amp fuse to machine binder post 1. The positive terminal of the DC supply is connected to post 1 of the 40-volt terminal block and through a 6-amp fuse to post 6 of the machine terminal block.

A machine signal light is connected across posts 1 and 6, and when the main line switch is ON, the signal light glows. HD2 relay will also be energized — post 6, 7 to 1B as a terminal, through 3B N/C, HD2 relay coil and post 1.

Start and Running Circuits (without cards)

The completion of the drive motor circuits is dependent upon the energization of HD1 relay. When this relay is energized, the following circuit supplies line power to the drive motor: main line switch, post 7, HD1 N/O, post 1, drive motor, post 8 and main line switch.

When the start key is depressed, the following circuits are completed to start the machine.

1. (3A, B) Posts 6, 7, start key, R1 coil, stop key, stacker stop switch, and posts 2 and 1. No hold circuit available at this time.
2. (3A) Post 7, 1B N/O, HD1 and R3 coils, and post 1. HD1 and R3 is held through C8. Note: when R3 is energized, the 3B N/C points will open and HD2 will be de-energized.

Without cards in the machine, the start key must be held closed to keep the machine in operation.

Start and Running Circuits (with cards)

When R1 is energized and the R1B points have transferred, the motor relay will be energized and the drive motor will operate the machine. When the R1A points close, a second circuit is completed under certain specific conditions. This circuit is from

post 1 to post 2, stacker stop contact, stop key, R1 coil, R1A N/O, C5 (M284°-B254°), C7 (M87°-B57°), post 8, post 6. The lower contact points of the card-jam contact are in parallel with C5 and the upper points are in parallel with C7. Now, if the lower contact points are closed when C5 opens and the upper points are closed when C7 opens, the hold circuit for R1 will not be interrupted.

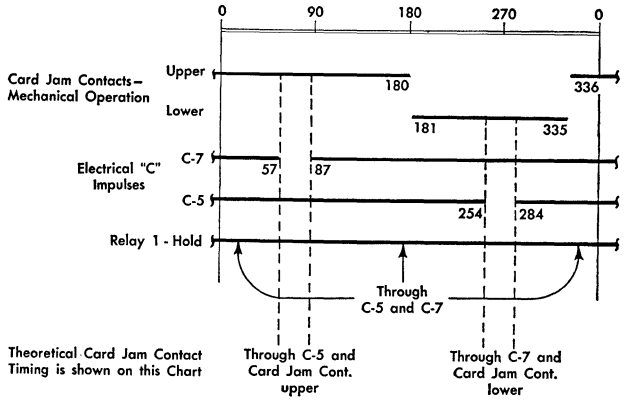


Figure 65. Continuous Running Operation

The card-jam contact and its operating mechanism have been designed so that for a fixed period of time the lower contacts are closed and for a fixed period of time the upper contacts are closed. The sequence chart (Figure 65) shows that mechanically the upper card-jam contacts are closed between 336° and 180° of a machine cycle. The lower card-jam contacts are closed from 181° to 335°. The break in contact duration of C7 is overlapped by the upper card-jam contact and the break in contact duration of C5 is overlapped by the lower card-jam contact. When cards are feeding correctly, R1 will be held energized and a pick circuit is provided through the R1B N/O points to pick the HD1 relay and R3.

If at any time during machine operation cards fail to feed, or feed incorrectly, the mechanical operation of the card-jam contact will be interrupted and the hold circuit for R1 will be opened. The R1A and R1B points will return to their normally open condition. When R1A opens, the R1 hold circuit is opened making it impossible for R1 to be re-energized if the card-jam contact resumes normal operation; it can be re-energized only by depressing the start key. The R1B points open the pick circuit to HD1 relay and R3.

The hold circuit for R3 and the HD1 relay comes into effective operation at this time. The circuit is as follows: post 1, HD1 relay and R3 in parallel, R3A N/O, C8 to C7, C6, post 8, post 7, and post 6. C8 with R3A points will keep R3 and the HD1 relay energized until it breaks at 140°. This circuit assures the machine will complete the reading and printing of a card, once it has been started.

The mechanical timing given in Figure 65 for the card-jam contact occurs when the machine is set to print on the upper line. When the machine is set to print on the lower line, the card will be advanced and cause the upper card-jam contact to be closed between 306° and 168°. This timing will overlap the break in C7 (57° to 87°).

Read and Print Circuits

The read circuit in the Type 552 is made active by closing the card-lever contact. The operating lever of the card-lever contact is ahead of the contact-drum and, when cards are feeding, the points of the card-lever contact are closed. This action will close the following circuit to energize R2 (card-lever relay). Post 6, post 7, post 8, C-6 (make 186° — break 26°), card-lever contact, R2 coil, X-eliminator relay as a terminal, posts 3, 2, and 1. The hold circuit for R2 is as follows: posts 6, 7, 8, 9, CB1 (make 336° — break 192°), R2A N/O points, R2 coil, X-eliminator relay as a terminal, posts 3, 2, and 1.

The sequence chart (Figure 66) illustrates the timing relationship between the card-lever contact, C6, and CB1. It should be noted that one card, running through the machine, will cause the card-lever contacts to close at 108° on one cycle and break at 129° of the next cycle. When cards are fed continuously, the card-lever contact break time (129°) for the first card has been overlapped by the make time (108°) of the second card. As long as cards are feeding continuously, the card-lever contact will remain closed.

The purpose of R2 is to provide a circuit to the contact drum; this results in the contact drum being *hot* when cards are feeding. The machine being capable of reading alphabetical information must have circuits that will read the zone impulses (12 - X - 0), and the selection impulses (1 through 9). The circuit to read the zone impulses: posts 6, 7, 8, 9, CB1, R2A N/O, to CB4 as a terminal, through CB3 (break contact), CB2 (make contact), common brush, contact-drum, through the zone hole in the

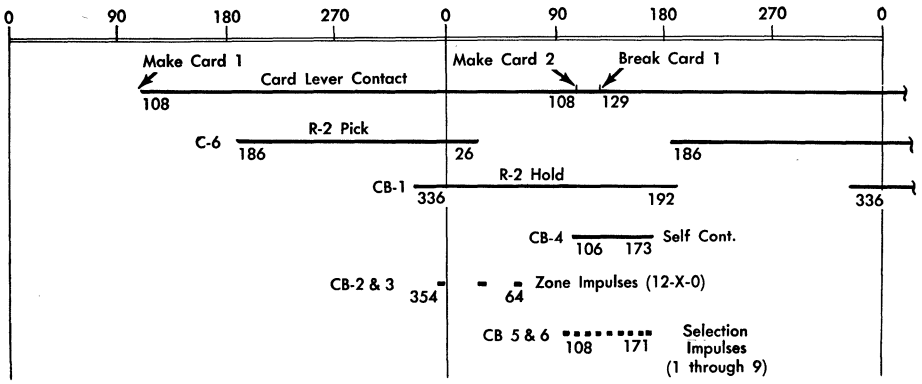


Figure 66. Card Reading Circuits

card, reading-brush, control-panel hub, by wire to the type-bar hub, print magnet, posts 4, 3, 2, and 1. The circuit to read the selection impulses: posts 6, 7, 8, 9, CB1, R2A N/O, CB4, CB5 (make contact), CB6 (break contact), to CB2 as a terminal, common brush, contact-drum, through a selection hole in the card, reading brush, control-panel hub, by wire to the type-bar hub, print magnet, posts 4, 3, 2, and 1. A parallel circuit to feed the zone selection circuit breakers is available: post 8, CB6, card-lever contact, to R2 coil as a terminal, to R2A—N/O as a terminal, to CB4 and CB3, etc. This circuit will be interrupted by the card-lever contact and C6 and will not overlap the complete reading time of the card.

X-Elimination Circuit

Each Type 552 machine is equipped with one ten-position X-eliminator. This device could be termed a ten-position, switch-controlled class selector. Its purpose is to eliminate the X and 12 punch readings that are sometimes placed over a numeric information field. When the X-elimination jackplug switch is ON, the following circuit becomes effective: posts 6, 7, 8, 9, CB1, R2A N/O, C3 (make 45° — break 247°), X-elimination jackplug switch, X-elimination relay, posts 3, 2, and 1. To eliminate a 12 or an X punch reading and allow only numerical information to print, wire the reading brush to a common hub of the X-eliminator and out the corresponding 0-9 hub to the type-bar. C3 is the controlling factor in this circuit; it is made between 45° and 247° which overlaps the impulses 0 through 9.

Dynamic Braking Circuit

Dynamic braking is a principle built around the fact that an electric motor and an electric generator are basically the same. An electric motor receives electrical energy and transforms it into mechanical energy; an electric generator receives mechanical energy and transforms it to electrical energy.

When a motor has been driving a machine and the electrical energy to the motor is cut off, the mechanical energy stored in the moving machine drives the motor for a period of time. How long the machine drives the motor will depend on several factors. One factor to consider in the Type 552 Interpreter is the machine temperature. When the machine is hot and the lubrication is light, the machine will coast for a longer period of time than when the machine is cold; therefore, the machine has no definite stopping point. This is undesirable because the machine may stop at one of a number of index positions; and if left for a period of time, damage to the machine may result.

Dynamic braking is basically applying an electrical load to a coasting motor. The coasting motor acts as a generator and produces electrical energy for the load resistor. The mechanical energy stored in the coasting machine is therefore converted into electrical energy by the motor and applied to a load resistor. The size of the load resistor will determine how fast the generated electricity will be consumed.

Using this principle, it is possible to apply a sharp load to the motor and machine the instant the electrical force to the motor has been cut off. This load would exceed the friction load of the machine thus causing the machine to stop.

This principle, called dynamic braking, has been applied to the Type 552 Interpreter. HD2 relay and a 25 ohm variable resistor is used to stop the machine between 260° and 285°. When a machine stop occurs, C8 will de-energize HD1, R3, and the R3B N/C points will energize HD2. Note when the HD2 points close, the 25 ohm variable resistor will be connected across the drive motor causing a very smooth stopping action of the machine and a fairly constant stopping point on the index. The customer engineer should adjust variable resistance to cause the machine stop between 260° and 285°.

Zero Elimination Device

Circuit Diagram. It is generally desirable for all positions in the numeric fields of the cards to be punched; if no significant digit occurs, the card column is generally filled with a zero punch. This results in the punching of zeros to the left of the first significant digit. When the cards are interpreted, it may be desirable to suppress the printing of these zeros. However, any zeros that occur to the right of the first significant digit must be printed.

The Type 552 normally prints a zero when a type bar is positioned by a zero impulse. Zeros that print to the left of the highest order significant number are at times undesirable and can be eliminated with the zero elimination device (Figure 67).

This device cannot be used with fields punched with alphabetical information or fields where a zero and some other digit is punched in the same column.

The maximum capacity of this device is twenty positions. It can be wired in several groups, the sum of positions will not exceed twenty, or a single group of any number of positions up to twenty. All or any part of this device can be wired to be active.

Principles of Operation

The zero elimination device does not eliminate the zero type-bar set-up but produces a 1 selection impulse. The zero impulse from the card, plus the 1 selection impulse from the zero elimination device will position the type-bar at a blank position so no printing will result. Therefore, the addition of a select 1 to the zero from the card will prevent printing in that type-bar.

The conditions for the addition of this select 1 impulse are:

1. The zeros to be eliminated must be to the left of the highest order significant digit (1-9) in a field.
2. All such zeros must be punched in the card, i. e. no blank columns.
3. The zero elimination device must be correctly wired to define the field.

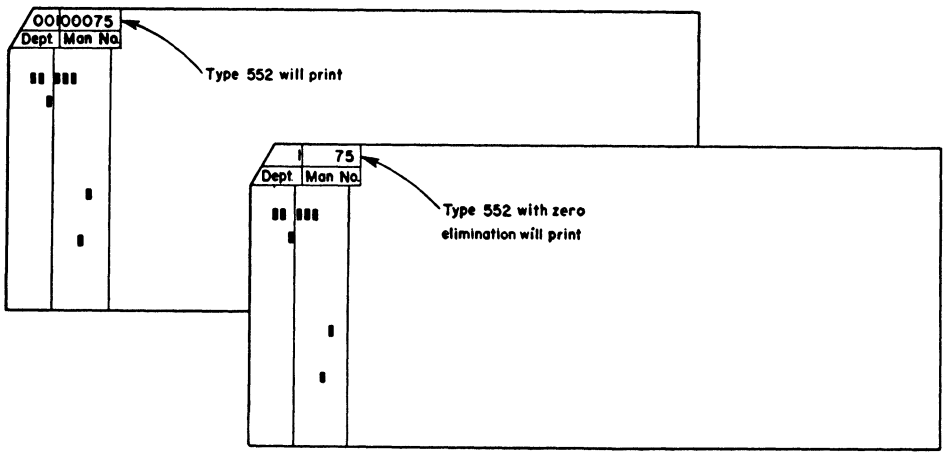


Figure 67. Zero Elimination

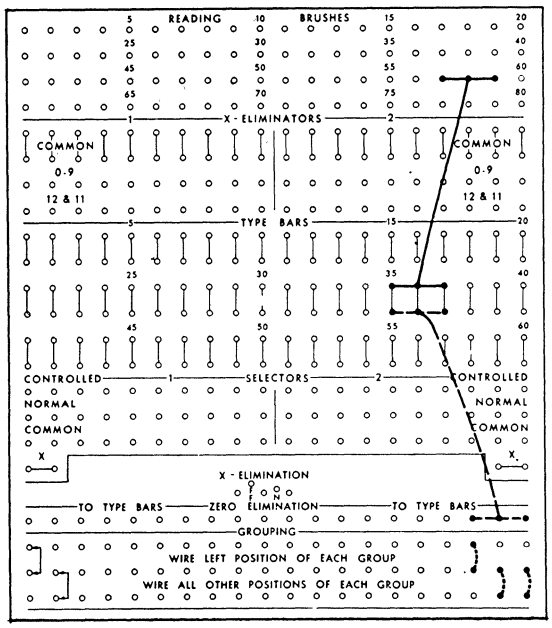


Figure 68. Zero Elimination Control Panel Wiring

Control Panel Wiring

A. Consider the three position field in Figure 68.
   1. Wire reading brushes 57-59 to type-bars 35-37.
   2. Wire zero elimination as shown. Any consecutive positions may be used.

B. The hubs of the zero elimination device are used:
   1. To accept impulses to pick the ZE relays.
   2. To emit impulses to select 1 in the wired type-bars.
   3. To establish holding circuits for ZE relays.

Circuits — Figures 69 and 70

1. Consider the three position field to be punched 040.
2. At 0-time the impulses from the card zone the type-bars and also energize RZE18 and 20. RZE18 is the high order position of the field.
3. RZE18 will hold through its 2-point and C3 but RZE20 cannot hold because RZE19 has not been picked, thus indicating a significant digit in that column.

   It is well to note that the hold of any zone elimination relay, except the high order position, is dependent upon the wired positions to the left. Because RZE18 is holding, the 1-9 numerical selection impulses from CB6 through the RZE18-1 point are available to energize the type-bar print-magnet. However, the 1 impulse, coming first, will cause the type-bar to be stopped in a blank printing position; zone 0 — select 1.
4. The pick and hold circuits for the ZE relays will be effective when reading the 1-9 significant figures from the card. Since the type-bar will be selected by the same impulse that picked the ZE relay, the added impulses through the ZE relay (1) points will have no effect on the mechanical operation of the type-bar.

NOTE: The ZE relays are of the wire contact type and are located on a separate relay-gate behind the rear relay-panel.

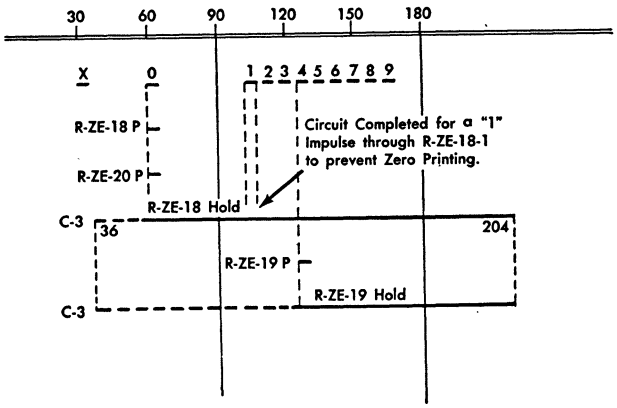


Figure 69. Zero Elimination — Sequence Chart

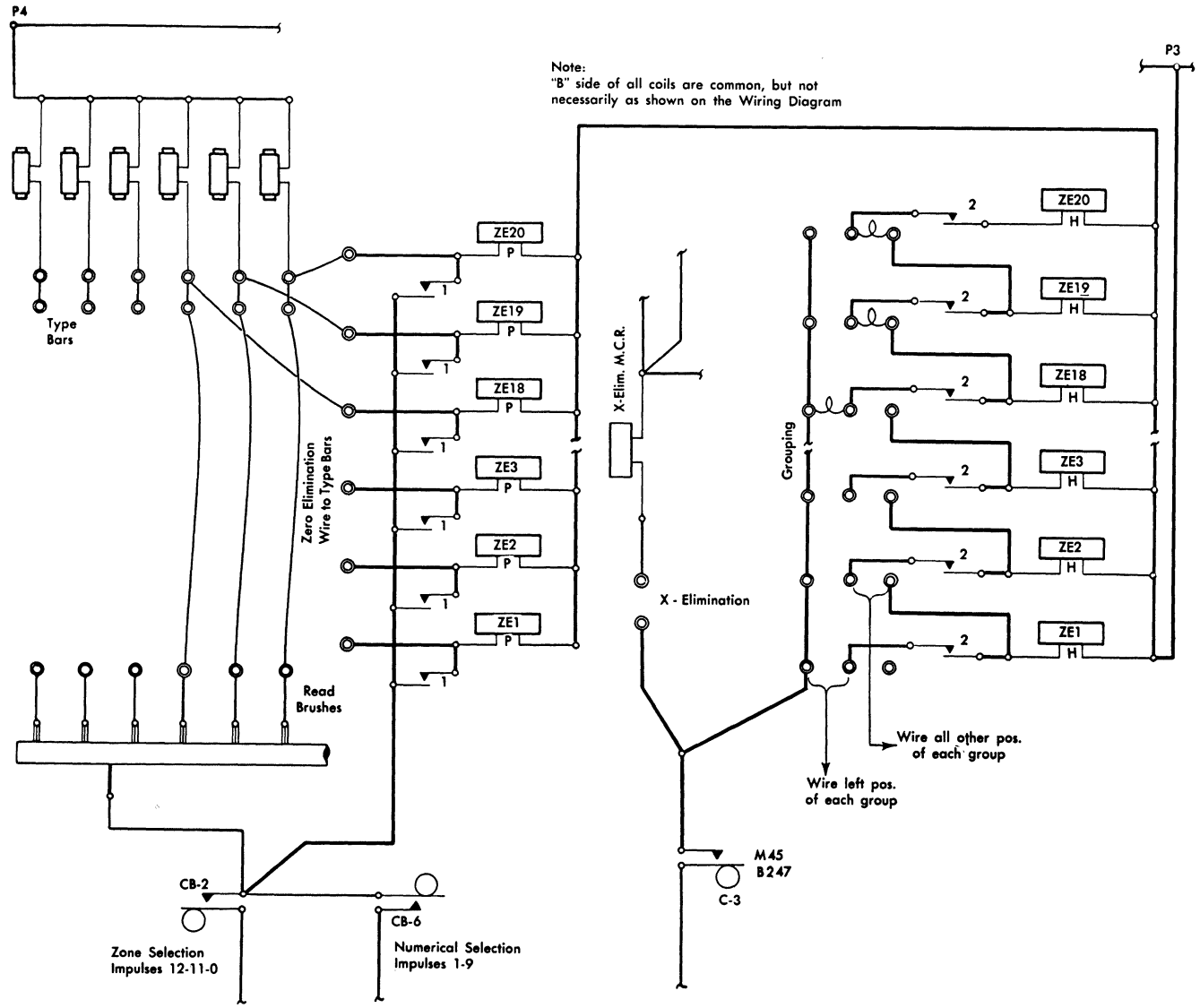


Figure 70. Zero Elimination Circuit

IBM

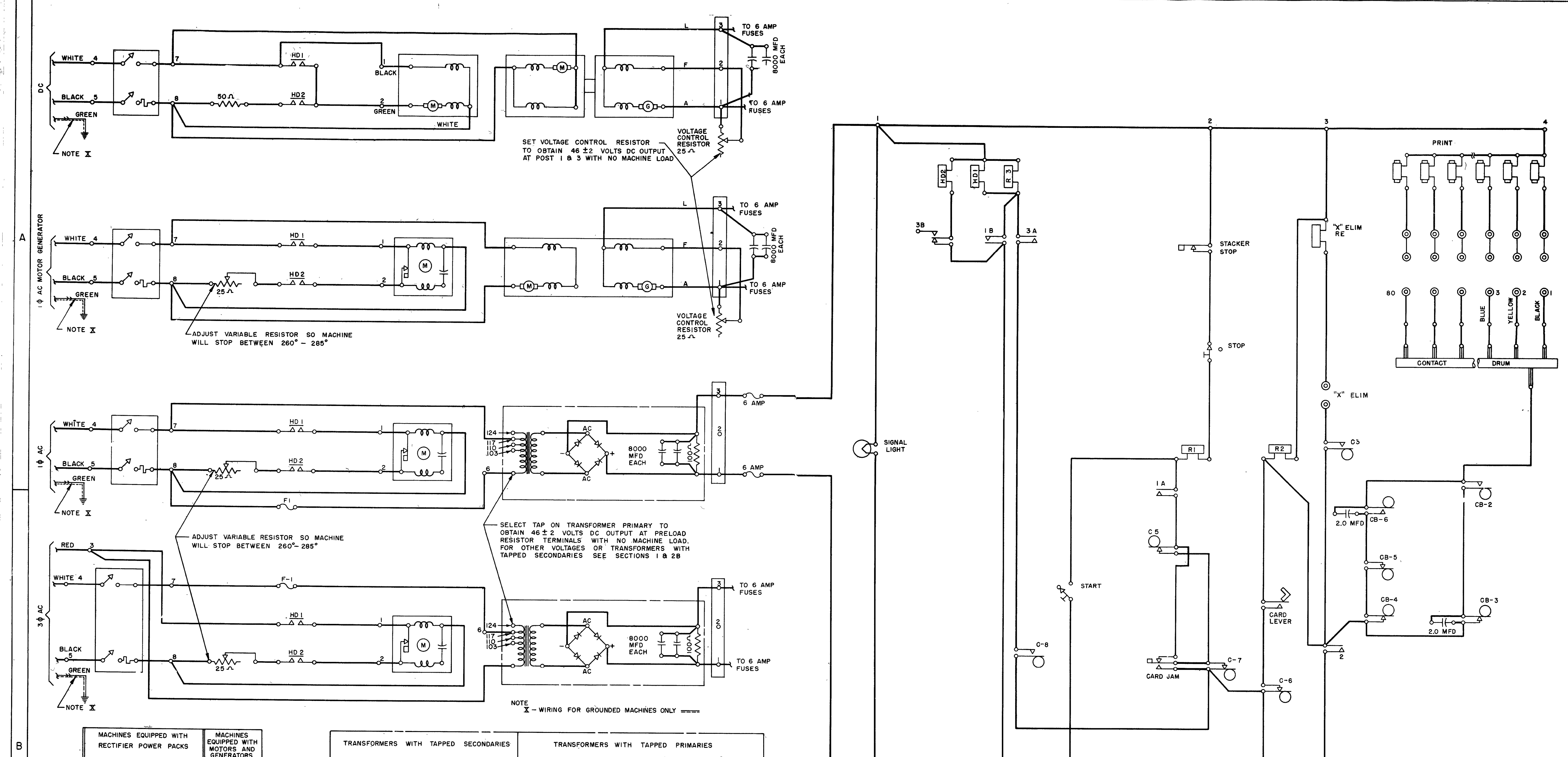
Wiring Diagram

DIAGRAM NO. – 161561 T

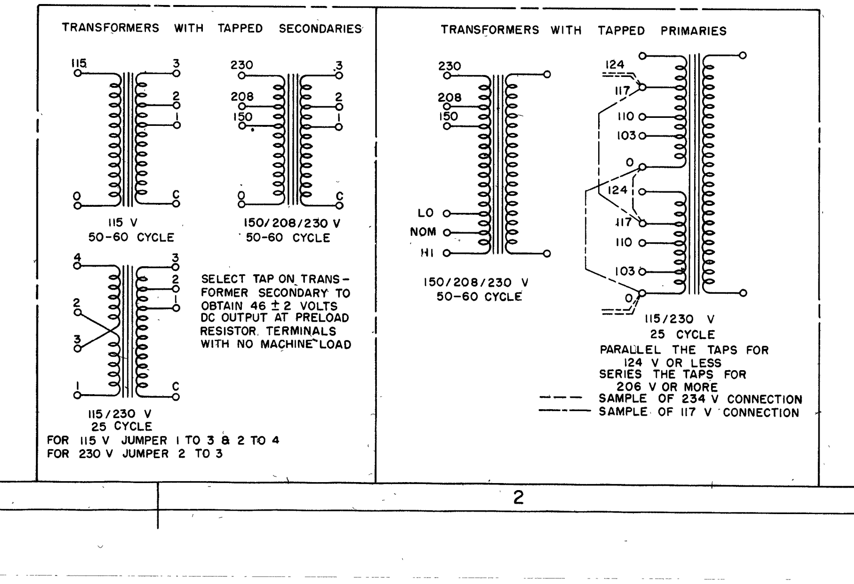
TYPE – 552 ALPHABETICAL INTERPRETER

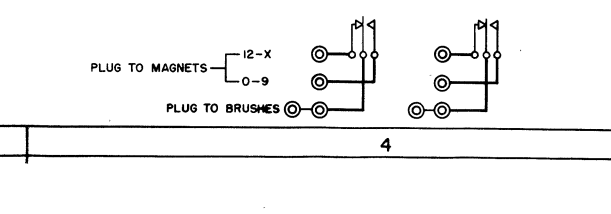
MACHINE SERIAL NO.–

INTERNATIONAL BUSINESS MACHINES CORPORATION



POWER SUPPLY			MACHINES EQUIPPED WITH RECTIFIER POWER PACKS				MACHINES EQUIPPED WITH MOTORS AND GENERATORS	
			SWITCH THERMAL ELEMENT		FUSE 1		SWITCH THERMAL ELEMENT	
VOLTS	CY	PH	AMP	PART NO	AMP	PART NO	AMP	PART NO
115	60	1	6.6	143366	3.0	107610	7.5	143375
115	60	3	6.6	143366	3.0	107610		
115	50	1	7.5	143375	3.0	107610		
115	50	3	7.5	143375	3.0	107610		
115	25	1	6.6	143366	3.0	107610		
115	DC						5.1	143351
150	60	1	7.5	143375	3.0	107610		
208	60	1	4.5	143345	2.0	107803		
208	60	3	4.5	143345	2.0	107803		
208	50	1	5.1	143351	3.0	107610		
208	50	3	5.1	143351	3.0	107610		
230	60	1	4.5	143345	2.0	107803	4.0	143340
230	60	3	4.5	143345	2.0	107803		
230	50	1	4.5	143345	2.0	107803		
230	50	3	4.5	143345	2.0	107803		
230	25	1	4.0	143340	2.0	107803		
230	DC						2.7	143327





TOLERANCE OF CAM SHAFT SETTINGS

NOTE: CAM NUMBERS INDICATE CAM POSITION ON SHAFT—COUNTING FRONT TO REAR

MAIN CAM SHAFT ASSEMBLY:—PLUS OR MINUS $\frac{1}{2}$ DEGREE

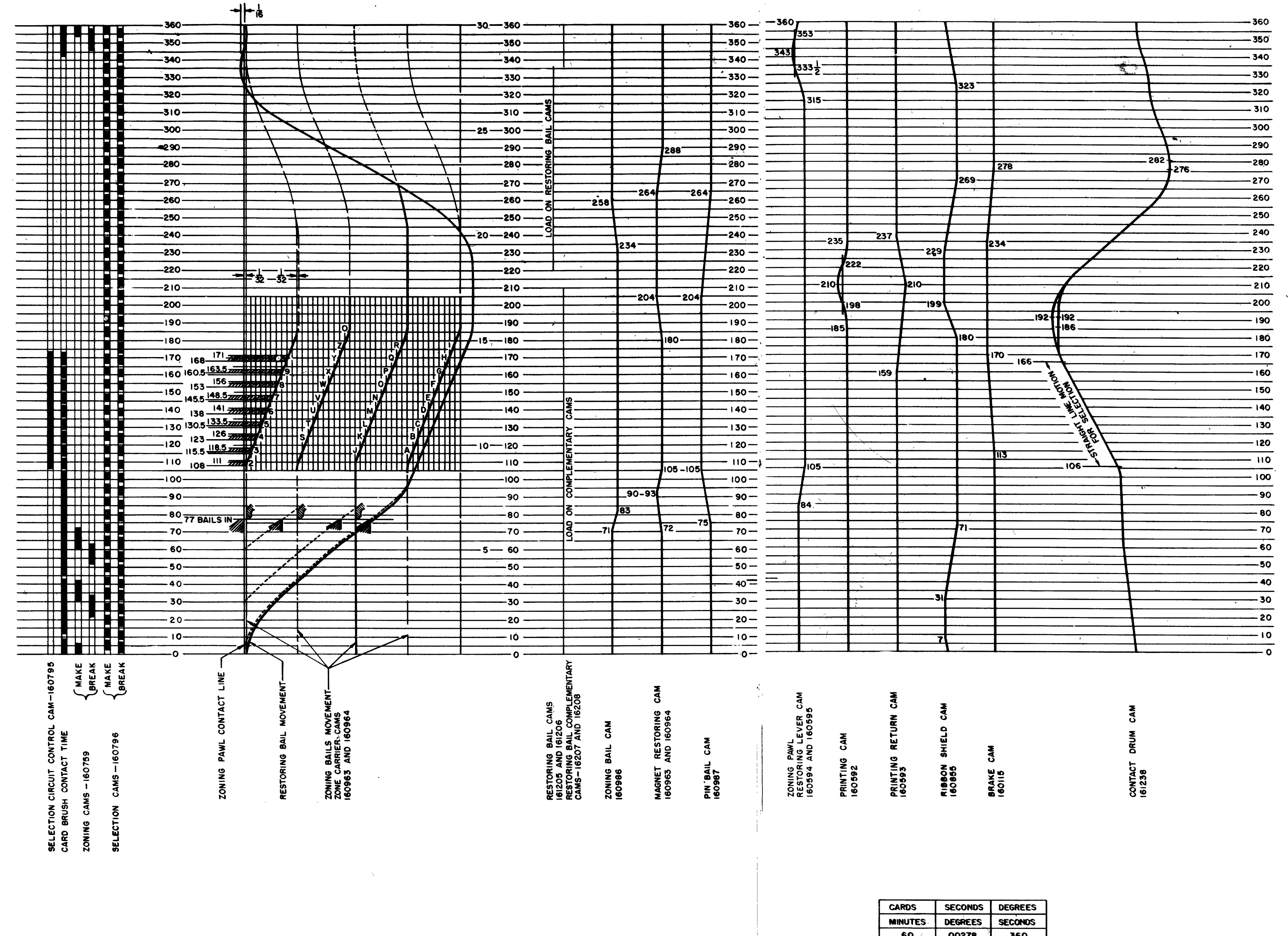
CAMS:—RESTORING BAIL CAM — 1 AND 10
RESTORING BAIL COMPLEMENTARY CAM — 4 AND 7
ZONE CARRIER CAM — 2 AND 9
MAGNET UNIT RESTORING CAM — 3 AND 8
PIN BAIL OPERATING CAM — 6
ZONING BAIL CAM — 5

PRINTING CAM SHAFT ASSEMBLY:—

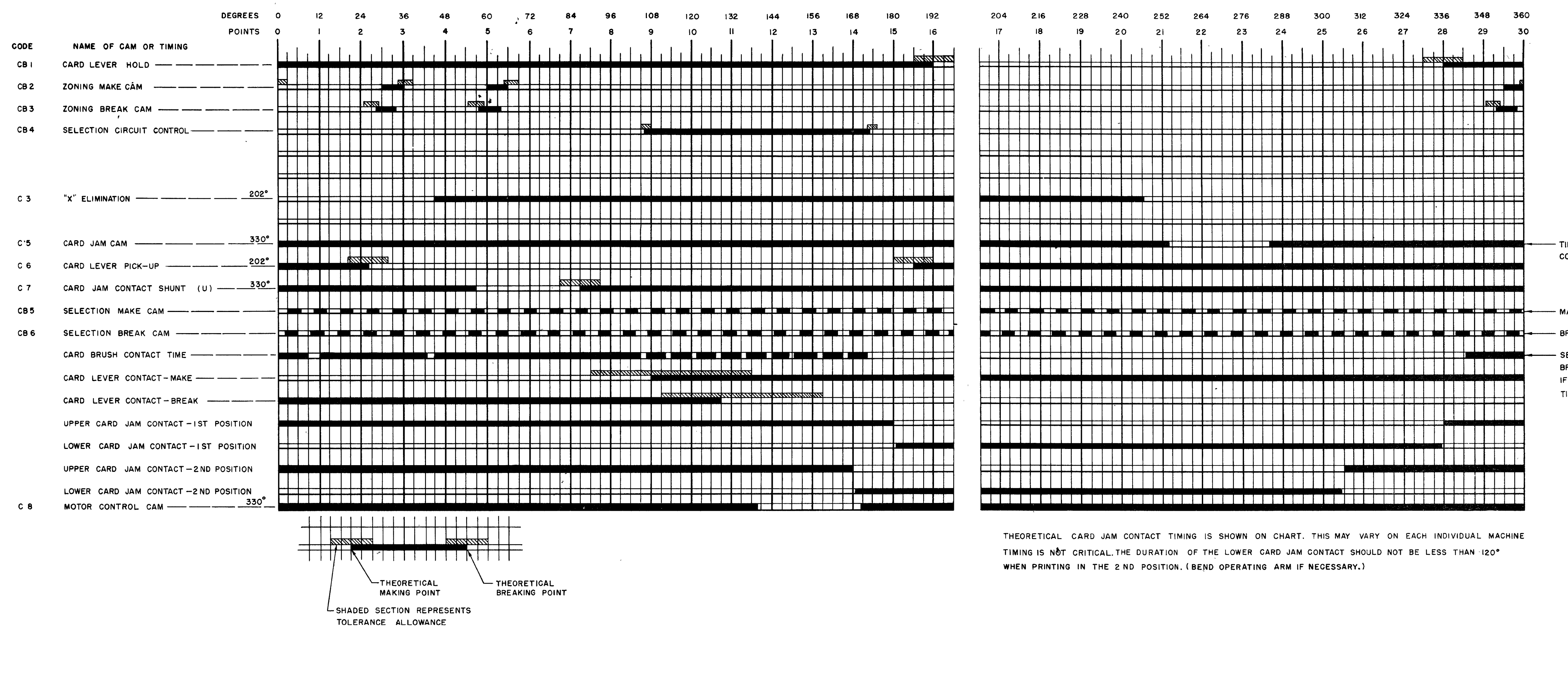
CAMS:— ZONING PAWL RESTORING LEVER CAM — 1 AND 5
PRINTING CAM — 2 AND 4
PRINTING RETURN CAM — 3
RIBBON SHIELD CAM — 6

FEED SHAFT:—

CAMS:— BRAKE CAM — 1
CONTACT DRUM CAM — 2



CARDS	SECONDS	DEGREES
MINUTES	DEGREES	SECONDS
60	.00278	360
65	.00256	390
70	.00238	420
75	.00222	450
80	.00208	480
85	.00196	510
90	.00185	540
95	.00175	570
100	.00167	600



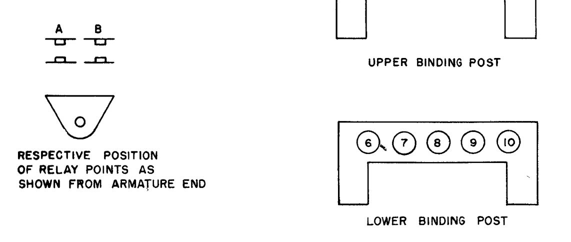
TIME "C-5" TO MAKE 21° ±6° BEFORE LOWER CARD JAM CONTACT (2ND POSITION) BREAKS

MAKE CAM MAY VARY $\frac{1}{2}$° EITHER WAY ON BREAK TIMING

BREAK CAM MAY VARY $\frac{1}{2}$° EITHER WAY ON MAKE TIMING

SELECTION BRUSH TIMING DURATION MINIMUM IS 6° BRUSHES SHOULD ALL BE MADE 1$\frac{1}{2}$° BEFORE CB-5 MAKES. IF BRUSH DURATION IS MORE THAN 6° THE ADDITIONAL TIME SHOULD BE ALLOWED ON THE BREAK SIDE.

THEORETICAL CARD JAM CONTACT TIMING IS SHOWN ON CHART. THIS MAY VARY ON EACH INDIVIDUAL MACHINE TIMING IS NOT CRITICAL. THE DURATION OF THE LOWER CARD JAM CONTACT SHOULD NOT BE LESS THAN 120° WHEN PRINTING IN THE 2ND POSITION. (BEND OPERATING ARM IF NECESSARY.)



INTERNATIONAL BUSINESS MACHINES CORP.					
MACH.	ALPHABETICAL INTERPRETER				
		MODEL	552		
NAME	WIRING DIAGRAM				
DRAW	LET	2-16-51	SCALE	NONE	
CHECK			TRAC	RLS	10-5-51
APPRO	RAS	4-21-51	CHECK	DMG	10-16-51

TYPES 550, 551 and 552

IBM
TRADE MARK

Form 22-6106-0 (7-53:2M-JC) J. C. 27981

Form 22-6106-0 (7-53:2M-JC)