FLEXOWRITER-JUSTOWRITER

Adjustment Manual

FRIDEN, INC. SAN LEANDRO, CALIFORNIA

PART I

FLEXOWRITER - GENERAL

DESCRIPTION AND GENERAL INFORMATION

Figure 1-1 The Flexowriter

DESCRIPTION

The name "Flexowriter" is used by Commercial Controls Corporation to apply to all its writing machines except those having special facilities for justifying lines. The latter machines for justifying are called "Justowriter" (explained in Part VII).

The Flexowriter, in its simplest form, is essentially a heavy-duty electric writing machine with built-in auxiliary units for providing various kinds of automatic operations associated with the creation of a printed document.

Character operation takes place one at a time in the same manner as an electric typewriter. The control of the Flexowriter can be by manual

keyboard operation, or, automatically in response to binary coded impulses. These impulses can be supplied by an external machine or from a punch tape reader mounted on the Flexowriter. It can also be arranged to automatically select binary coded impulses for controlling an external machine, or for controlling a tape punch mounted on the Flexowriter, regardless of how the Flexowriter is operated.

WRITING MACHINE

The Flexowriter, being basically a heavy-duty electric writing machine, is not intended for use solely as an electric typewriter. This is due to the extremely rugged construction and special features of the typing mechanism which are not required in the ordinary use of an electric typewriter.

Every Flexowriter will have the writing machine as its base or foundation and from there on, units may be added in various combinations to automatically perform many other functions incidental to typing. The typing mechanism is built around a base or frame assembly, which houses the operating mechanism for whatever auxiliary units may be applied to the Flexowriter. The writing machine can type a maximum of 86 different characters from 43 type bars. The type bars are shiftable with two characters on each bar.

The Flexowriter is constructed the same as most correspondence typewriters in the respect that the carriage is moved for the letter spacing while the typing mechanism is stationary. The Flexowriter shifts all type bars simultaneously between printing of upper case characters and lower case characters. Also, line spacing on the Flexowriter is incidental to the power operated carriage return function.

There is a significant difference between the Flexowriter and certain other types of writing machines (principally used in the communications field). In these machines instead of the carriage moving for letter spacing, the typing mechanism moves. Also, the carriage return function does not move the platen, but only returns the typing mechanism to its position for starting a new line. The line spacing function is separate from this carriage return and operates only to index the platen for line spacing. The platen, in this type of machine, is usually shifted to select between upper and lower case typing.

In the communications type of machine, the carriage return and line space functions are separate in independence, while on the Flexowriter they are combined. This requires two separate operations on the communications type of machine at the end of each line, but provides the added flexibility wherein the line spacing mechanism may be operated without returning the carriage to the left margin. In the Flexowriter, however, a line spacing operation cannot be obtained without its being incidental to a carriage return operation.

All operations of a Flexowriter writing machine, whether typing a character or performing a functional operation, must be originated by an operation of a key lever. Each key lever in the Flexowriter controls the operation of a cam which receives its power from a continuously rotating power roll. This cam is connected to the type bars through intermediate bell crank connections

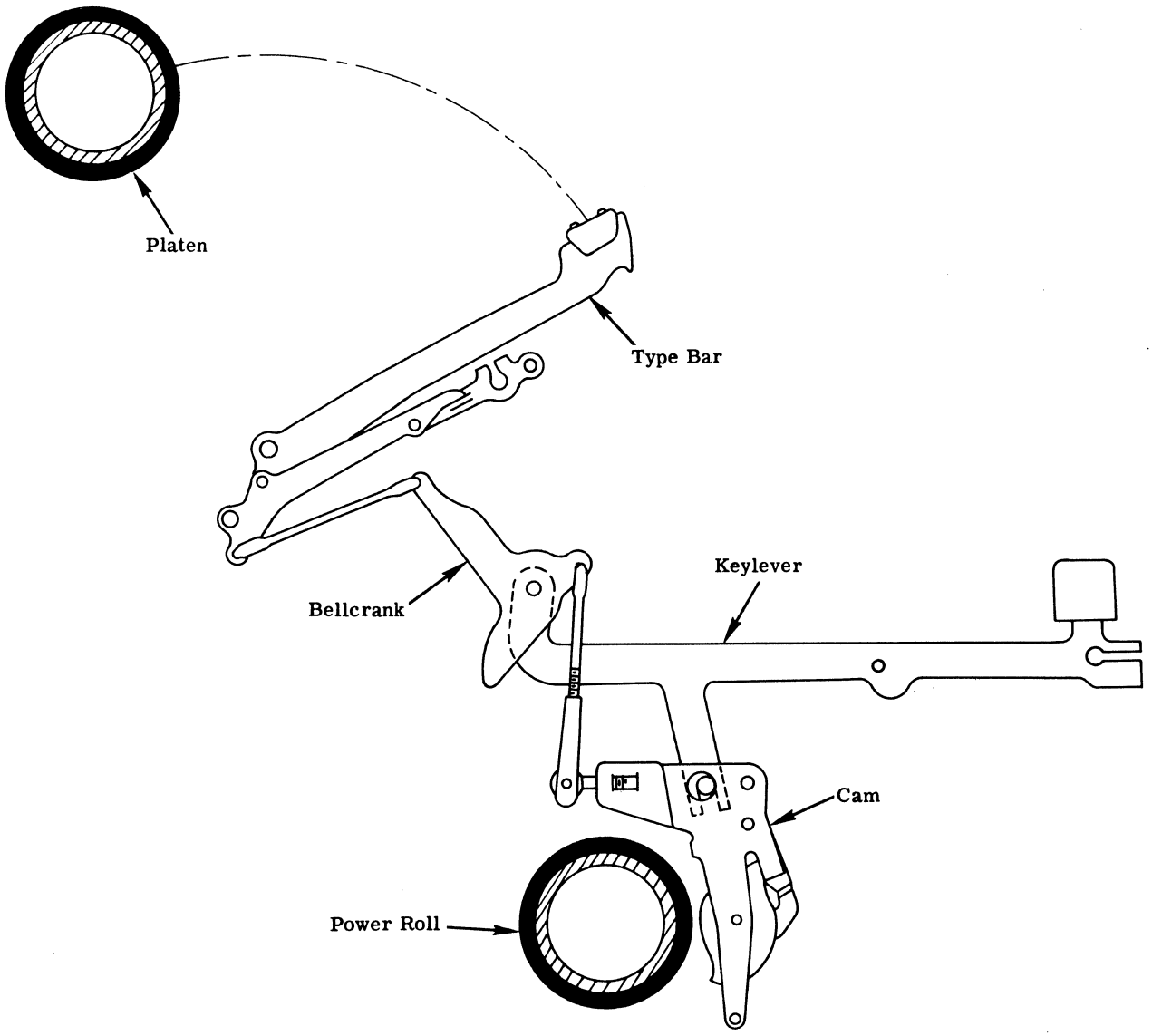

Figure 1-2 Keylever Operation

to operate each type bar individually to the printing position. (See Figure 1-2.)

In typing, the amount of force a character requires for proper impression, varies. The cams are made adjustable so that a fine impression adjustment may be obtained for each character. A coarse adjustment for the blow of each type bar is obtained by selecting one of several different bell cranks which are available for each type bar position.

The same general type of cam, under control of a key lever, is provided for each of the functions of the Flexowriter. Thus, the entire operation of the typewriter portion (writing machine) of the Flexowriter is under control of the key levers. In each instance, the key lever performs no other function than to trip the cam for operation by the power roll. Therefore, all key levers require the

same force to operate a cam.

AUTOMATIC FEATURES

In addition to the writing machine, the Flexowriter is usually provided with one or more built-in auxiliary units to perform other functions incidental to writing a document. These auxiliary units function on the binary coded principle. Therefore, a better understanding of the various uses and applications of the Flexowriter will be obtained by a general knowledge of the coding system used.

CODE SYSTEM

There are many different systems using codes to convey information, and the choice between these codes depend upon the type of apparatus used in connection with the code. With apparatus such as used in the Flexowriter, the various elements have only two significant positions. In other words, a mechanical device may be normal or in operated position, an electrical contact may be open or closed, a relay may be energized or de-energized, or a paper tape may be perforated or not perforated. This type of apparatus lends itself particularly to the use of a binary code, which is so called because two is used as a base. The binary code may be compared with the decimal system which is actually a code using ten as a base. Another example is a ternary code using three as a base.

In the binary code, each element of the code involves a choice or selection between only two conditions. These two conditions may be conveniently represented by the apparatus previously mentioned, while other code systems, such as the ternary or decimal, cannot be as conveniently handled or stored by these devices because they involve a choice of more than two conditions for each unit of the code.

The binary code system builds into combinations in the following manner: one unit code gives two combinations, two units of code gives four combinations, three units gives eight, four units sixteen and five units gives thirty-two, etc.

Figure 1-3 shows an example of the binary code system using a three unit code. In this case an electrical contact or group of contacts represent each unit of code. Each code contact has two conditions, either operate or non-operate. Thus, the number one code having one contact will have two conditions (or combinations). These two conditions of number one are connected to two separate contacts of the number two code. Each of the number two contacts has two conditions, thus the total conditions of number two code is four. The number three code has four separate contacts and each having two conditions will result in a maximum condition of eight. In other words, a three unit code will result in a maximum code combination of eight. The five unit binary code is the smallest that may be used to represent typographical characters. The five unit code, however, provides only thirty-two combinations and can only represent the twenty-six letters. Therefore, it is not sufficient to include the figures and punctuation ordinarily used in typography. This is why the figures are sometimes spelled and a period spelled "stop" in some telegrams.

A more convenient method of representing typo-

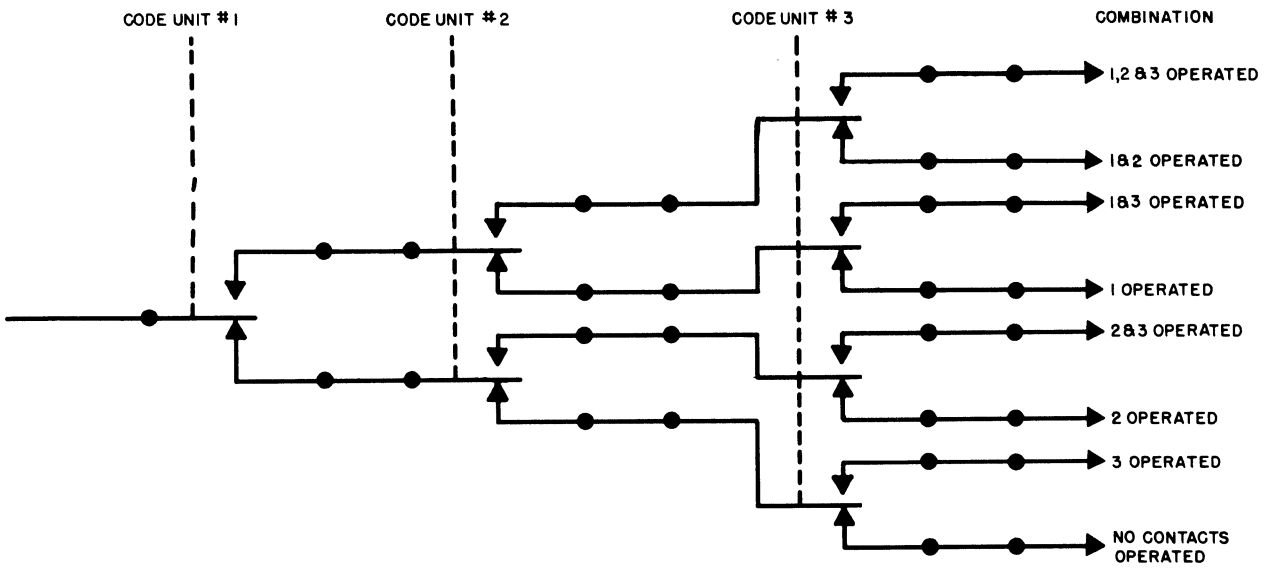

Figure 1-3 Example Binary Code System

graphical information with a five unit code is to use two codes out of the available thirty-two as "shift" codes. These shift codes are used to distinguish whether the remaining 30 codes represent letters, figures or punctuation. This, in effect, provides for the representation of 60 different characters or control functions through the use of a five unit code amplified by combining with two shift codes. This is the coded system used almost exclusively in the present age commercial teletypewriting machines.

The above use of the five unit code with shift codes should not be confused with the case shift used on a correspondence typewriter. The shift function used with the five unit code distinguishes between letters and figures, but does not allow the use of capital and lower case letters. If capital and lower case letters, plus, figures and punctuation are to be designated by a binary code, it is more convenient to use a larger number of units such as a six, or even more in certain systems. Binary codes are seldom above an eight unit range in ordinary information handling systems except in punch card accounting work where a twelve unit code is used.

The following table shows the maximum number of combinations available for the number of units in a binary code up to an eight unit code:

1 unit - 2 combinations
2 units - 4 combinations
3 units - 8 combinations
4 units - 16 combinations
5 units - 32 combinations
6 units - 64 combinations
7 units - 128 combinations
8 units - 256 combinations

The following paragraphs discuss the auxiliary units mentioned which are mounted on or within the main frame of the Flexowriter as shown in Figure 1-4.

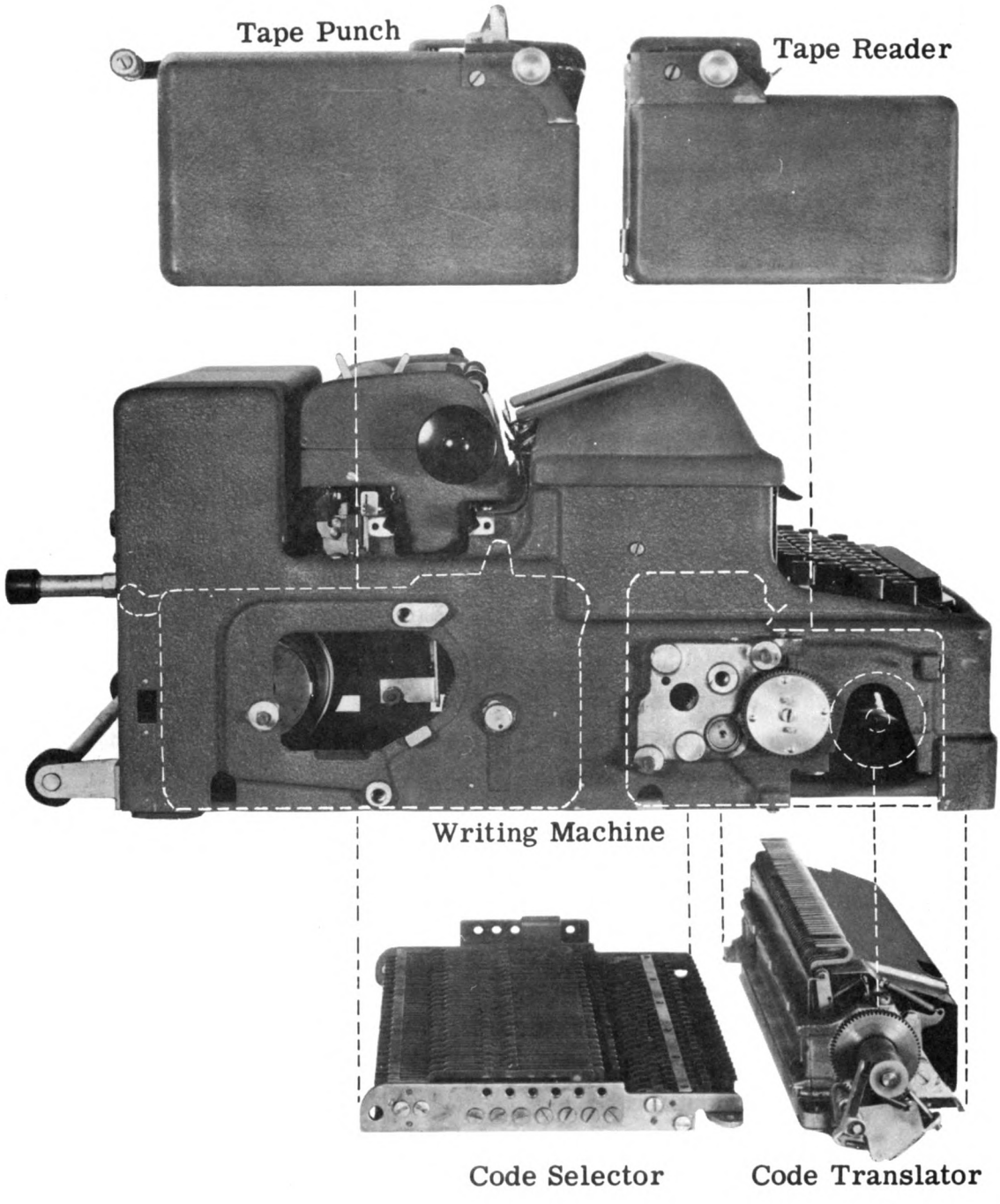

Figure 1-4 Flexowriter Units

CODE SELECTOR

This unit is for the purpose of selecting a different binary code for each individual character and functions of the Flexowriter. This mechanism is designed to select any combination of units in a code up to a maximum of twelve units. The twelve unit code is used for punch card accounting work.

The selector operation produces a binary code which is represented by an open or closed position of an electrical contact. To operate the contacts, the selector consists of an assembly of sliding members which are mechanically operated by the cams of the writing machine. A cam operation causes a sliding movement of its associated selector slide only. All the selector slides are positioned to operate a group of transverse bails. One bail is employed for each unit of the code being used plus a common bail which is always operated by every selector slide. Therefore, if a six unit code is used, there would be seven transverse bails, and each bail being adapted to operate a normally open electrical contact.

The selector slides are coded by means of cam surfaces on the slide which operate the code bails. A different combination of bails are operated by each selector slide simply by removing the cam surfaces associated with certain code bails.

Therefore, when a character or functional key lever is depressed, its associated cam and selector slide is operated and in turn closes the code contacts corresponding to the code arrangement for that particular key lever position.

The code selector design enables the Flexowriter to be arranged so that certain key levers will operate to type or perform some other machine function without selecting a code. This is accomplished by merely omitting a selector slide at this position or by removing all the cam surfaces on this particular slide. The Flexowriter may also be arranged to have the cams operate the selector slides which in turn will operate the code contacts but will not perform any other function on the writing machine.

Therefore, it is apparent, for any keylever position the Flexowriter may be arranged to:

1. Type or operate a function only.
2. Select a code only.
3. Select a code and type or cause a functional operation.

The electrical impulses, which are the result of closing the code contacts, may be used to control any device which will respond to a binary code. This may be another Flexowriter, a tape punch, or any similiar device to which the circuits controlled by these contacts may be wired.

The PSM Flexowriters and Justowriters use six upper bails and the contacts are wired to three escapement magnets for proportional spacing operation.

TAPE PUNCH

The tape punch is used to store or record information typed on a Flexowriter for use at some later time to automatically operate the same or a different Flexowriter or any device which will respond to a binary code.

The tape punch is a separate unit mounted on the rear left side of the Flexowriter. It is mechanically operated by a single revolution, magnetically operated clutch and has a code punch magnet for each unit of a binary code. These code and clutch magnets may be controlled from the

code selector of the Flexowriter or from any other source capable of selecting code combinations in the form of electrical impulses.

The tape punch is designed so that it can be arranged to perforate any code involving up to eight units. The code holes are punched in a transverse row across the paper tape which usually varies in width according to the number of units of the binary code involved. A feed hole, which is smaller than the code hole, is punched near the center of the tape for the purpose of intermittently feeding the tape past the punch positions and also for feeding the tape when reading the code holes.

TAPE READER

The reader is that unit of the Flexowriter which senses the recorded codes of a perforated tape and operates electrical contacts. In the Flexowriter, the contact operation ordinarily pulses the translator to automatically control the writing machine for each code read, thus reproducing the text recorded in the tape.

The reader is mounted on the front left hand side of the Flexowriter with one stud and one dowel. It may be removed easily from the base by unplugging a fifteen point Jones plug, removing the cover and loosening the mounting stud.

Mechanical power is supplied from the power drive of the writing machine through a four hole coupling.

The tape reader is under control for its operation by manually operated switches mounted above the Flexowriter keyboard. The reader is designed to handle from 11/16 to one inch wide tape. This permits the reader to sense up to eight code units in a one inch wide tape.

The reader is normally adjusted for tape with the feed holes in line with the code holes, but a slight readjustment can enable it to operate on tape having the feed holes slightly advanced with relation to the code holes. The reader is also designed to operate with chadless tape.

When reading a binary code in a tape, a normally open contact for each unit of the code is closed whenever a hole is sensed in the tape for that unit of the code.

Besides the normally open contact mentioned, several other contacts may be added to each unit of the binary code. This multiple contact arrangement permits certain codes to be detected directly at the reading unit without requiring any external translating mechanism. This arrangement is used in the automatic operation of the Flexowriter so that certain codes such as carriage return, tab, back space and stop codes may be sensed by the reader and immediately stop the automatic operation of the reader.

As stated previously, the code contacts of the reader are used on the Flexowriters to control the operation of the translator. However, these code contacts of the reader may be used in other special applications to control any other external device which can respond to a binary code in the form of electrical impulses for providing some function similiar to that of the code translator.

In using the tape reader with the code translator, the six code contacts of the reader, associated with a six unit binary code, are each connected to the corresponding code magnet of the translator. Also, the common contacts of the reader are con-

nected to the electromagnet of the translator clutch.

When controlling any device, such as the code translator, the speed of the reader shaft is the determining factor in the speed of operation of the control device. For this reason, the apparatus to be controlled by the reader should have an operating speed slightly in excess of the reader speed. This is to insure that the controlled device is always in step with the reader.

CODE TRANSLATOR

This unit is for mechanically selecting and operating key levers of the Flexowriter in response to coded electrical impulses. The unit includes a code magnet for each unit of the binary code, plus a magnet for operating a single revolution mechanical clutch.

If the code magnets of the code translator are each connected to the code contact of a code selector on another Flexowriter, operation of the code selector will cause simultaneous operation of the second Flexowriter through the code translator. These same code magnets may be controlled by code contacts in any other device which is arranged to form distinctive binary codes in the same manner as the code selector.

The code translator may be arranged to operate in response to any code involving up to twelve units. It is designed to operate up to fifty-two key levers. A six unit code is most commonly used in the control of a Flexowriter. However, the translator may be arranged to operate in response to a five unit code in the same manner as the communications teletypewriting machines wherein the previously described figures and letters shift arrangement is used.

FLEXOWRITER COMBINATIONS

A great many combinations of the four units (described in Section 1) with the typewriting mechanism (writing machine) for the Flexowriter may be obtained, but the following are the combinations which are most commonly required.

FLEXOWRITER - RECORDER (Figure 2-1)

This is a combination of the writing machine with a code selector and tape punch. This arrangement is only capable of recording in the form of a perforated paper tape, the binary code selected by the code selector during manual operation of the writing machine keyboard.

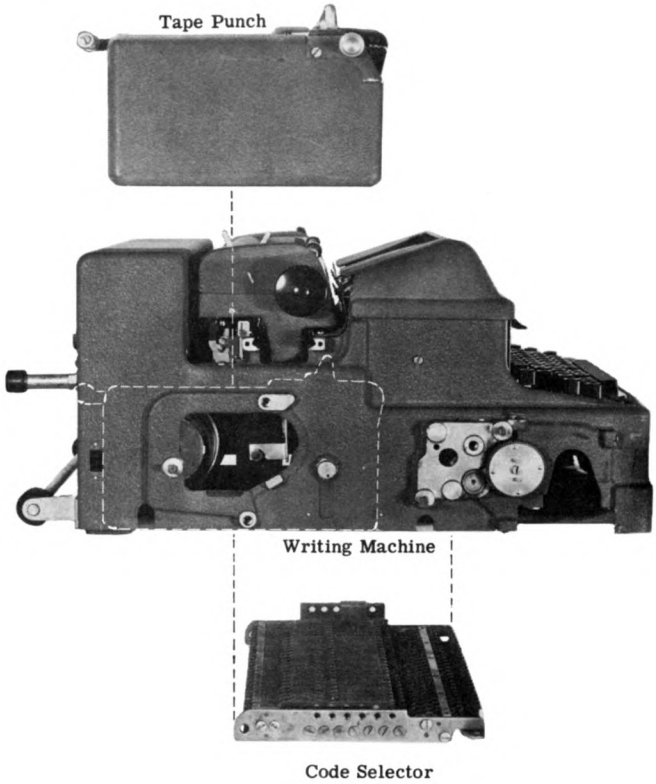

Figure 2-1 Flexowriter - Recorder

FLEXOWRITER - REPRODUCER (Figure 2-2)

The tape reader and code translator is used in this combination with the writing machine. This arrangement is able to automatically reproduce typing on the Flexowriter by reading a coded tape produced on another Flexowriter of the same model. It is also obviously capable of being operated as an ordinary electric typewriter from manual operation of the keyboard.

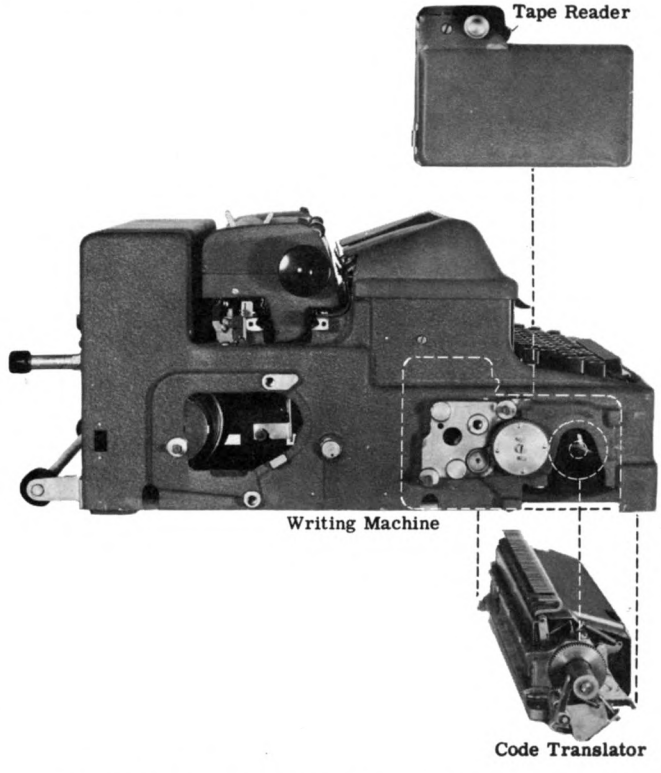

Figure 2-2 Flexowriter - Reproducer

FLEXOWRITER RECORDER - REPRODUCER (Figure 2-3)

This arrangement includes the writing machine,

Flexowriter Combination

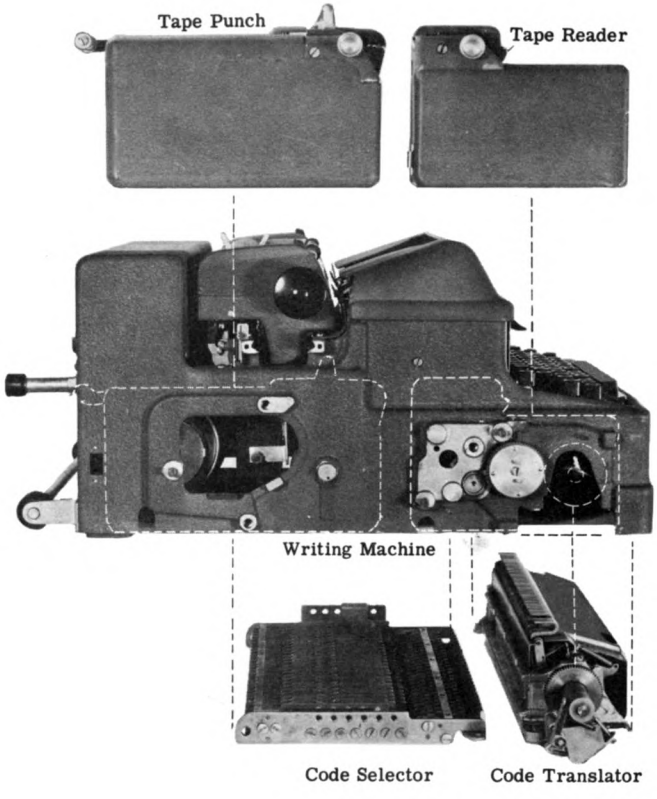

Figure 2-3 Flexowriter Recorder - Reproducer

plus the code selector, tape punch, tape reader and code translator. It has the combined capabilities of the Flexowriter Recorder and the Flexowriter Reproducer. Also, with this arrangement, during automatic operation of the Flexowriter from a punched tape, a new tape may be simultaneously punched when desired.

FLEXOWRITER - TRANSMITTER (Figure 2-4)

This machine requires only a code selector with the writing machine. The contacts of the code selector will, in this case, be connected through an external cable to another device, causing this device to operate automatically in response to the selector contact operation. (The

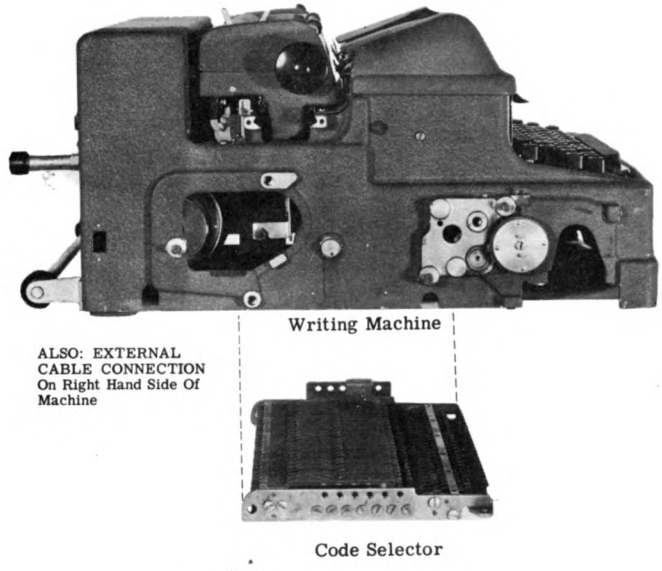

Figure 2-4 Flexowriter - Transmitter

device controlled by a Flexowriter - Transmitter would, for instance, be a Flexowriter - Receiver.)

FLEXOWRITER RECEIVER (Figure 2-5)

This would be a Flexowriter writing machine equipped with a code translator only. The magnets of the code translator would be connected through

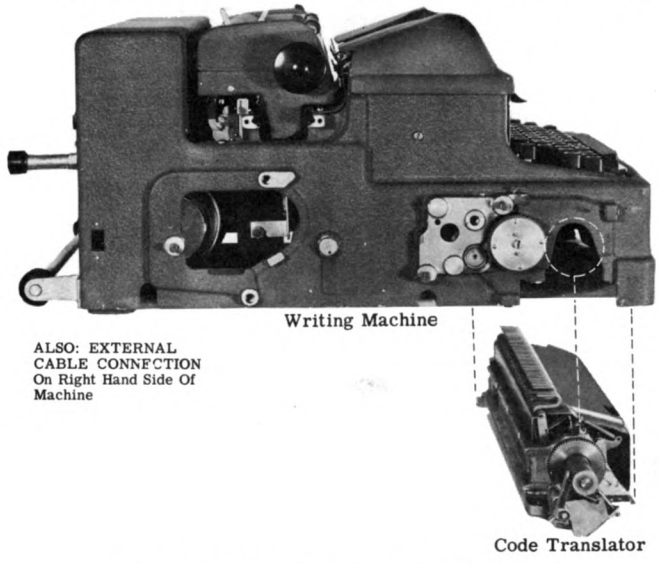

Figure 2-5 Flexowriter Receiver

an external cable to another device for providing binary coded electrical impulses for operating the code translator. (An example of the device for controlling the Flexowriter Receiver is the previously described Flexowriter - Transmitter.)

FLEXOWRITER - TRANSMITTER - RECEIVER (Figure 2-6)

This is a combination of the two previously described machines and includes the writing machine equipped with both a code selector and a code translator. Such a machine is capable of transmitting coded impulses for the automatic control of another device, such as a Flexowriter Receiver or Flexowriter Transmitter - Receiver. It is also capable of being controlled by an external device, such as a Flexowriter Transmitter or a Flexowriter Transmitter - Receiver. In this machine a manual control switch is ordinarily provided to determine whether the Flexowriter Transmitter - Receiver is to be used for the purposes of transmission or reception. This switch is usually of the three position type, permitting the machine to be used merely as a typewriter without either transmitting or receiving.

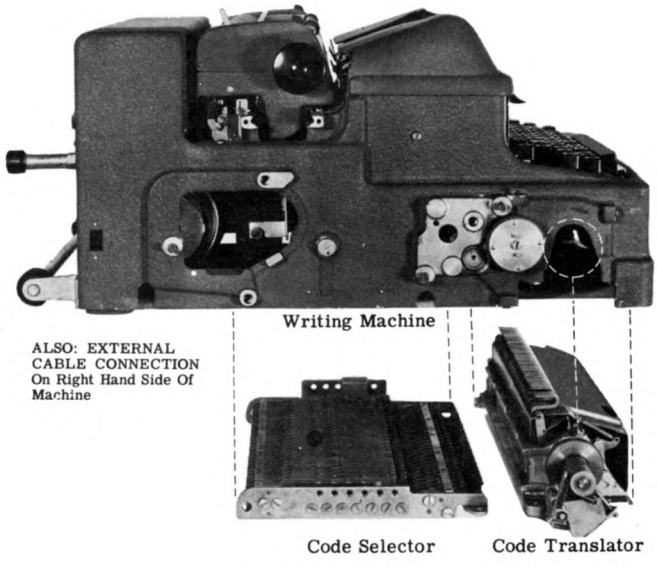

Figure 2-6
Flexowriter - Transmitter - Receiver

FLEXOWRITER RECORDER - TRANSMITTER (Figure 2-7)

This is substantially the same machine as the Flexowriter Recorder except that the code contacts of the code selector are arranged for connection to an external cable. This permits an external device to be controlled by the code selector, either causing or without causing simultaneous operation of the tape punch. A suitable

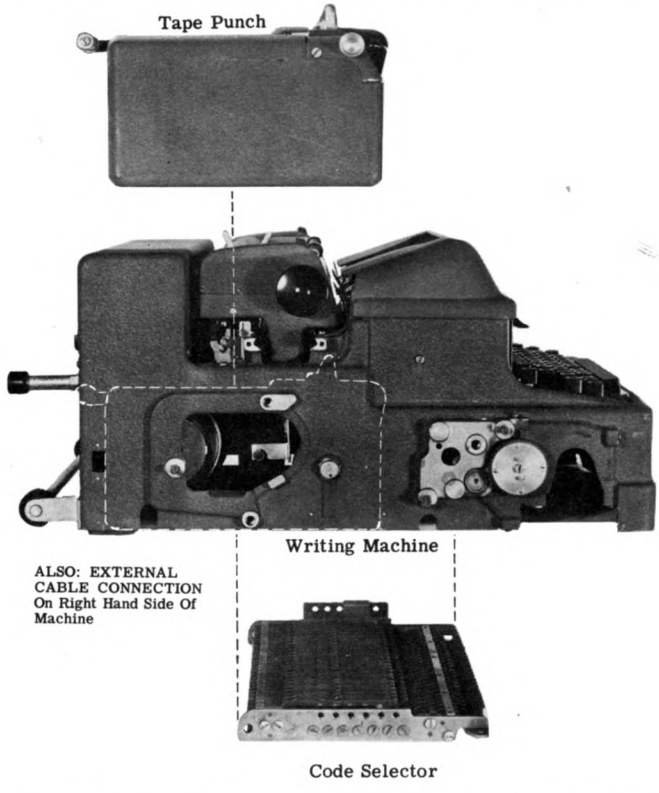

Figure 2-7 Flexowriter Recorder - Transmitter

manual switch can be provided allowing the machine to be used as an electric typewriter or merely as a recorder by operating a tape punch only.

FLEXOWRITER RECORDER - TRANSMITTER - RECEIVER (Figure 2-8)

This is a combination of a writing machine having a code selector, tape punch and code translator. This arrangement is able to produce a record tape by recording manual operations of the keyboard. Also, it is able to receive incoming coded signals into the code translator, thereby automatically operating the Flexowriter to type, and when desired, to punch a tape.

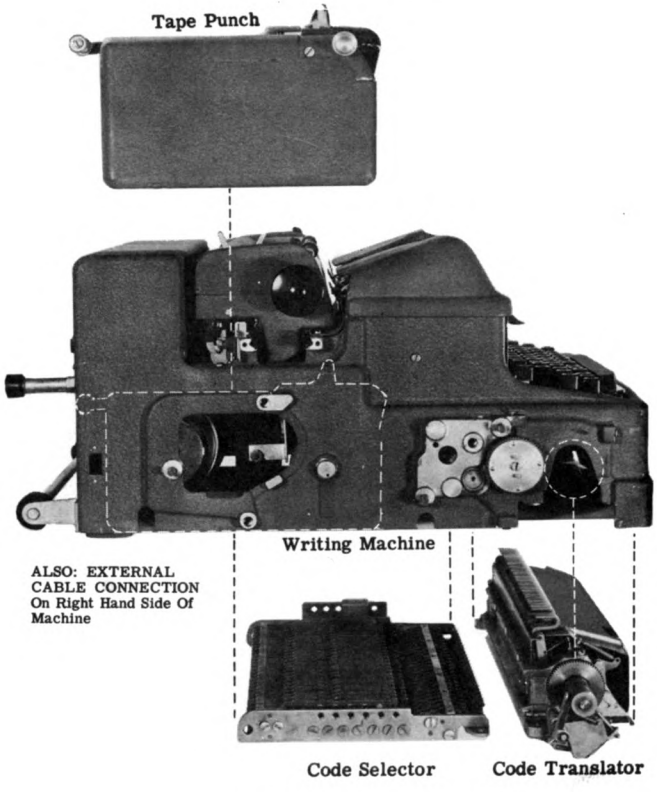

Figure 2-8
Flexowriter Recorder - Transmitter - Receiver

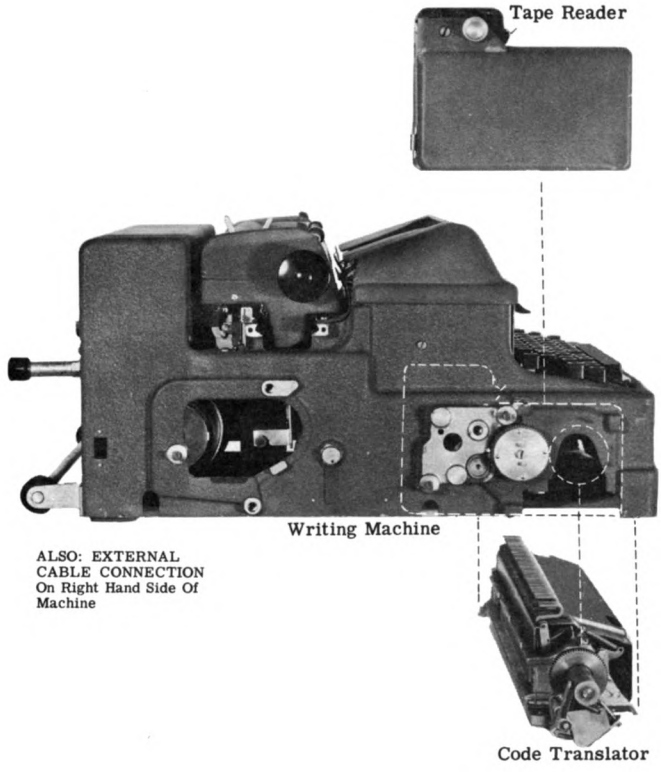

Figure 2-9 Flexowriter Reproducer - Receiver

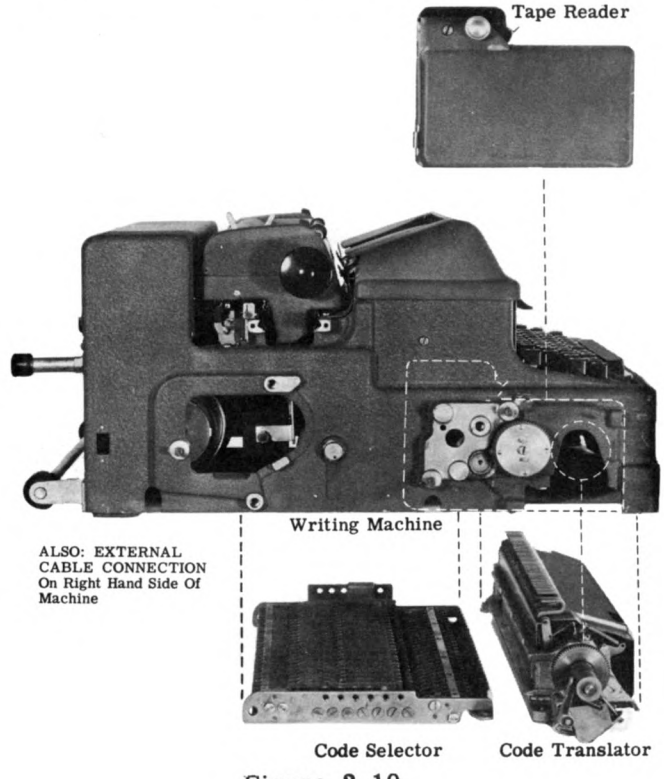

Figure 2-10
Flexowriter Reproducer - Transmitter - Receiver

FLEXOWRITER REPRODUCER - RECEIVER (Figure 2-9)

This is the same combination of units described in connection with the reproducer, but also includes means for connecting the code magnets of the code translator to an external control over a cable. It is capable of reproducing typing from a record tape, or to be operated automatically from the remote source such as a Flexowriter transmitter over its cable connection. A manually operated switch is necessary to select between these two sources of automatic operation of the machine.

FLEXOWRITER REPRODUCER - TRANSMITTER - RECEIVER (Figure 2-10)

This arrangement involves the writing machine, plus a code selector, tape reader and code translator. It is capable of automatically operating the Flexowriter by reading a tape prepared on another machine and at the same time a remote machine may be simultaneously operated in the same manner. The code translator is connected to the external cable connection by a suitable switching arrangement so that this machine may receive controls for its automatic operation over the cable connection when desired.

FLEXOWRITER RECORDER - REPRODUCER - TRANSMITTER - RECEIVER (Figure 2-11)

This is the same arrangement of parts as the Recorder - Reproducer except with switching

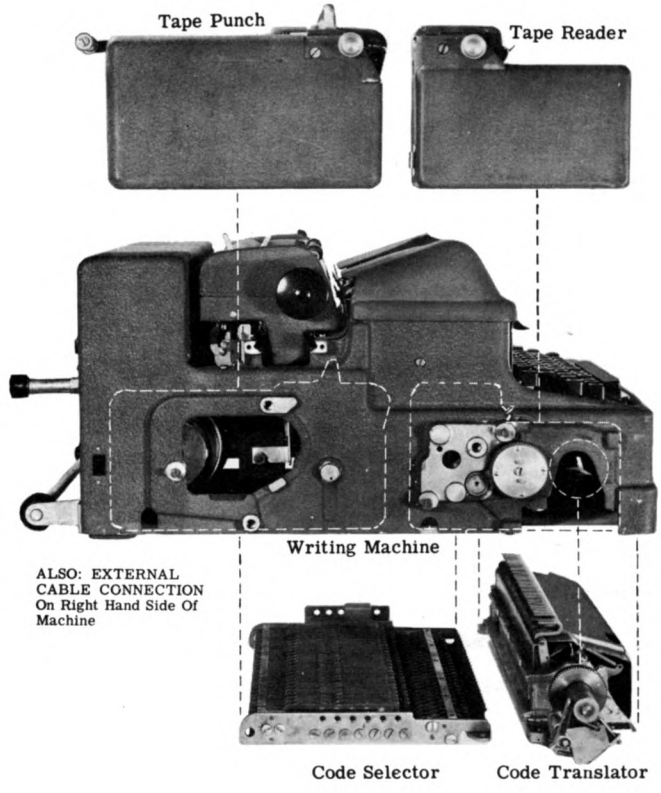

Figure 2-11
Flexowriter Recorder - Reproducer - Transmitter - Receiver

circuits arranged to either connect the code selector or the code translator to an external cable. This arrangement is capable of everything which may be done with the Recorder - Reproducer, and in addition is able to transmit messages to a remote machine either during manual operation of the keyboard or from automatic operation of the Flexowriter by reading a punched tape. It is also capable of being automatically operated from signals over the remote cable connection from another Flexowriter during which time the tape can be punched when desired. Another capability is that the manual operation of the keyboard may be arranged to punch a tape at the same time that the signals are being

transmitted to automatically control another Flexowriter.

FLEXOWRITER DUPLEX REPRODUCER (Figure 2-12)

This is an arrangement of two tape readers on the writing machine along with a code translator. The tape punch cannot be used on the Duplex Reproducer because the second reader is mounted in the space ordinarily occupied by the punch. Controls are usually provided for automatically operating the Flexowriter by a tape in either of the two readers. Both readers may be turned on so that they will alternate in their control of the automatic operation of the typing mechanism. The Duplex Reproducer may be arranged to operate in either of two different manners. In one form, the two readers alternate in a fixed cycle and the machine then stops automatically. In the other form, the two readers operate indefinitely in an alternate fashion in the control of the Flexowriter.

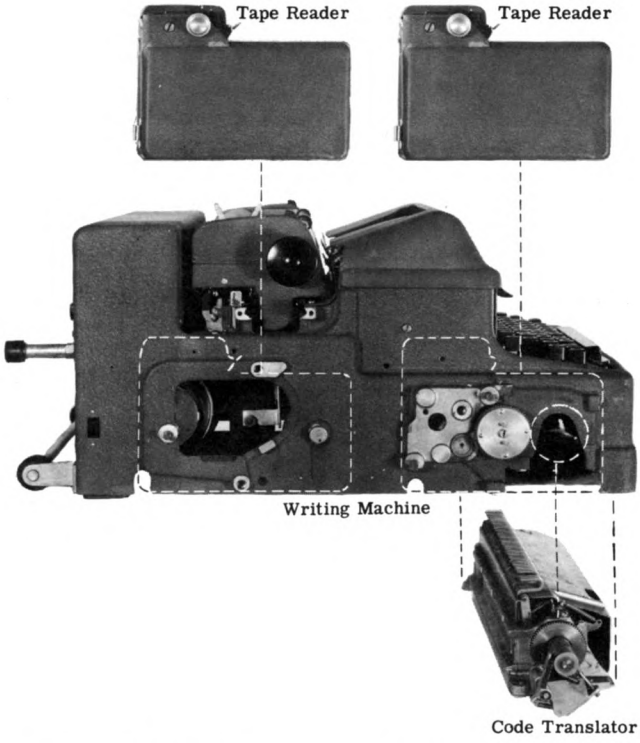

Figure 2-12 Flexowriter Duplex Reproducer

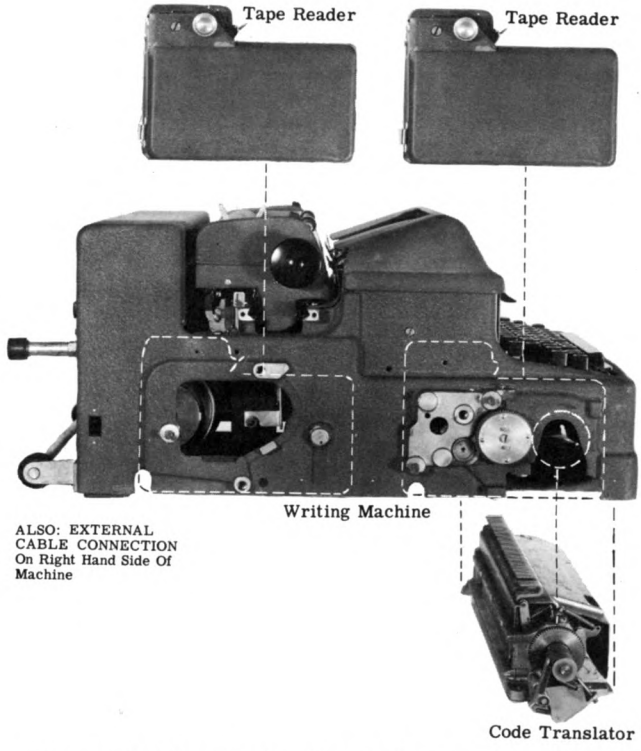

Figure 2-13 Duplex Reproducer - Receiver

DUPLEX REPRODUCER - RECEIVER (Figure 2-13)

This is the same arrangement as provided in the Duplex Reproducer, except that the code translator would be arranged for connection to an external cable when the code translator is not being controlled by either of the two readers. It is capable of the same operation as the Duplex Reproducer and in addition can be operated automatically over the cable circuits from an external Flexowriter Transmitter or similar code transmitting device.

DUPLEX REPRODUCER - TRANSMITTER - RECEIVER (Figure 2-14)

This is the same arrangement as the Duplex Reproducer - Receiver but with a code selector added. It is capable of all the above described functions in connection with the Duplex Reproducer - Receiver. In additon it is capable of transmitting coded controls over the cable connection to any external device.

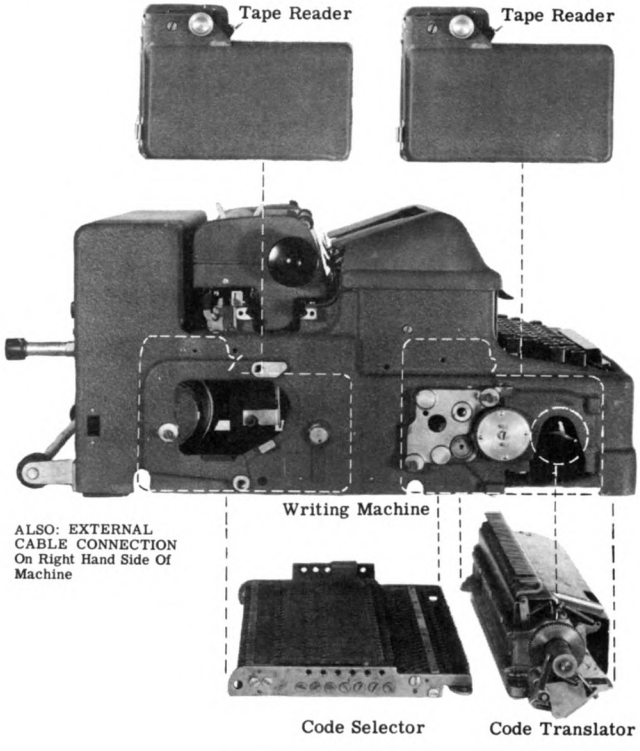

Figure 2-14

Duplex Reproducer - Transmitter - Receiver

FLEXOWRITER RECORDER TAPE TRANSMITTER (Figure 2-15)

This is an arrangement of the writing machine with a code selector, tape punch and tape reader. It is capable of all the functions of the Flexowriter Recorder. The tape produced by the punch may be fed directly into the tape reader which has its contacts connected to the external cable connection. After the tape has been punched on this machine it can be read by the tape reader without handling by the operator for the purpose of controlling an external device such as a Flexowriter Receiver. In this arrangement, the tape reader may be operated for controlling this external machine at the same time that the keyboard is being operated for punching additional tape.

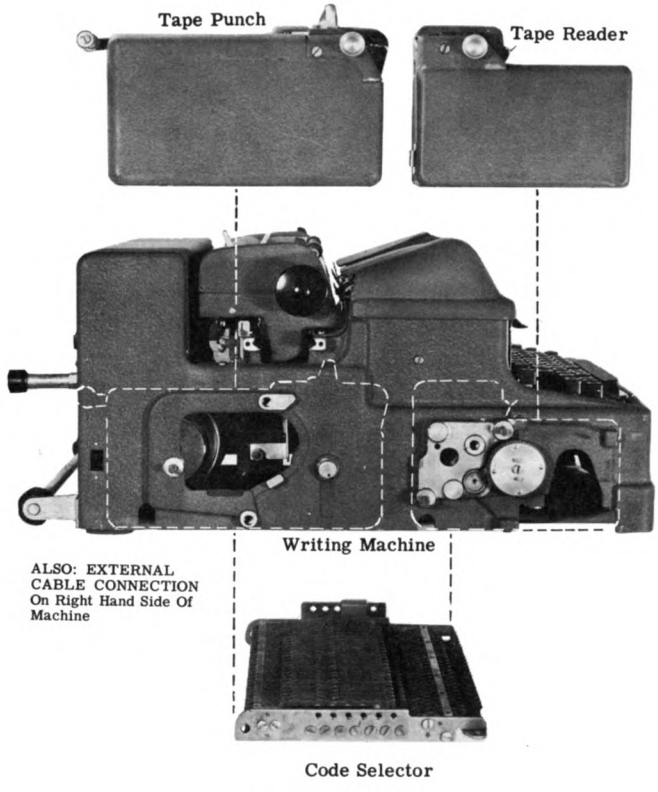

Figure 2-15

Flexowriter Recorder Tape Transmitter

The chart in Figure 2-16 gives a quick reference for all the Flexowriter combinations discussed including, the units the machine is equipped with, plus the operation the machine is capable of performing.

FLEXOWRITER COMBINATIONS AVAILABLE	EQUIPPED WITH							CAPABLE OF PERFORMING THE FOLLOWING								
	TYPING UNIT	CODE SELECTOR	TAPE PUNCH	TAPE READER	CODE TRANSLATOR	2 TAPE READERS	CABLE CONNECTED	Typing Automatically	Selecting Code	Punching Tape	Reading Tape	Translating Code	Transmitting To Remote Machine	Receiving From Remote Machine	Reading From Two Tapes Alternately	Duplicating Tape
Flexowriter Transmitter	X	X					X		X				X			
Flexowriter Receiver	X				X		X					X		X		
Flexowriter Transmitter-Receiver	X	X			X		X		X			X	X	X		
Flexowriter Recorder	X	X	X						X	X						
Flexowriter Recorder-Transmitter	X	X	X				X		X	X			X			
Flexowriter Recorder Transmitter-Receiver	X	X	X		X		X		X	X		X	X	X		
Flexowriter Reproducer	X			X	X			X			X	X				
Flexowriter Reproducer-Receiver	X			X	X		X	X			X	X		X		
Flexowriter Reproducer Transmitter-Receiver	X	X		X	X		X	X	X		X	X	X	X		
Flexowriter Recorder-Reproducer	X	X	X	X	X			X	X	X	X	X				X
Flexowriter Recorder-Reproducer Transmitter-Receiver	X	X	X	X	X		X	X	X	X	X	X	X	X		X
Flexowriter Duplex Reproducer	X				X	X		X			X	X			X	
Flexowriter Duplex Reproducer Receiver	X				X	X	X	X			X	X		X	X	
Flexowriter Duplex Reproducer Transmitter-Receiver	X	X			X	X	X	X	X		X	X	X	X	X	
Flexowriter Recorder Tape Transmitter	X	X	X	X			X		X	X	X		X			

Figure 2-16 Flexowriter Combination Chart

FLEXOWRITER MODELS

The Flexowriter combinations discussed in Part I, Section 2 are available in different models. The primary difference between the following Flexowriter models is the specific physical arrangement of the tape which is punched or read and the binary code used.

MODEL FL

This model is called a "Flexowriter Letterwriter", and has been designed expressly to type repetitive information automatically as a by-product of routine typing. It uses a six-unit binary code which is suitable for the automatic control of this particular model. Therefore, the perforated tape from this model is not interchangeable with the tape used on other models.

The Model FL is discussed in detail in Part II of this manual.

MODEL FC

The "Flexowriter Communication" machine was designed for use in communication systems. It uses a standard five unit binary code which is the same as used in commercial printing telegraph systems. A standard three bank keyboard is used, thus, its typing facilities are necessarily limited to capital letters only. The shift mechanism is designed to select between the printing of the letters (lower case) or figures (upper case).

The Model FC is discussed in detail in Part III of this manual.

MODEL FG

The "Flexowriter Graphotype" machine is designed to perforate a six unit binary coded tape required for operating the Automatic Graphotype machine.

There are several different models of the Flexowriter Graphotype machine which are designed specifically to perforate a tape to control a particular Automatic Graphotype model.

The tape perforated in any one particular Model FG is not necessarily interchangeable with another Model FG. Also, a perforated tape from any of the various Model FG's cannot be interchanged with other Flexowriter models.

The different Model FG machines are discussed in detail in Part IV of this manual.

MODEL FTM

The "Flexowriter Teletypewriter" Multiple circuit machine is used exclusively for teletypewriting applications involving the transmission and reception of messages to and from remote locations. The tape used on the Model FTM is physically the same as that used on the Model FL, but the codes assigned to certain characters are different than in the Model FL because it is particularly adapted to teletypewriting systems.

The Model FTM is discussed in detail in Part V of this manual.

MODEL FPC

Flexowriter Models

The "Flexowriter Punched Card" machine is designed to produce a record tape while an original document is being typed. The record tape may then be used to automatically punch cards for use in a tabulating system.

There are three models available, namely; Model FPC-8 and 8-A, and Model FPC-5. The Model FPC-8 and 8-A uses an eight unit binary code, while the Model FPC-5 uses a five unit binary code. These models are not interchangeable, therefore, it is impossible to punch an eight unit code on the Model FPC-5 and vice versa.

The Model FPC is discussed in detail in Part VI of this manual.

INSTALLATION

This section contains the necessary information for a Customer Engineer to properly install a Flexowriter or Justowriter.

PACKAGING

A great deal of careful study was involved before the present packaging procedure of machines was adopted. This was necessary to insure that the many adjustments would be maintained through all conditions of shipment. To aid the Customer Engineer in the initial installation of a machine or when shipping a machine is necessary, it would be well to understand the packaging procedure described here.

Carriage end plugs (Figure 4-1) must be inserted between the carriage ways and rails to prevent damage to the escapement mechanism during shipment. The manual release levers should be locked down by inserting a paper plug before the carriage plugs are locked in place.

The feet of the machine must be replaced with rubber shock mounts. The feet must then be packaged and tied to the machine.

The motor belt must be disconnected from the motor pulley and the motor mounting should be drawn up tight against the base of the machine (by turning motor adjusting screw).

The machine must be fastened securely to the wood pallet with four large hex nuts.

The top cover, tape spool holder and margin release levers must be held in place with masking tape.

The padded cleats and sling must be installed as shown in Figure 4-1.

The cover must be installed and the machine placed in a fibreboard carton (the fibreboard carton is used on machines with 12" and 16" carriages, a wooden box is used to package 20" carriage machines). Two liners must be inserted in the carton and the covers must be glued.

MACHINE INSTALLATION

The procedure for initial machine installation is as follows:

1. Note condition of package and record on shipping tag (Form Number 330R) any noticeable damage.
2. Unpack and note general appearance of machine.
3. Note if operators instructions, machine specifications, ribbon, tape, dust cover and type cleaning brush are packed with machine.
4. Untie carriage. Connect motor belt and adjust.
5. Turn motor belt by hand in direction of rotation of motor, until all cams are restored to normal. (It may be necessary to return type bars to rest manually as motor belt is turned.)
6. Feed tape into the punch. Then, with no tape in the reader, turn machine and start reader operation.

   All pins of reader should operate causing

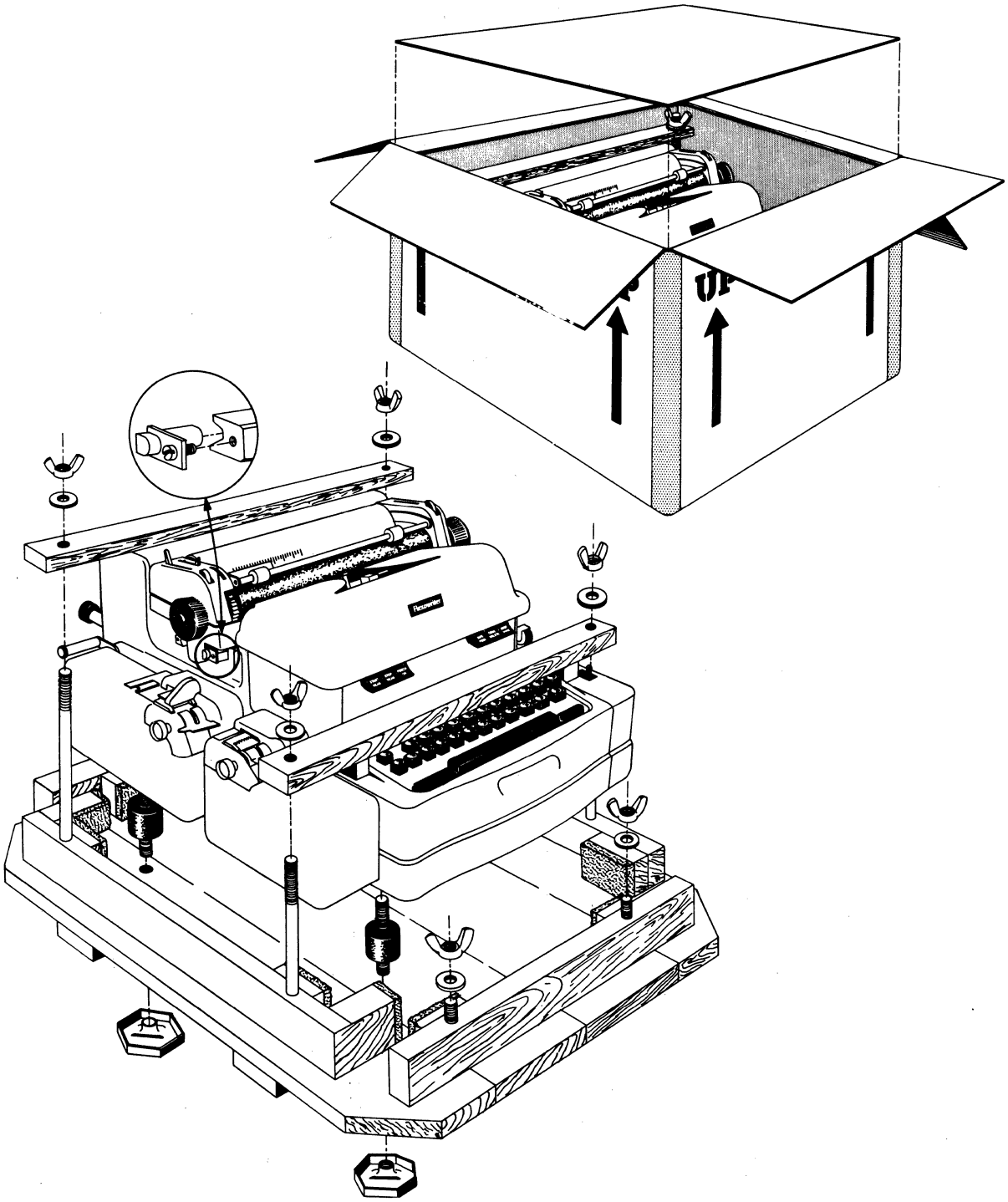

Figure 4-1 Packaging Procedure

translator clutch operation. However, no translator seeker operation should takeplace (this is the same as reading a code delete).

7. Place a piece of blank tape in the reader to prevent pins from operating and again start reader. The translator should operate without seeker operation.
8. Manually operate the keyboard without punching a tape, checking every character and function key for proper operation.
9. Manually operate the keyboard with the punch on being sure to operate every character and function key.
10. Without removing the tape from the punch, insert beginning of tape in the reader and run automatically with punch on. Continue this automatic operation until several reproductions of the original tape have been completed.

Form 518AR should be filled out completely during installation procedure described above.

90 DAY INSPECTION REPORT

On all service calls within the ninety day guarantee period, make an extra copy of the service report. Ninety days (last day of 90 day guarantee) after machine has been installed, complete the 90 day inspection and return the 90 day report (Form 518BR), completely filled out, to the Service Department at Rochester. Include the extra copies of the service reports, if any, stapled to the upper left hand corner of this report.

Check the machine for cleanliness, lubrication and operation. If any malfunctions are noted, Thoroughly Examine The Machine Before Making Any Adjustments.

GUARANTEE POLICY

The free service guarantee on Flexowriter and Justowriter equipment is for a period of 90 calendar days after installation. If the equipment is outside the fifteen mile radius, it is subject to a transportation charge, at our cost, plus the cost of travel time at our current hourly service rate. All service calls made after that time are charge calls.

Flexowriter and Justowriter equipment has a one year guarantee covering defective parts or factory workmanship only. If after the 90 day guarantee expires it becomes necessary to install a part because it has proven defective this part will be replaced in the customer's machine without charge, but Commercial Controls will charge the customer our regular service charge to include service time, travel time and transportation. The defective parts must be returned to the General Service Department in Rochester.

INSPECTION AGREEMENTS

The Commercial Controls Inspection Agreement is sound insurance and will prolong the life of equipment. It is imperative that equipment be kept in the peak of operating efficiency through regular periodic attention by a factory-trained Customer Service Engineer who will clean, oil, adjust and inspect our machines under an agreement. Agreements are for a period of one year and will be carried out according to our

price schedule on a thirty, sixty, ninety and one hundred and twenty day basis.

The following sequence may be used as a definite guide to follow when making a Flexowriter or Justowriter inspection:

I. Remove following units if attached:
- a. Reader
- b. Punch
- c. Translator
- d. Selector
- e. Power Roll

II. Power Drive
- a. Remove "V" belt from pulley and inspect. Replace if necessary.
- b. Remove power drive shaft.
- c. Remove power roll drive and carriage return clutch shaft.
- d. Remove intermediate gear.
- e. Clean, inspect and lubricate Oilite bearings.
- f. Replace complete power Drive and lubricate when assembling.

III. Power Frame
- a. Clean, inspect and lubricate.
- b. Check mounting screws.
- c. Replace power roll and adjust motor belt.
- d. Check cam to power roll clearance, both lobes.
- e. Check keylever trip adjustment and adjust if necessary.
- f. Check ribbon feed and ribbon reverse operation.
- g. Check keylever locking for operation.

IV. Carriage Check
- a. Remove both carriage tension and carriage return tapes.
- b. Check carriage for binds and looseness. Carriage should run free but not be loose.
- c. Replace both carriage tapes. Adjust carriage tension.
- d. Check complete tab and carriage return adjustments.
- e. Check and adjust back space.
- f. Check color change operation and adjust.
- g. Check carbon ribbon feed mechanism and adjust.

V. Escapement
- a. Check escapement wheels for excessive looseness and adjust.
- b. Check "U" bar operation. Adjust trip link and operate with type bars to check trip.
- c. PSM - check electrical trip coils and armatures. Adjust links if necessary.

VI. Selector
- a. Clean and check for worn parts.
- b. Lubricate all pivot points.
- c. Install selector on machine.
- d. Clean and adjust selector contacts. Check wire connections.

VII. Punch
- a. Clean and check for any worn parts.
- b. Check armatures for wear.
- c. Clean and adjust contacts.
- d. Remove clutch - clean, lubricate and readjust.
- e. Mount punch on machine.
- f. Perforate tape - check feeding and tape registration.
- g. Check operation of keylock from tight tape or broken tape.

h. Lubricate as specified.

VIII. Reader

a. Clean and check for any worn parts.
b. Clean all contacts.
c. Rotate reader drive and check for proper latching.
d. Mount reader on machine.
e. Insert paper over pins and adjust to open adjustment. Remove paper and check all break contacts and make contacts.
f. Check operation of feeding after mounting translator.
g. Lubricate as specified.

IX. Translator

a. Clean and check for any worn parts.
b. Check armatures for wear.
c. Check all screws.
d. Remove clutch - clean, lubricate and re-adjust.
e. Lubricate as specified.
f. Mount translator on machine. Adjust gear mesh.
g. Check seeker to keylever adjustment.
h. Insert test tape in reader and check out.

X. Machine Complete

a. Run repeat character test of entire keyboard.
b. Test tab, carriage return, line space and back space operation from tape.
c. Reproduce all test tapes.
d. Check alignment of copy.

Note: On Justowriters add following -

1. Computer adjustment complete
2. Hole counter adjustment complete

XI. Relays

a. Check operation of all relays on machines for proper operation.

Note: All special attachments to be checked for operation.

SPECIAL FEATURES

This section contains the more commonly used features and variations in the Flexowriter. No standard model, as described in this manual, includes all the features listed, but all these features and variations are available in special machines in substantially any combination. In nearly all cases, the special features must be built into the machines at the factory.

KEYBOARD

The keyboard on a Flexowriter can be provided with practically any arrangement of keys. Figure 5-1 shows the maximum number of keylevers that can be provided and a typical arrangement of characters.

Usually no change is ever made in the illustrated standard arrangement of alphabet keys, but various different characters can be assigned to any of the other printing keys. This applies to keylevers in positions 1 thru 43 (as shown on the chart in figure 5-1,) which normally are the only keys in the keyboard which print. However, any of these keylevers can be arranged to control cams for

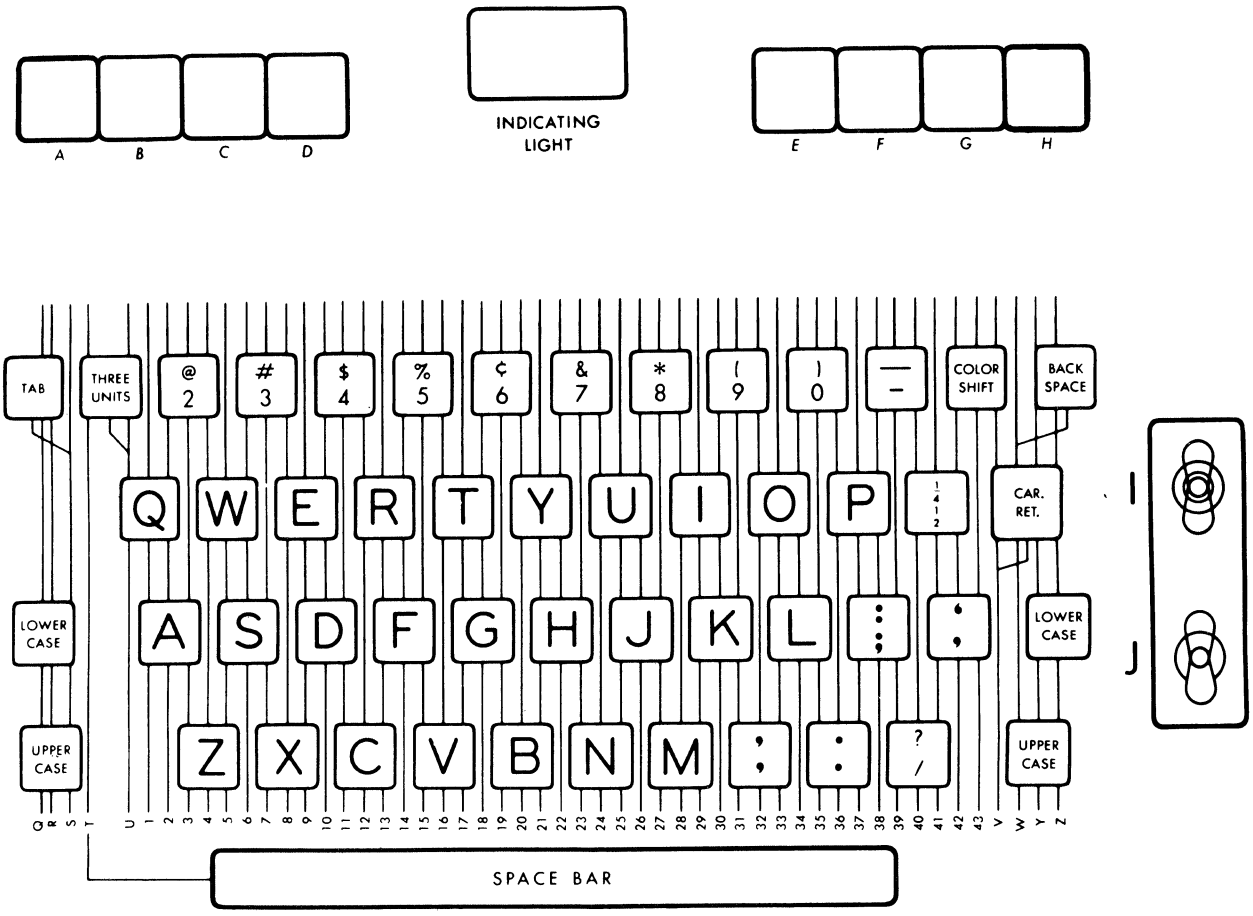

Figure 5-1 Example Keyboard Chart

the sole purpose of selecting coded impulses in the Code Selector without printing.

When the Flexowriter is provided for both upper and lower case printing (typing), shift keys are provided in the positions shown (Figure 5-1). In this instance, the lower case shift keylever in position "Z" operates a shift cam and is interconnected by a bail to another lower case shift keylever in position "Q" which does not operate a cam. Likewise, the upper case shift keylever in position "R" operates a shift cam and is interconnected by a bail to another upper case shift keylever in position "Y" which does not operate a cam. The Flexowriter can also be constructed for single case typing only and in this instance keylevers in position "R" and "Z" are available for special non-printing purposes such as the selection of a functional or control code.

The following keylevers are also available for special non-printing functions such as the selection of a code in instances where their normally used function is not required:

Keylever in position "S" normally used for TAB.

Keylever in position "W" normally used for BACK SPACE.

Keylever in position "U" normally used for three unit space in proportional spacing models. This keylever, however, will always cause carriage spacing.

The keyboard shown in figure 5-1 has four transverse rows of keys and is commonly called a four-bank keyboard. However, the Flexowriter can be provided with a three-bank keyboard arrangement such as is generally used on communications machines used with a 5 unit binary code. If the top or figures row in figure 5-1 is omitted and the figures are combined with the top row of letters, the shift mechanism is then used to select between the typing of letters and figures.

Special arrangements of keyboards are also available on the Flexowriter for use with a 5 unit code which employs all four banks of keys. These special arrangements employ different keylevers for letters and figures with an interlock preventing operation of the figures keys when shifted to type letters and preventing operation of the letters keys when shifted to print figures.

Normally all keys are dark blue in color with white engraved characters. However, any of these keys can be gray or maroon in color in cases where it is desired to distinguish certain keys from others in the keyboard. Also, the engraved characters in the keys can be colored other than white for purposes of distinction.

KEYBOARD INTERLOCK

A mechanical keylever interlock is normally provided on all Flexowriters and Justowriters. The purpose of this interlock is to allow only one keylever to be depressed at one time, thus preventing collision of type bars and mispunching of codes in the tape. The interlock is normally effective on all keylevers except the shift keylevers in position "Q" and "Y". These two keylever positions, through an equalizing rod, work simultaneously with their companion keylevers in position "Z" and "R". However, any of the other keylevers can be notched so that it is not affected by the interlock.

Figure 5-2 shows a sample of an interlock in

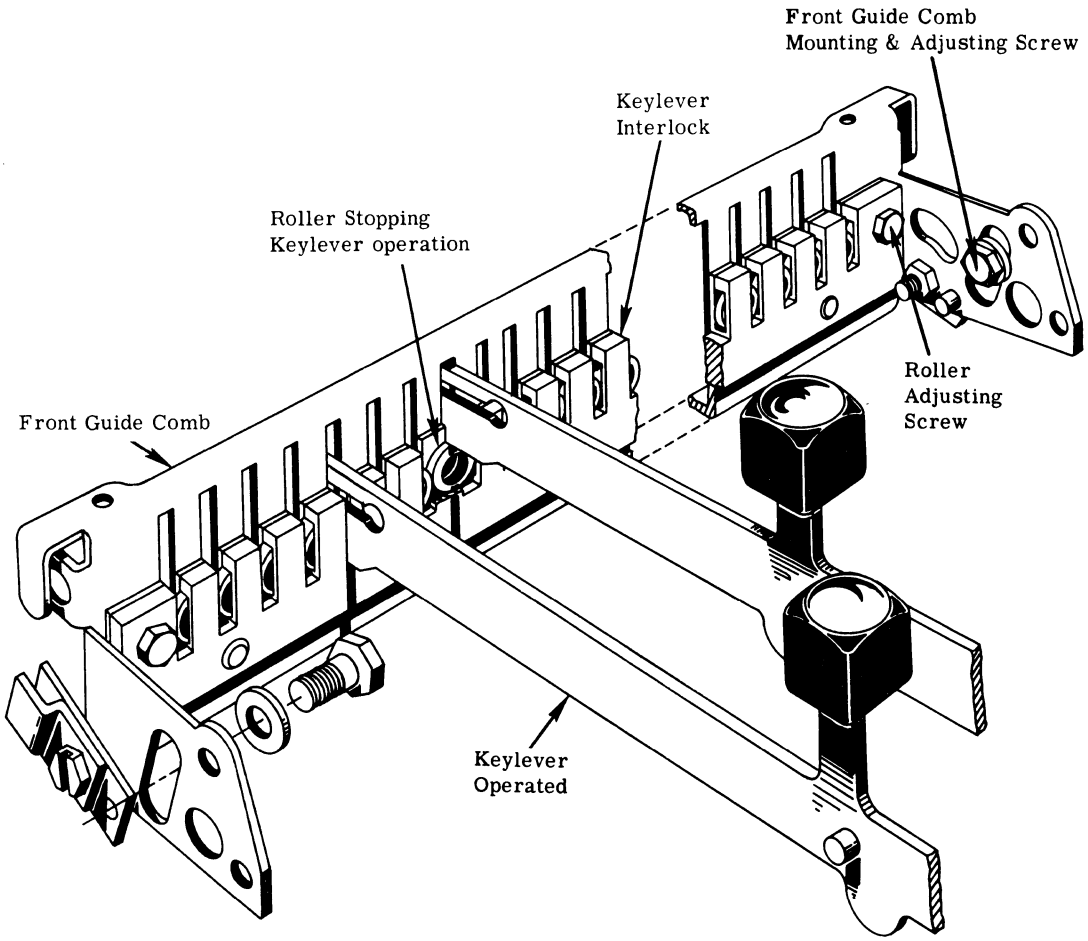

Figure 5-2 Keylever Interlock

operation. The interlock consist of one less roller than there are keylevers, consequently, when one keylever is depressed, the rollers move along the channel and prevent another simultaneous keylever operation.

If it is necessary to remove and replace a keyboard interlock use the following procedure:

1. Remove the reader cover
2. Remove the translator
3. Remove the keylock bar operating link. Remove the keylock bar by removing the right hand mounting screw and bracket.
4. Remove the interlock mounting screws and remove the interlock.

   NOTE: If an interlock is being initially installed on a machine, the front guide comb will have to be removed and replaced with a new one. To do this remove the upper and lower case equalizing rods. Also, the lower section of the L.H. lower case and R.H. upper case keylevers will have to be removed.
5. Using the .190 - .210 trip gage, check the keylever trip across the keyboard. Raise the guide comb if the majority of keylevers trip on the .190" side of the gage.

Lower the guide comb if the majority of the keylevers do not trip at .210". This adjustment should be made so that the distance of travel of the keylevers is equal on both sides of the keyboard. (Try to get this adjustment without changing the bifurcation on the end of the keylevers.)

6. When the trip adjustment is correct secure the guide comb mounting screws and recheck .190" - .210" adjustment.
   NOTE: Install upper and lower case equalizing rods if removed.
7. Install interlock with three mounting screws (do not tighten mounting screws). Be sure that slots in interlock align with slots in guide comb correctly.
8. With a keylever (about 9th from left hand side) held down, set right hand end of interlock so that the keylevers on the right hand side have about 3/64" play between the top of its interlock roller and the top of the slot in the guide comb.
9. Depress a keylever on the right hand side (about 9th) and adjust the interlock so that the keylevers on the left side have about 3/64" play between the top of its interlock roller and the top of the slot in the comb. Be sure the slots of the interlock align with the slots in the guide comb, then secure the interlock mounting screws.
10. With a center keylever held down check each keylever for approximately 3/64" play. If some keylevers are less than 3/64", close the bifurcation to get proper clearance. It may be necessary to disregard the .210" adjustment.
    NOTE: The movement of the rollers is controlled by a stop at each end of the bracket. If more or less travel is necessary, loosen and move the roller adjusting screws (figure 5-2). Be sure and check the keylevers for proper locking after moving these screws.
    CAUTION: DO NOT OIL INTERLOCK.
11. Install keylock bar. With machine off, set keylock bar to clear bottom of keylevers by approximately 1/32". Install keylock bar operating link.
12. Install space bar, translator and reader cover.

CASE SHIFT

In double case Flexowriter, the type basket is shifted relative to the platen by two cams controlled by keylevers (figure 5-1). This arrangement requires a key operation for shifting to one position and a different key operation for shifting to the other position.

A special shift arrangement similar to that used on communications printers can be provided on the Flexowriter. This arrangement causes the machine to shift to letters position whenever the space bar is operated in figures shift position, (see Special Feature Shift On Space, page 5-17).

BACK SPACE

A back spacing mechanism is usually provided in the Flexowriter for moving the carriage one letter space to the right. This is a cam-operated mechanism under control of a keylever in position "W". In proportional spacing models, the back

space will move the carriage one unit to the right.

CARRIAGE RETURN

The carriage is returned in the Flexowriter by power through a friction clutch, controlled by a keylever. Indexing or rotation of the platen for line spacing is incidental to the carriage return operation and cannot be separated from it.

The left hand margin in typing is determined by the position to which the carriage is returned. This position is manually adjustable in increments of one letter space on machine spacing at ten or twelve characters to the inch, two letter spaces on machines spacing at 16 characters to the inch, and on proportional spacing machines the margin is adjustable in increments of four units of spacing.

A special arrangement can be provided for initialing a return of the carriage automatically after the carriage has been spaced past an adjustable predetermined point. Another special arrangement can be provided which will automatically select a line feed code following a carriage return code selection. (See Special Feature - Automatic Line Feed, page 5-15).

TABULATION

A carriage tabulating mechanism is usually provided in the Flexowriter and is controlled by a keylever in position "S". The tab positions of the carriage are determined by individual stops which are manually positioned at variable increments of two letter spaces in machines spacing ten, twelve and sixteen characters to the inch, and at increments of four units of spacing in proportional spacing machines.

A special tab arrangement is available for three-bank keyboards operating on a 5 unit code. In this instance the code assigned to the tab is one of the letters codes in figures shift position. Thus, the operation of this letter key will electrically cause operation of the regular tab keylever in position "S", providing the machine is in figures shift position. (See Special Feature - Model FC Tab Mechanism, page 5-19).

REPEAT CAM

Normally all keylevers control cams which make only one operation regardless of how long the keylever is held down. However, in some instances it is desirable to have a cam which will operate continuously for as long as the keylever is held down. This is accomplished by removing one lug on the release lever of a cam (see figure 5-3).

A repeat operation will usually only be found necessary for either space, back space or underline.

In the case of repeat space and repeat underline it is necessary to retain the normal single operating cam.

A special keylever is provided in position "U" for repeat space operation. If repeat underline is used, another key position will have to be given up.

Due to the delay control circuit in automatic back space operation it is not necessary to have a special keylever position for repeat back space.

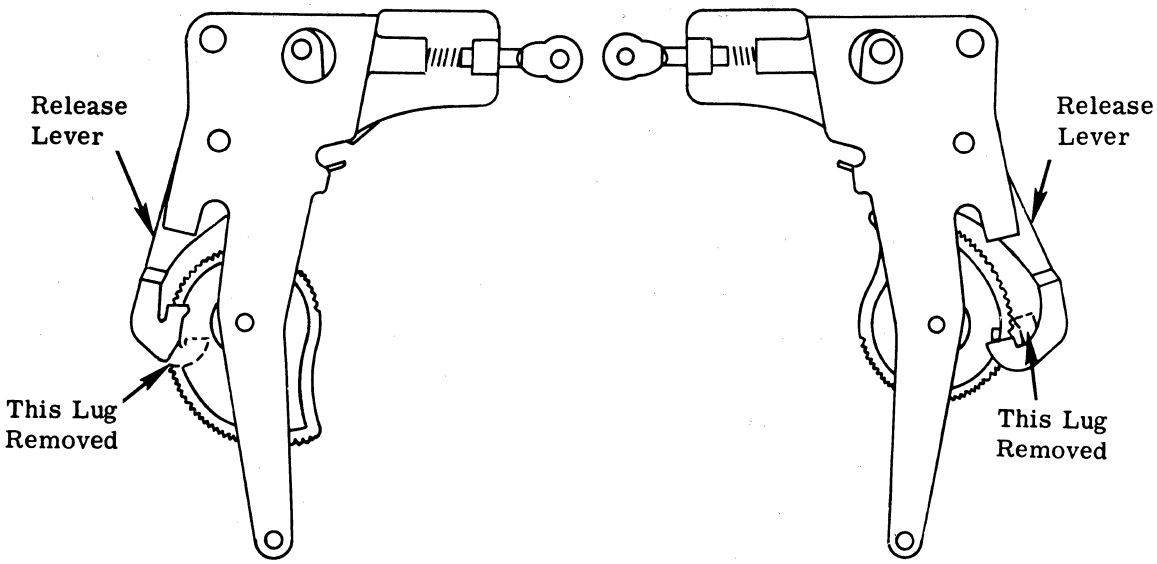

Figure 5-3 Repeat Cam

FRONT CONTROL PANEL

A control panel is provided directly above the keyboard of the Flexowriter and can be equipped with up to eight manually operated switches. (A through H - Figure 5-1), some of which are used for machine control plus an indicating light. The light is placed in the center of the panel when it is used, and the switches are grouped on each side of the light. Each switch includes an operating lever which is engraved to show the function of the switch.

The switches may be of the locking or self-restoring type. In the locking type, the lever remains in its operated or depressed position until it is manually restored. The self-restoring switch lever returns to normal position as soon as the manual operating pressure is removed. Each of the switch levers can operate a Class A (normally open) contact, or a Class B (normally closed) contact, or a Class C (Transfer) contact.

SIDE CONTROL SWITCHES

Toggle switches can be provided at the right hand side of the keyboard for control of the Flexowriter. The most common arrangement is only a single power switch which is provided to turn the power off and on for the entire machine. However, this side control switch arrangement can include either one or two toggle switches "I" and "J" (Figure 5-1) and a plate over these switches can be engraved to indicate their function. Each switch can be either the two position or the three position type where the center position is off. Also each switch can be either a single pole type (one circuit only) or a double pole type (two circuits).

TYPE STYLES

Flexowriter are available in a large variety of type styles and sizes either proportionally spaced or uniformly spaced. In case shift machines, the shift motion is .265 of an inch, and any type style adapted to this shift motion and to the following spacing variations can be used. In monospacing machines, type can be used which is spaced 10 characters to the inch (Pica), 12 characters to the inch (Elite), 16 characters to the inch, or 6-2/5 characters to the inch. In proportional spacing machines, type can be used which has a unit spacing value in inches of one thirty-second (approximately twelve point) one thirty-sixth (ten point) or one forty-eighth (eight point).

CARRIAGE SIZES

The standard Flexowriter is equipped with a 12 inch carriage which will accept an 11 inch wide sheet and has a $9\frac{1}{2}$ inch writing line. In addition, 16 inch and 20 inch carriages are available on all machines except 8 point and 10 point proportional spacing models. The 16 inch carriage will accept a 15 inch wide sheet and has a $13\frac{1}{2}$ inch writing line. The 20 inch carriage will accept a 19 inch wide sheet and has a $17\frac{1}{2}$ inch writing line.

PLATEN AND RATCHETS

See Platens and Ratchets — Part II, Section 2, page 2-56.

RIBBON

A fabric ribbon with an automatic reversing feed mechanism is provided as standard equipment on Flexowriters. A special carbon paper ribbon feed mechanism is also available which feeds a narrow ribbon from a supply spool across the machine to a rewind spool, (see Special Features - Carbon Ribbon Mechanism). This mechanism permits the standard fabric ribbon to be used when the carbon paper ribbon is not being used.

RIBBON SHIFT

A manually operated ribbon shift is provided on all Flexowriters which selects between the use of two different fields of a fabric ribbon. An automatic ribbon shift can be provided which operates from a single code received by the code translator to change the field used in the ribbon. This mechanism uses a keylever in position 43 and is effective to change the color of printing when a two-color ribbon is used. A different ribbon shift mechanism is also available which is operated by an electromagnet.

This magnetic ribbon shift operates to select one field of the ribbon when the electromagnet is energized and the other field when de-energized.

CODE TRANSLATOR AUXILIARY CONTACTS

A special cam-operated contact assembly can be provided in any Flexowriter Code Translator which does not involve greater than an 8 unit

code. Any number up to three cams can be mounted on the Code Translator shaft and each cam can control a Class C (Transfer) contact. Each cam is adjustable to any radial position on the shaft and cams are available having various extents of operating duration.

FUNCTIONAL CONTACTS

Auxiliary contacts can be provided at various points in the Flexowriter to operate in accordance with the normal functional operations of the machine. The case shift contacts (CSC), controlled by the movement of the type basket, may have up to eight Class C (transfer) contacts. A single Class B (Break) or a single Class A (Make) contact can be provided to operate during the back spacing operation of the Flexowriter. Also, contacts can be provided to operate at the start of both the carriage return and tabulating operation and to remain operated until the completion of these operations. These contacts can involve up to four springs providing two Class A or two Class B assemblies.

CABLE CONNECTIONS

One or two cable connectors can be provided at the right rear side of the Flexowriter for the purpose of connecting the internal wiring of the machine to an external device. A.N. style connectors are used and one connector up to size 24 can be provided and if a second connector is required it can be up to size 22.

MOTOR

The standard motor used in the Flexowriter operates on 115 volts, 60 cycle and is rated at 35 M. H. P. It is an induction motor having a rated speed of 1725 R. P. M. This same motor is used on 115 volts, 50 cycle with changes in the drive ratio to compensate for its reduced speed. When the Flexowriter is to be used with higher voltages between 120 and 260 volts, 50 or 60 cycle, an external transformer is provided and the same motor is used. A special motor is available for 115 volts direct current applications. A rheostat is built into the Flexowriter with this D.C.

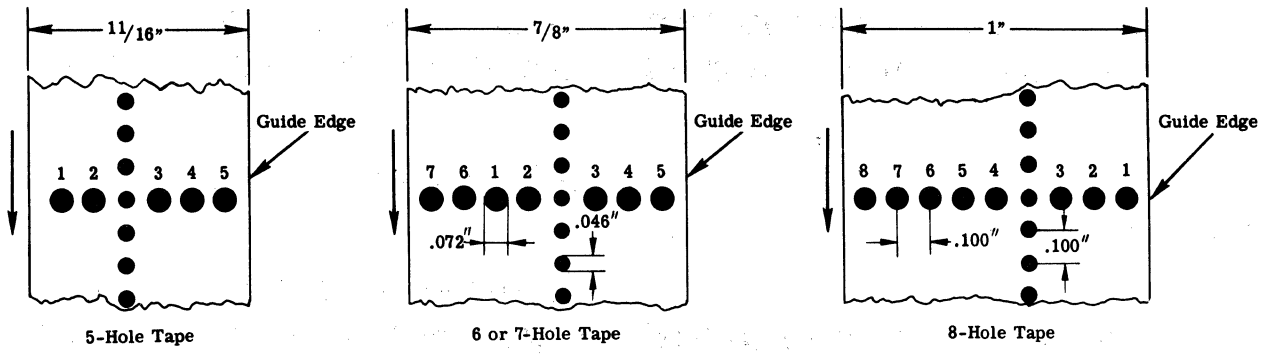

Figure 5-4 Tapes Used

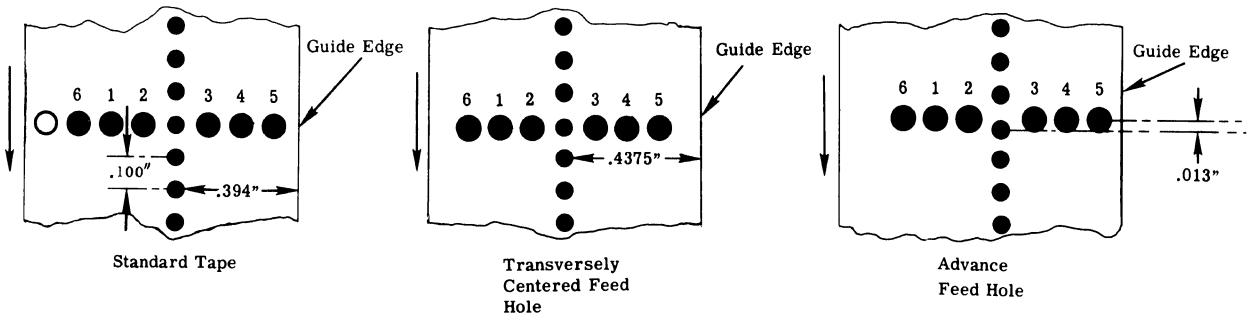

Figure 5-5 Special Tapes

application for adjusting the speed of the motor.

DIRECT CURRENT POWER SUPPLY

The Flexowriter usually has a built-in, full wave rectifier supplying approximately 90 volts D.C. rated at 1 amp. In this case the rectifier is connected directly to the A.C. supply line and the D.C. power is not isolated from the line. Flexowriters are also available with a built-in D.C. supply at approximately 48 volts rated at 2 amps. This uses a transformer which isolates the D.C. power from the A.C. supply line.

RELAY CAPACITY

The upper rear portion of the Flexowriter provides space for mounting a number of relays usually required for the control of the machine.

This space is sufficient for mounting a maximum of seven large telephone type relays. A greater number of relays of the medium size can be used in this space. If no carriage position switches are required a maximum of 18 medium size relays can be used, and if these switches are required, a maximum of 15 medium size relays can be used.

TAPE USED

The Tape Punch and the Tape Reader used on the Flexowriter can use any standard tape between .687 and 1.000 inch wide. Three width tapes are most commonly used in this range, eleven-sixteenths of an inch for a maximum of five code channels, seven-eighths of an inch for a maximum of seven code channels and one inch for a maximum of eight code channels. All tapes have code holes which are .072 inch in diameter and feed holes .046 inch in diameter. (See figure 5-4.)

All holes are spaced .100 inch both longitudinally and transversely. The tape punch is normally constructed to punch feed holes in line with the code holes transversely of the tape, but specially constructed tape punches are available which punch these feed holes .013 in advance of the code holes, (See Figure 5-5.) The tape reader is adjustable to either of these two feed hole positions. Both the tape punch and the tape reader are normally constructed for use with tape having the center line of the feed holes spaced .394 inch from the inside or guiding edge of the tape, but specially constructed punches and readers can be provided for use with tape having the center

line of the feed holes spaced .4375 from this guiding edge.

OPERATING SPEEDS

The maximum operating speed of the Flexowriter is determined by the rate at which reliable repeat printing of a single character can be obtained.

Roughly this is about 10 characters per second, and to provide a workable margin of safety, the Tape Reader is set to automatically operate the Flexowriter at a nominal speed of 571 characters per minute. Although the drive mechanism for the Code Translator operates at 588 R.P.M., it is not recommended that codes be supplied to it for automatic operation at a rate higher than 571 per minute. The mechanical drive for the tape punch operates at 853 R.P.M. to provide for maximum manual keyboarding speed.

PIN FEED PLATENS (See Figure 5-6)

Pin feed platens are available in various sizes which provide a means of feeding multiple-

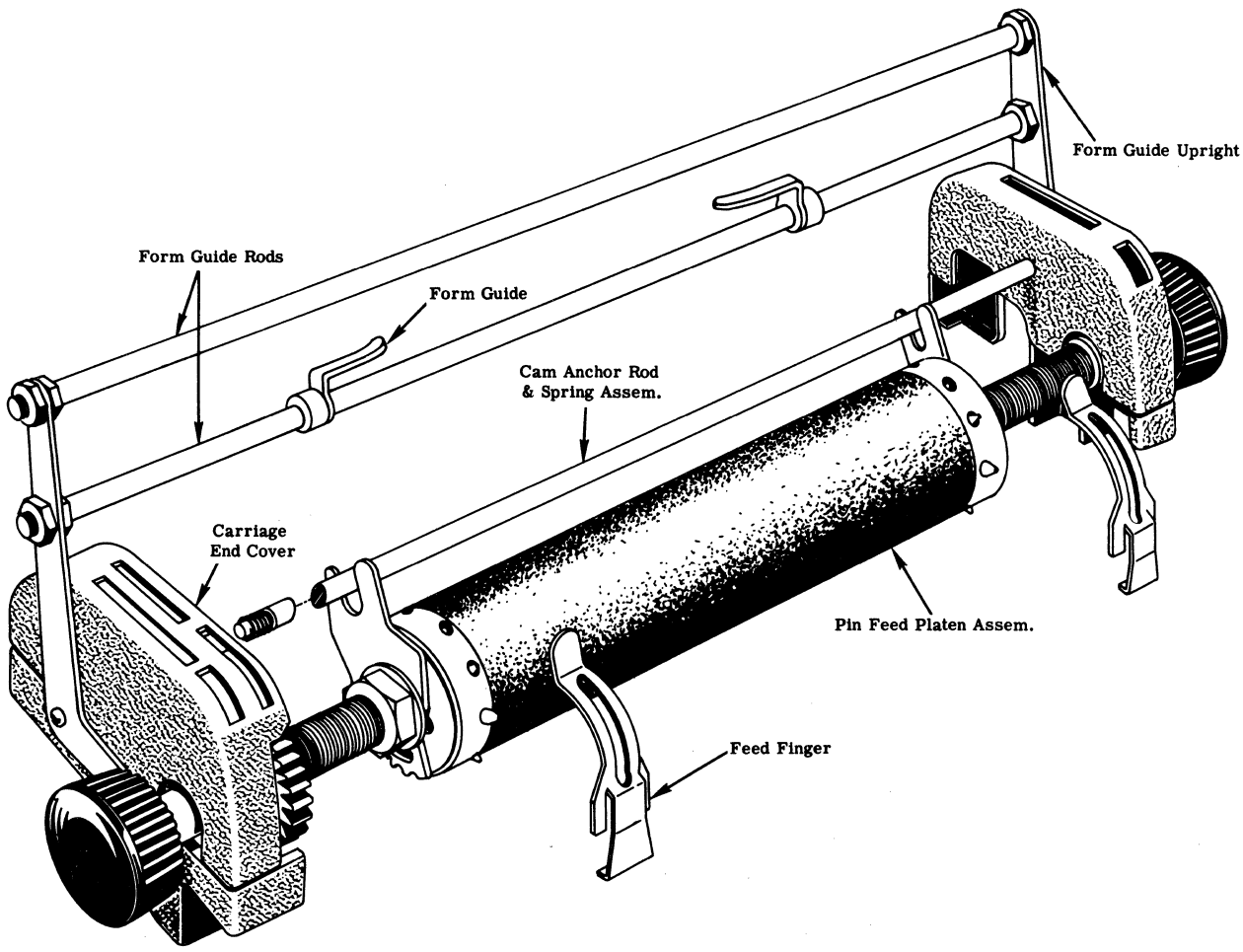

Figure 5-6 Pin Feed Platen Assembly

FORM DIMENSIONS - PIN FEED PLATENS

Over All Form Width	Pin to Pin	Over All Form Width	Pin to Pin	Over All Form Width	Pin to Pin
5-3/4	5-1/4	9-7/8	9-3/8	13-5/8	13-1/8
6-1/2	6	10-3/8	9-7/8	14-7/8	14-3/8
8	7-1/2	10-5/8	10-1/8	16	15-1/2
8-1/2	8	11-3/4	11-1/4	16-3/4	16-1/4
9-7/8	9-3/8	13-5/8	13-1/8	17-27/32	17-11/32
10-3/8	9-7/8				

Figure 5-7 Platen Chart (Pin Feed)

copy forms, with interleaved carbon, through the machine and maintaining register between the copies. Perforations along the edges of the form permit retractable pins in the rims of the platen to pull the form with the indexing (rotation) of the platen. Feed fingers are provided which spring into place on the front paper scale to hold the forms against the platen rims, thus keeping the perforations on the pins. Guide rods are also provided to keep the forms feeding into the platen evenly. During operation, the feed roll release lever is held forward in the released position because the feed rolls are not required to feed the paper.

Platen cylinders are available in three grades of hardness, No. 1 - soft, No. 2 - medium and No. 3 - hard. Each of these grades of hardness are available in different lengths, measured between the pins. The chart in Figure 5-7 shows the various lengths available.

The platen cylinder may be replaced by removing the right-hand platen knob, platen bushing and the hex nut against the right-hand pin wheel assembly, (Figure 5-8). The right-hand pin wheel assembly may then be removed from the shaft. The two hex nuts lock the cylinder on the shaft in any position desired with regard to center.

The platen ratchet is fixed to the platen shaft and no platen release is provided. The ratchets available for pin feed platens are shown in Figure 5-9.

The indexing mechanism should be adjusted in the same manner as for a standard platen (See Part II, Section 2, page 2-36.) If after adjusting the indexing mechanism (pawl, stop, detent, etc.), and the registration of the form is off, loosen the ratchet set screws, hold the ratchet and turn the platen to the desired position. Be sure and tighten the ratchet set screws securely.

The pin position may be adjusted, if necessary, by loosening the roundhead screw in the slotted opening of the locating plate and rotating the plate until the pins begin to protrude as they reach the top of the front paper scale and begin to retract just before leaving the slot in the feed finger. Rotate the platen backward to insure that the pins do no catch on the top of the front paper scale.

CARBON PAPER RIBBON MECHANISM

This mechanism provides for the use of carbon paper ribbon but does not interfere with the use

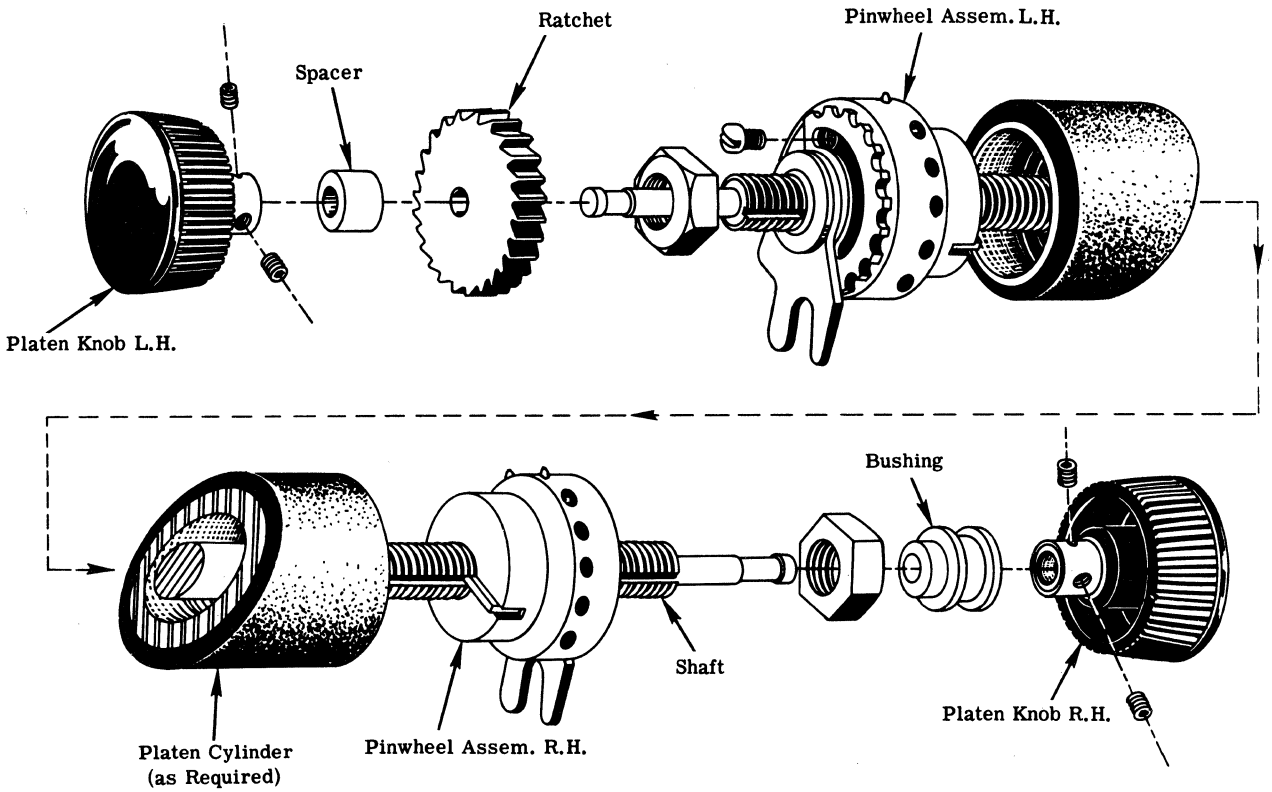

Figure 5-8 Pin Feed Platen Disassembled

of fabric ribbon (all Flexowriters are equipped for a fabric ribbon.)

A 4" diameter (645 ft.) roll of carbon ribbon (9/32" in width) is unwound from a right hand spool and is fed across the machine and rewound on a left hand spool. The ribbon is moved after each operation of a type bar.

This is accomplished by meshing a gear with the escapement mechanism (See Figure 5-10), which will cause the ribbon to move the correct amount of space so that the characters will not over-strike on the ribbon.

AUTOMATIC PUNCH CONTROL FROM KEYBOARD

A Flexowriter can be arranged to automatically control the punch through keyboard operation. With this device the tape punch can be turned on and off from the keyboard.

An example circuit of punch control from the keyboard is shown in Figure 5-11. The "Punch On" switch is a non-locking switch, which when depressed will energize the "Punch On" relay (K3), causing all information typed to be punched in the tape. Note in figure 5-11, that the K3 relay holding circuit is through a normally closed contact on the K4 (Punch Off) relay. Therefore, if K4 becomes energized the K3 will de-energize stopping punching operation.

The selector slides for positions K and L are coded to operate additional contacts. The L position operates SC7 and the K position operates SC8. Therefore, if the basket is in Figures posi-

PIN FEED PLATEN SPECIFICATIONS
Number of Spaces in One Inch of Form

Count the number of spaces in 10 inch form, move decimal point one space to left and find nearest number in chart.

Platen Ratchet Part Number	No. of Teeth	1 Tooth	2 Teeth	3 Teeth	4 Teeth	Upper Index Pawl Stop	Detent Arm Assembly	Index Pawl Carrier
304769	33	6.00	3.00	2.00		1000325	1076864	1073401
304771	44		4.00	2.66	2.00	1000325	1076864	1073401
1096910	55		5.00	3.33	2.50	1002272	1076886	1076862
1098579	66		6.00	4.00	3.00	1002273	1076884	1076862

Figure 5-9 Ratchet Chart (Pin Feed)

tion and the K keylever (open parenthesis) is depressed a DC circuit is completed to the K3 (Punch On) relay as follows: from -DC, TC6, SC8, CSC 8 and 7 contacts, K3 coil, TC5, to +DC. With K3 energized all keylever operations will be recorded in the tape until the "L" position keylever is depressed (figures position-closed parenthesis). The "L" position operation will complete a circuit to the K4 (Punch Off) relay as follows: from -DC, TC6, SC7, CSC 4 and 3 contact, K4 coil, TC5, to +DC. Thus, with K4 energized, the holding circuit to K3 is broken when K4 - 1 and 2 contacts break.

Additions to the above example arrangement may be provided such as adding on additional "common" contact operated by the K slide only. This contact would break the circuit to the punch magnets preventing the K code from being recorded in the tape when in figures position. This would allow the punch to be turned on without punching the K code in the tape. Another contact may be added with the same results for Punch Off operation (L in figures position).

AUTOMATIC PUNCH CONTROL BY CARRIAGE POSITION

This feature controls the Tape Punch so that the material typed in predetermined vertical columns only will be recorded in the tape. This mechanism is designed so that the punch can be turned on or off automatically at as many different points in the carriage travel as may be desired.

The mechanism is operated by adjustable tabs mounted in a rack on the carriage. This rack is located behind the margin and tab racks. Each tab has a projection which either turns on the punch or turns it off. There is a maximum of four projections to a tab and they are normally arranged so that the projection in control position 1 turns the punch on and control position number 2 turns the punch off. Projections in control position 3 and 4 may be used for controlling a remote machine or other purposes such as operating a light on the control panel.

Figure 5-12 shows an example circuit arrangement for carriage position control of the punch.

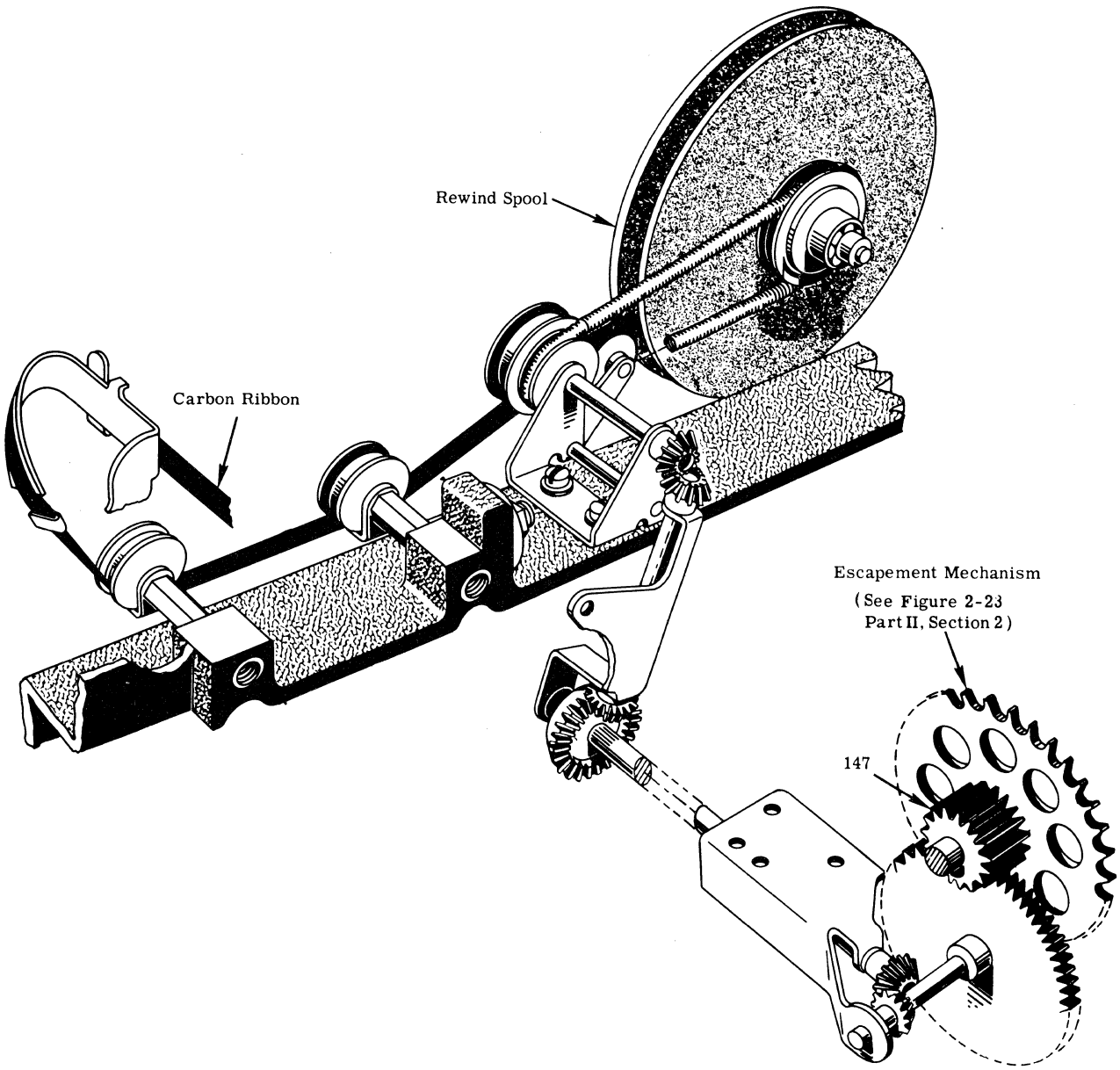

Figure 5-10 Carbon Ribbon Mechanism

To make the punch operative for carriage position control, the Punch On switch (on the control panel) must be in the "ON" position. When the carriage reaches a tab with a projection in the control position 1, the Punch On micro switch (carriage operated) will close energizing the K3 Punch Control relay. When the K3 relay picks up, a holding circuit is completed through the normally closed Punch Off micro switch, through the K3 - 1 and 2 contacts to the K3 coil. The K3 - 11 and 12 contacts, when closed, will put a negative D.C. potential on the stationary strap of the selector common contact (SCC). Therefore, SCC Operation (caused by keylever operation) will complete cir-

cuits to the punch magnets and punch clutch magnets. When the carriage reaches a tab stop with a projection in control position 2, the Punch Off micro switch (carriage operated) will open, breaking the holding circuit to the K3 Punch Control relay. The K3 - 11 and 12 contact will open breaking the circuit to the punch magnets and clutch magnet, preventing punch operation.

A Punch All switch, located on the control panel, may be used to by-pass the carriage operated micro switches so that all information typed will be recorded in the tape regardless of carriage position. The Punch All switch has no function unless the Punch On switch (on control panel is also depressed.)

AUTOMATIC LINE FEED OPERATION

In communications equipment, the line feed (platen indexing) is not incidental to carriage return operation as is the case on the Flexowriter. Therefore, it is necessary to automatically punch a line feed code (2) after a carriage return code (4) when making a communication tape on a Flexowriter.

To punch the line feed code automatically after a carriage return code, an additional contact is operated by the carriage return selector slide. This contact is shown as SC7 in figure 5-13 and is operated by the carriage return selector slide only (SC7 operation is in addition to the

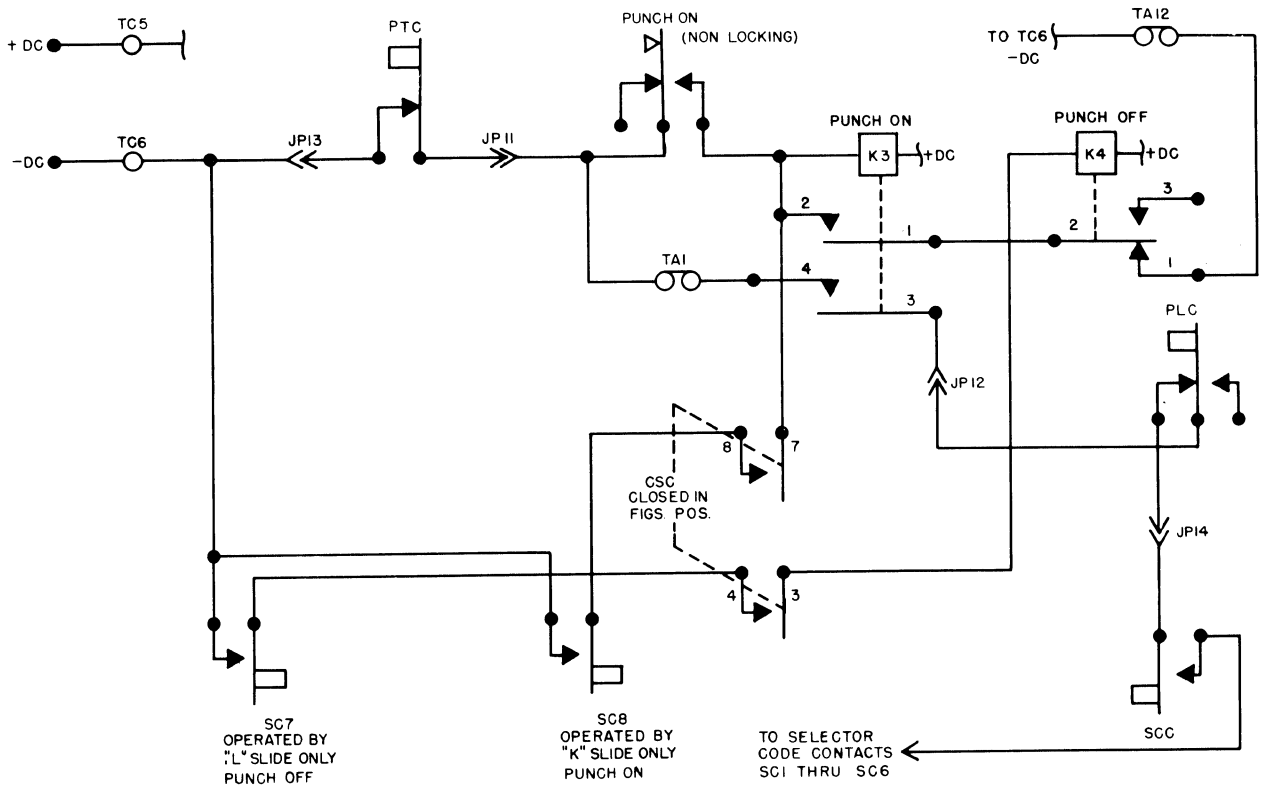

Figure 5-11 Keyboard Control of Punch

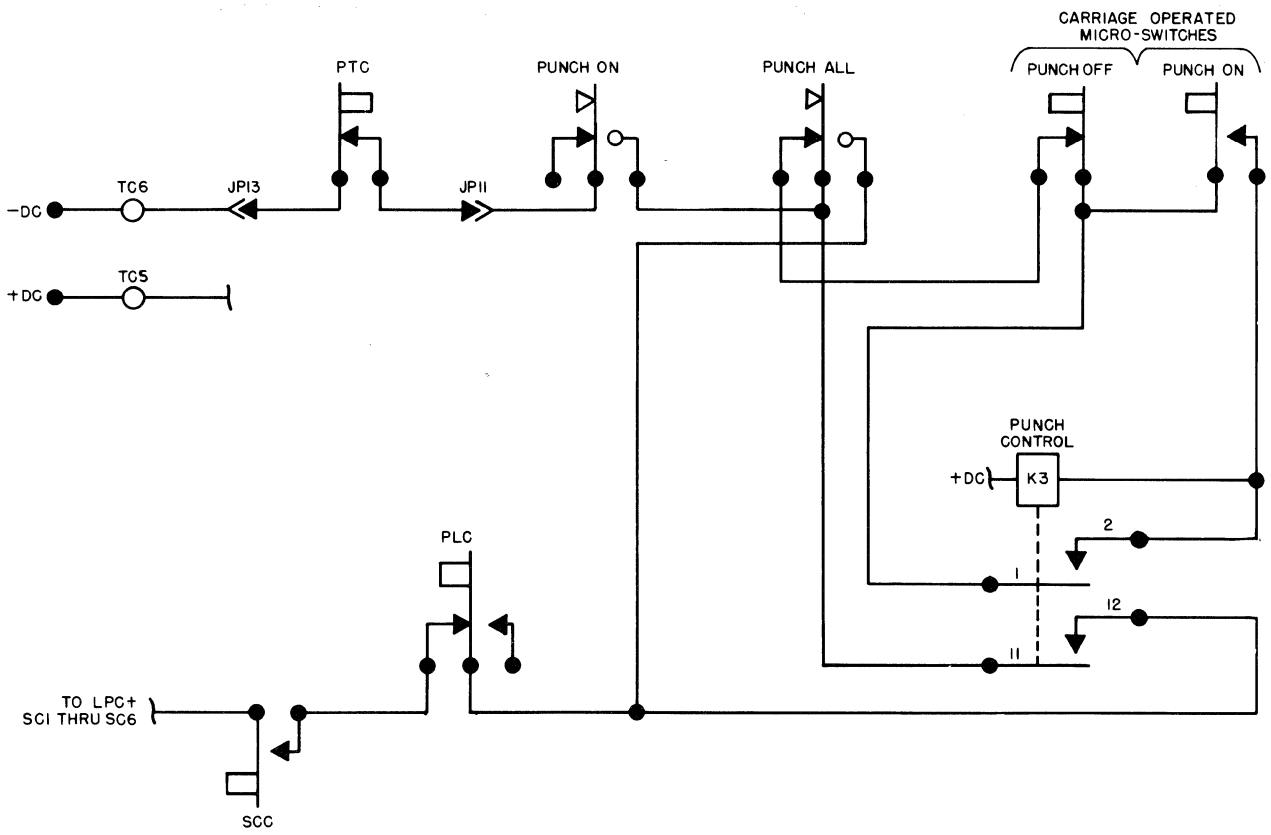

Figure 5-12 Carriage Position Control of Punch

SC4 and SCC contact operation for energizing the number four punch magnet and the clutch magnet.)

Figure 5-13 shows an example circuit arrangement for automatic line feed operation. Using this circuit as a reference, when the carriage return keylever is depressed, the carriage return code (4) and line feed code (2) are punched in the tape in the following sequence: The carriage return cam operates causing selector slide and consequently SCC, SC4 and SC7 contacts to close. The number four punch magnet and the clutch magnet are energized causing the punch to rotate. Also, due to the SC7 contact closing, a D.C. circuit is completed to the line feed relay No. 2 (K4). The rotation of the punch will cause the transfering of the PLC contact, which will complete a D.C. circuit to the anti-repeat relay,(K2). K2 - 17 and 18 contact, when closed, will complete a circuit to the line feed relay No. 1 (K3).

NOTE: The K4 relay is still energized. Both K3 and K4 are slow drop-out relays. The relays are slugged and remain in the operated position for approximately 30 milleseconds after the coil circuit is broken.

The Punch completes its cycle punching the 4 code and feeding the tape. The PLC contact returns to normal and the anti-repeat relay (K2) drops-out. K2 - 5 and 6 contact makes, completing a circuit to the No. 2 punch magnet and the clutch magnet as follows: from -DC, TC6, JP13, PTC, JP11, Punch On N/O contact,

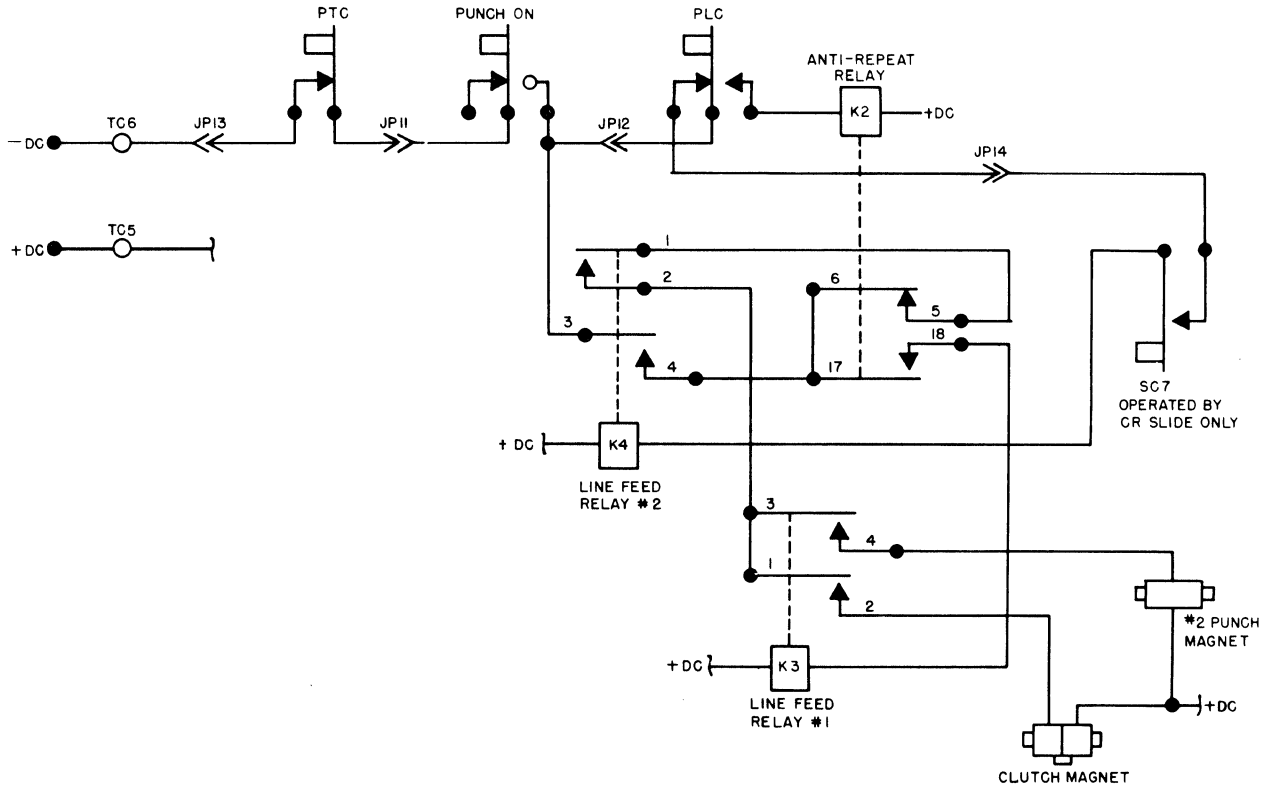

Figure 5-13 Automatic Line Feed Circuit

K4 - 3 and 4, K2 - 6 and 5, K4 - 1 and 2, K3-3 and 4 - 1 and 2, No. 2 punch magnet and punch clutch magnet, TC5, to +DC. Therefore, the punch makes another cycle of operation, punching the 2 code in the tape.

SHIFT ON SPACE

This is a special arrangement of the space keylever, letters keylever (lower case), letters cam and letters selector slide. The regular letters shift cam furnishes the power for shifting but does not operate a code selector slide (see figure 5-14). The regular letters shift cam is controlled by a dummy keylever which in turn is controlled by either the space bar or a second letters shift keylever (with keybutton). Thus, when the space bar is operated the dummy letters keylever is also operated through the pivoting of the shift equalizing rod. This causes the regular space cam to operate and space the carriage plus select the space code, and in addition operates the regular letters shift cam to shift the basket without selecting the letters code.

The letters shift keylever (with keybutton) is arranged to operate both shift cams causing shifting to letters position and selecting the letters shift code.

The results of this feature correspond to an optional feature on communications equipment. It insures that the machines will be shifted to lower case (letters) upon operation of the space

Special Features

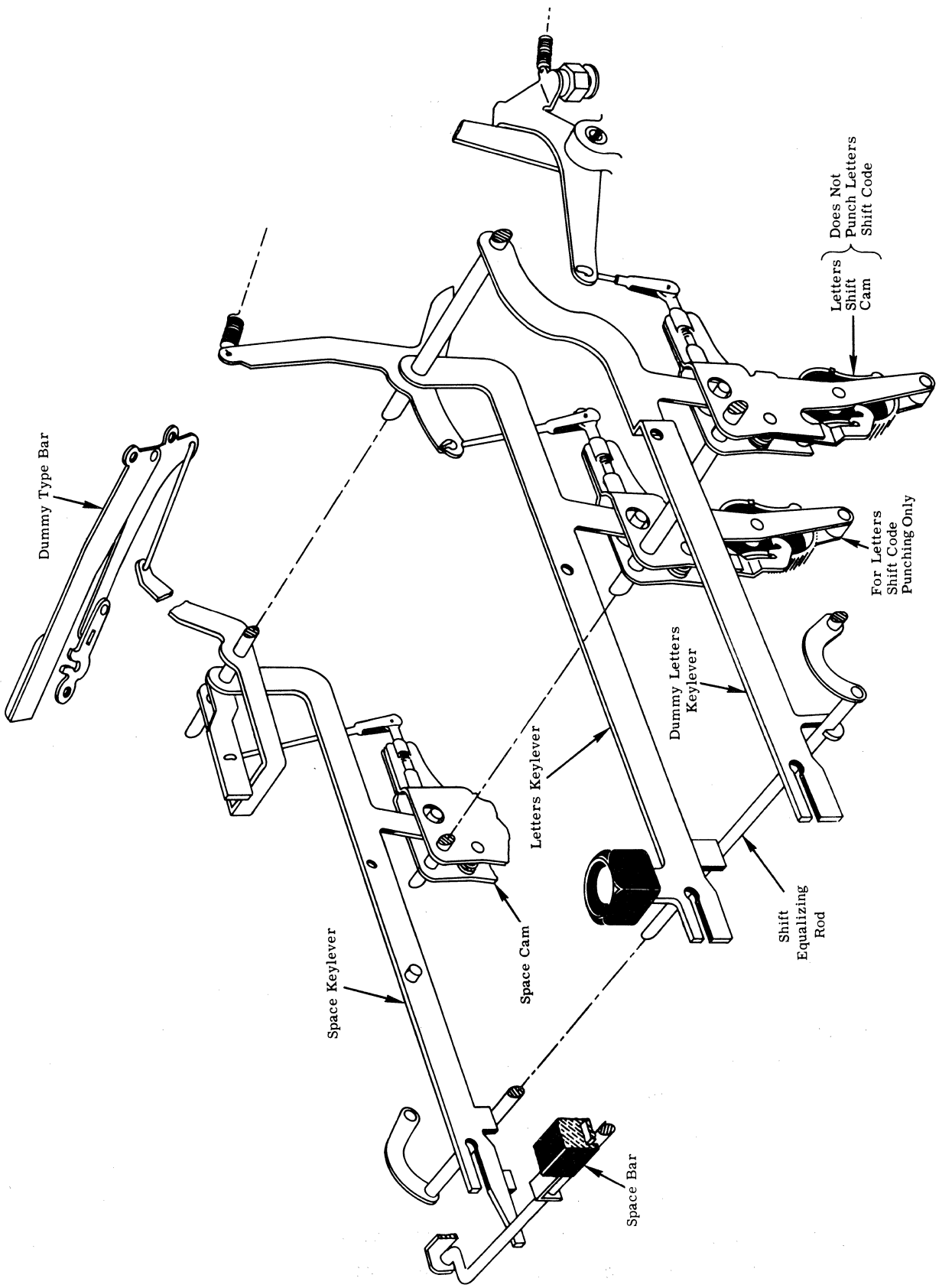

Figure 5-14 Shift On Space

bar because it is seldom that two figures will be separated by a space.

MODEL FC TAB MECHANISM

Machines using a five unit code system have no code combination available for operating the tab mechanism. Therefore, it is necessary to use one of the character codes such as the letter "G" in the figures shift position to actuate the tab mechanism. This is accomplished by adding an extra selector bail operated only by the "G" position cam, and the contacts controlled by this extra bail is in series with a case shift contact (controlled by the shift equalizing shaft movement). The shift contact is closed when the basket is in figures (upper case) position, thus, when both contacts are closed, a circuit is completed to the number six translator magnet and through a blocking rectifier to the translator clutch magnet. The number six permutation bar is released and the translator shaft rotates causing the regular tab mechanism to operate. The keylever used to operate the tab cam is not provided with a key button and is not intended to be operated manually.

The number six permutation bar used has only one projection which blocks out the tab position seeker at all times except when the bar moves on a figures "G" operation.

This tab operation will occur either in response to manual operation of the "G" keylever in figures position or in response to reading a "G" code by the tape reader when the machine is in figures position.

COMBINATION CODE KEYBOARD

This is a special arrangement of keys in four banks which enables either a five-unit or a six-unit code tape to be punched. It includes a communications style, three bank keyboard with all these keys selecting a five-unit code. An additional bank of keys in keylever row number one all select codes involving the six-unit. The key buttons on this first row can be different in color, and carry numerals in letters position with extra symbols and signs in the figures position. The first row also includes tab and back space keylevers. A shield is provided for covering these first-row keylevers when a five-unit code is being punched.

This combination keyboard is used were it is occasionally necessary to punch a five-unit communications code, but otherwise the machine can be used with a six-unit code, to provide greater keyboard capacity and faster operation due to the elimination of the shift between letters and figures. It provides for the typing of capital case letters only.

LINE LENGTH INDICATOR

This feature is used wherever lines should not be typed beyond a maximum length. The operation is such that when the light goes on it indicates to the operator that the maximum length of the line is approaching. The light will remain on for seven spaces (seven character spaces on a monospacing machine), after which time the light will go off, indicating the maximum length of the line has been reached.

The light is mounted above the keyboard (in the middle of the control panel) and is controlled by a carriage operated contact. The length of line is adjustable by the operator in the same manner as the margin stop. The adjustable contact operator is located on a rack behind the margin and tab racks and is set by pressing down on the left end and sliding the operator along the rack.

TAPE PUNCH INDICATOR

This feature can be used whenever it is particularly desirable to warn the operator of the condition of the tape punch.

The light is mounted above the keyboard (providing the Flexowriter is not using a light for some other purpose) and may be wired to light only when the punch is turned on (controlled by the Punch On switch on the control panel), or it may be wired to indicate when the supply of tape is exhausted or has excessive tension (circuit controlled by the PTC contact in the punch).

TAPE FEED HOLE REPUNCHING

This feature is required in certain special applications where it is necessary to reproduce the entire tape including feed holes (that portion of the tape with feed holes only).

To provide for this feature a dummy keylever is used in place of a standard keylever position. This keylever will operate a cam and selector slide only (no type bar operation). The selector slide is coded to close the selector common contact (SCC) only, thus completing a circuit to the punch clutch magnet only.

The translator is arranged so that the seeker for the above mentioned dummy keylever will operate only when none of the permutation bars have been operated. In other words, when a feed hole is "read" by the reader, the reader common contact (RCC) closes, completing a circuit to the translator clutch magnet causing translator shaft rotation. And since no permutation bars were released, the feed hole seeker will operate the dummy keylever (the permutation bar projections in this position are removed). The keylever operation will trip its cam, operate the selector slide, close the SCC contact, energize the punch clutch magnet, start punch shaft rotation, resulting in the feed hole only being punched in the tape.

TAPE TENSION ATTACHMENT

This arrangement is used on a Reproducer where tape is fed out of another punching device (not on the Flexowriter) directly into the reader. Its functional purpose is to stop the Flexowriter reader operation if for some reason the reader has caught up to the supply of punched tape.

The attachment consists of an arm and roller assembly mounted on the outside of a cover. The inside of the cover houses a micro-switch which is controlled by the arm and roller assembly. The complete attachment is located at the rear left side of the machine (in the location normally used by the tape punch). The tape rides over the roller before reaching the reader. Thus, if the tape becomes taut for some reason, the arm will pivot, open the micro-switch and break the circuit to the reader magnet, stopping reader operation.