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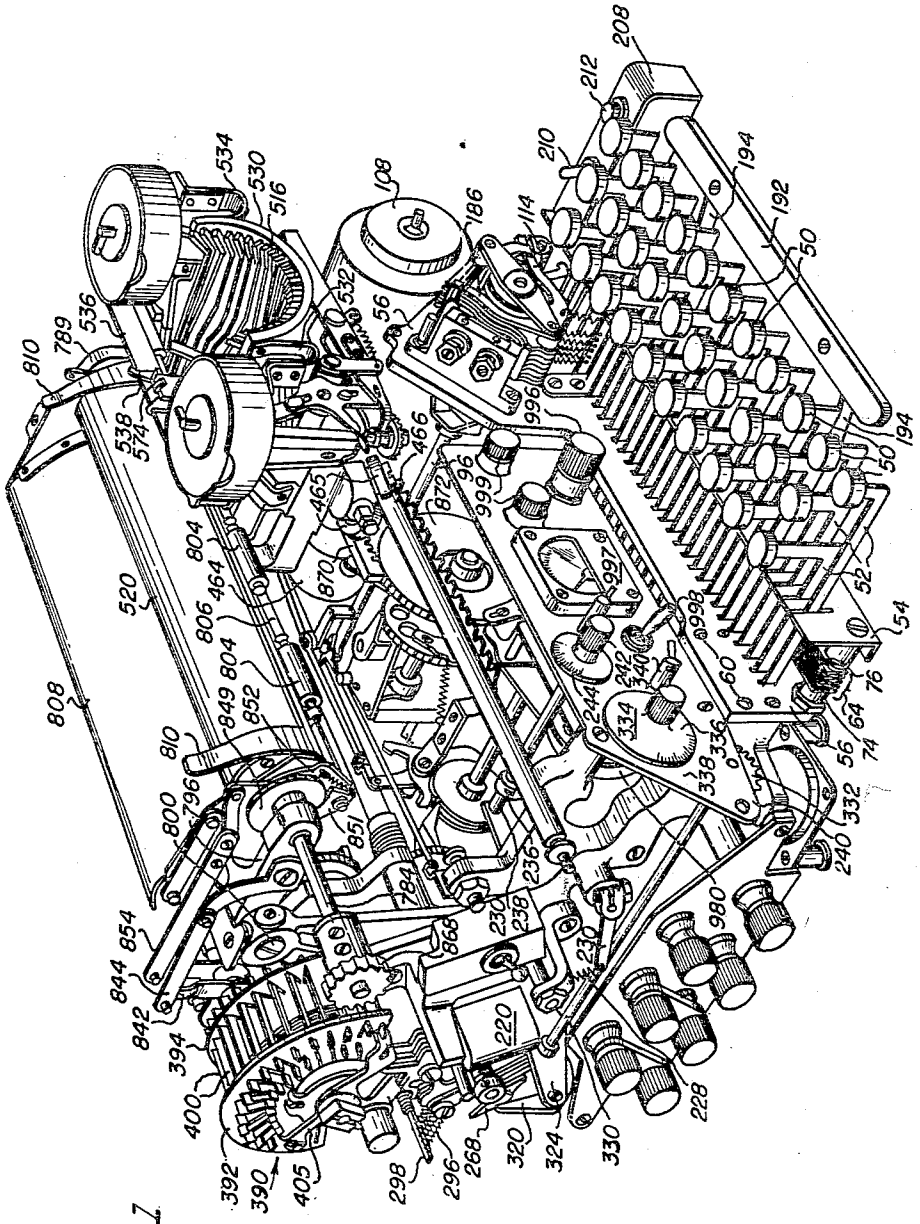

FIG. 1

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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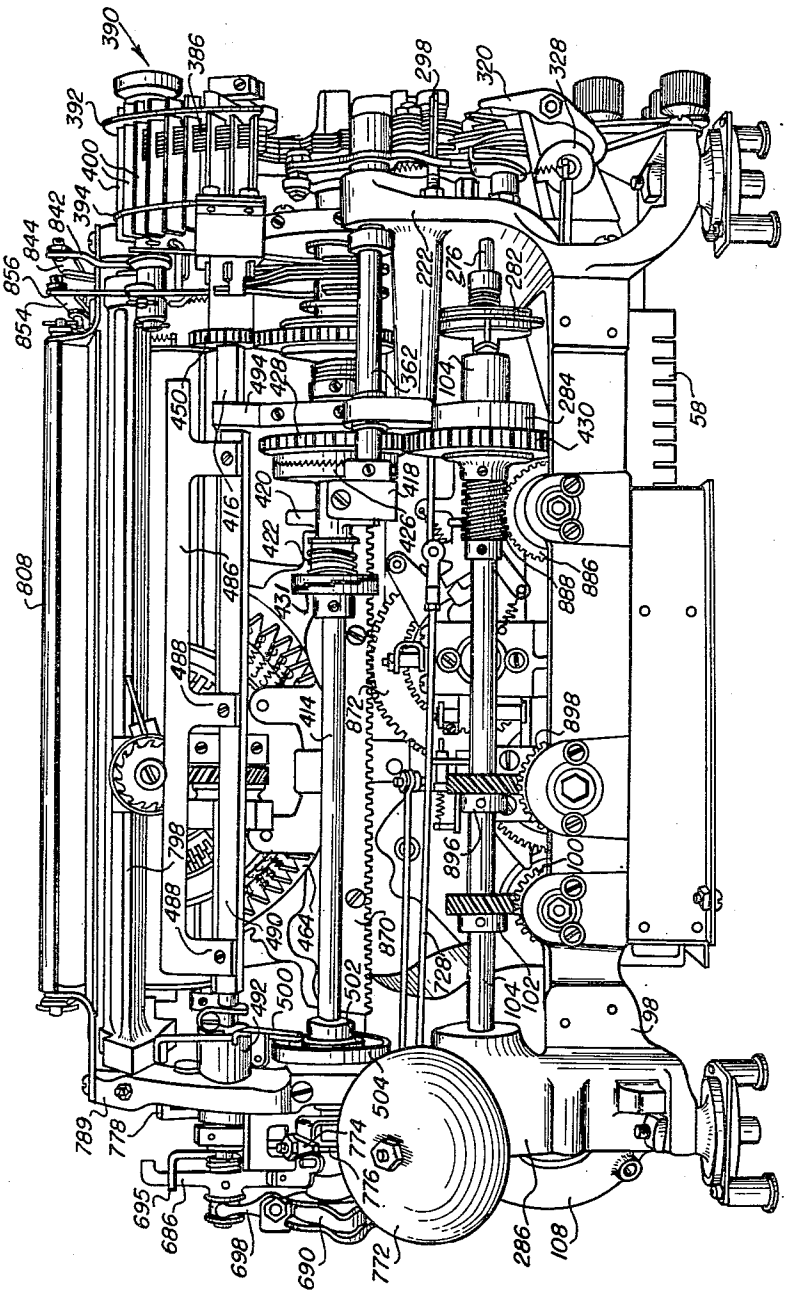

FIG. 2

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON
BY Strauch, Nolan & Diggins
ATTORNEYS

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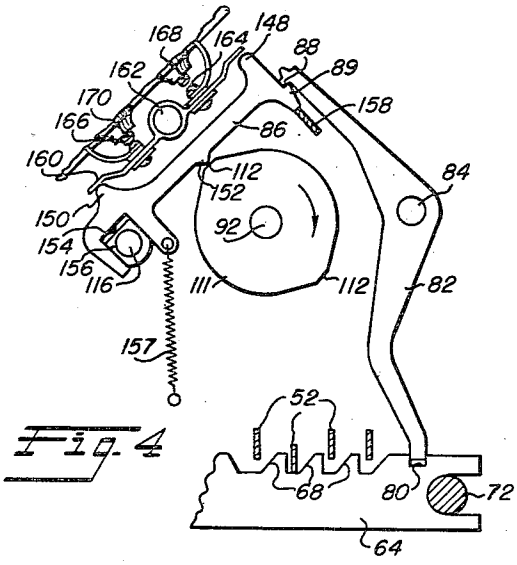

Fig. 4

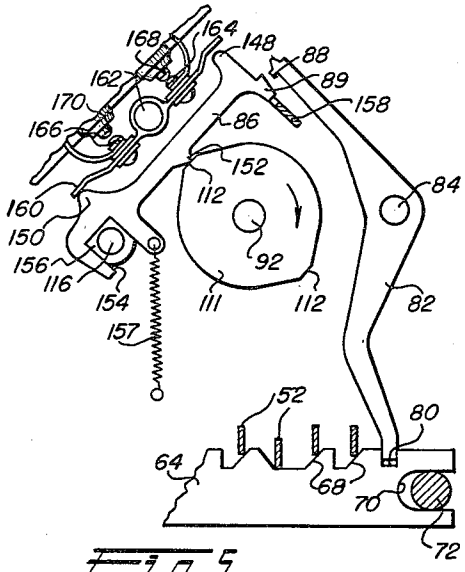

Fig. 5

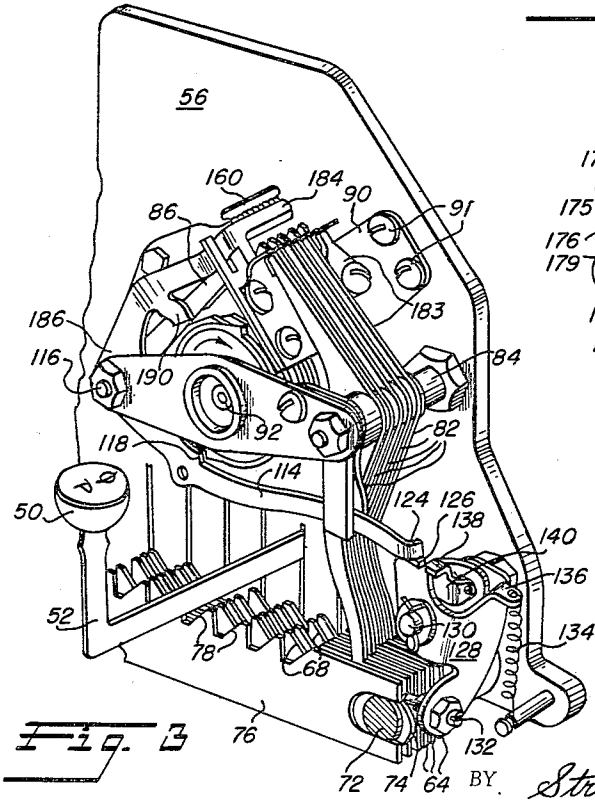

Fig. 3

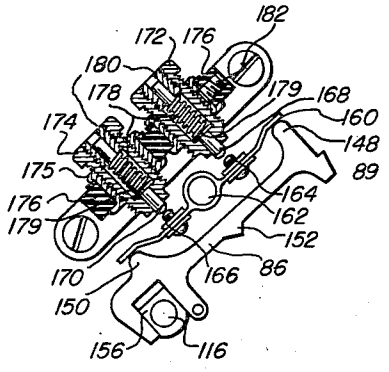

Fig. 10

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins

ATTORNEYS

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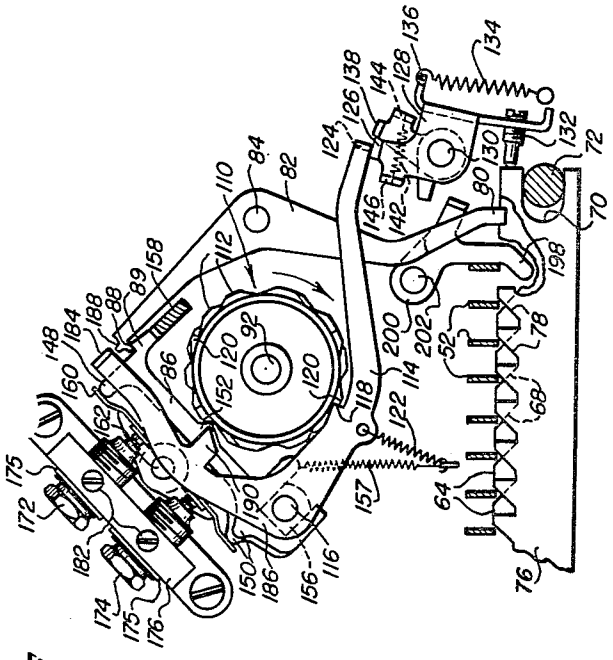

FIG. 6

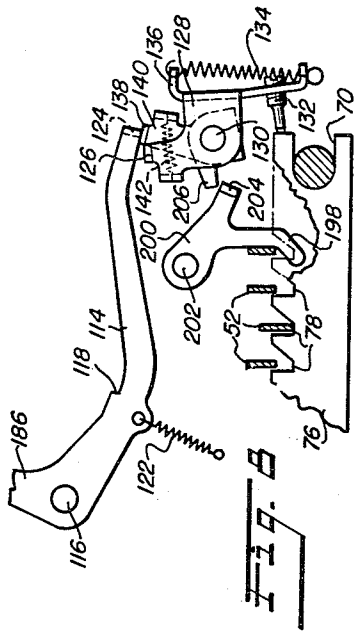

FIG. 8

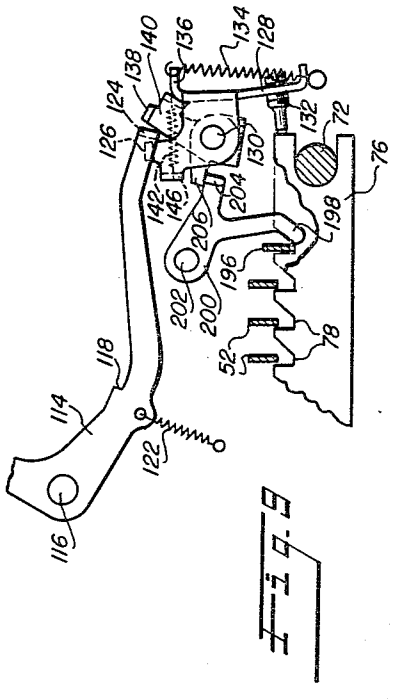

FIG. 9

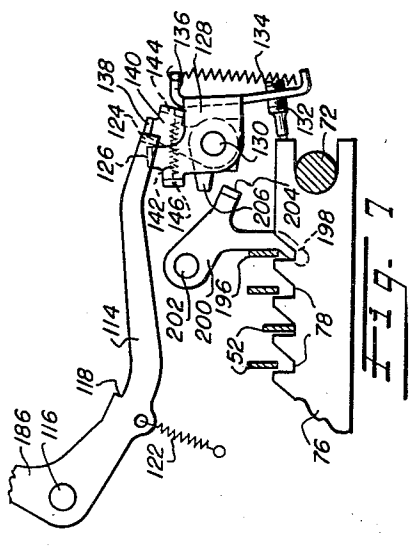

FIG. 7

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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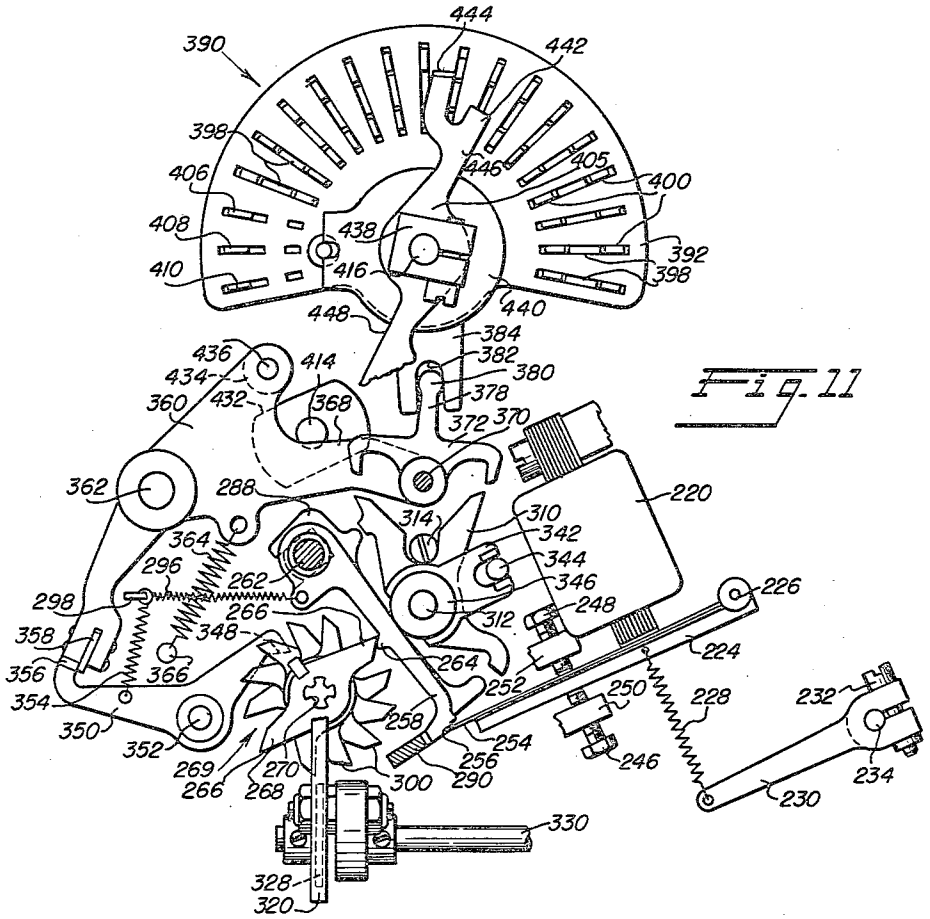

Fig. 11

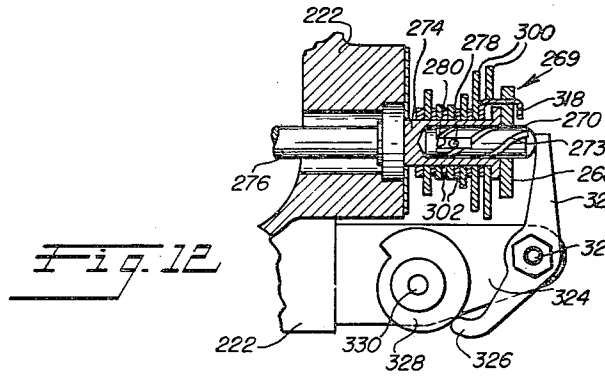

Fig. 12

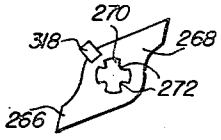

Fig. 13

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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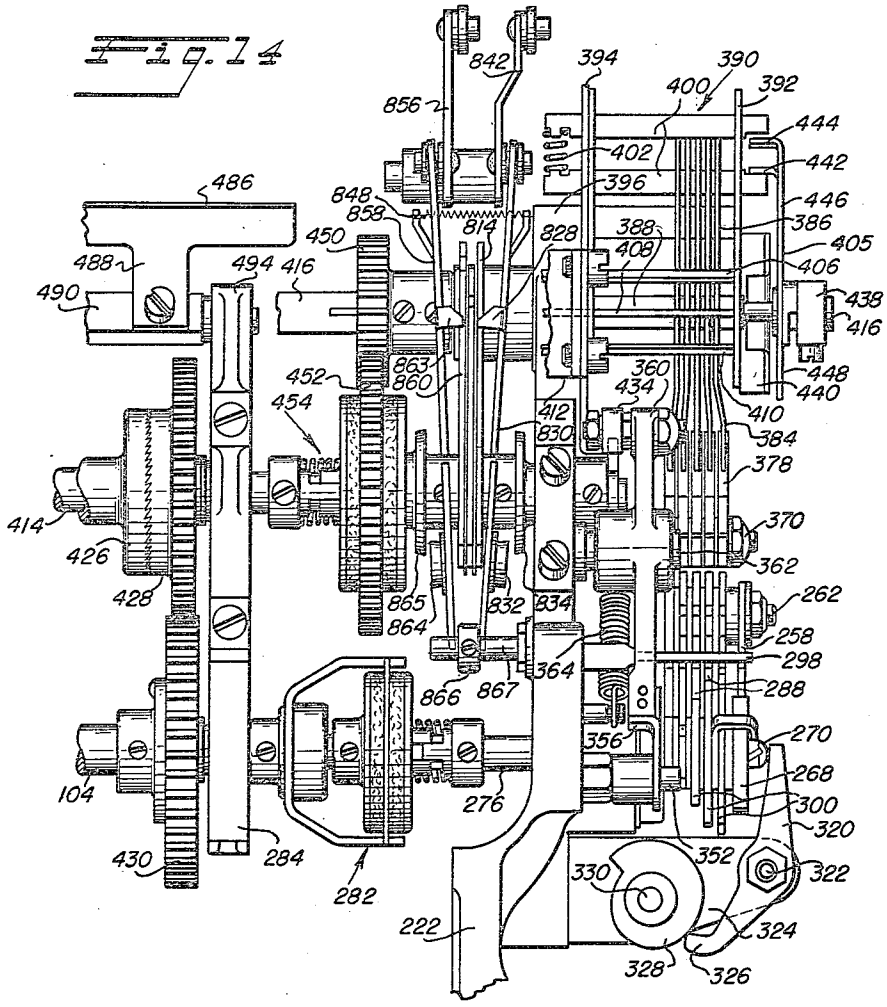
Fig. 14



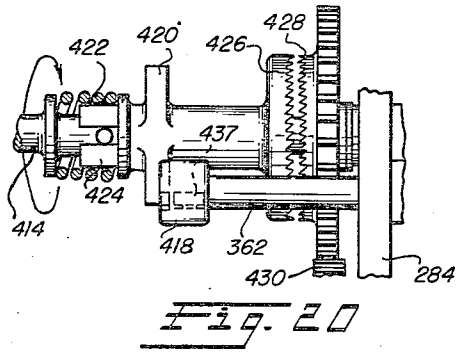


Fig. 20

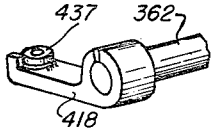


Fig. 21

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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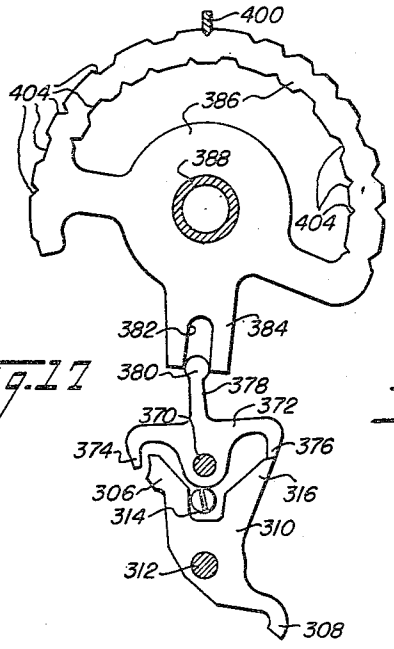


Fig. 17

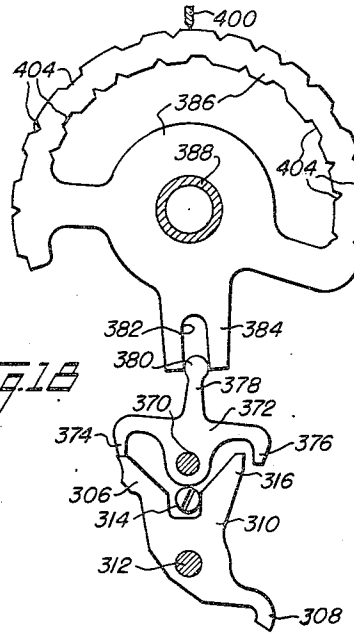
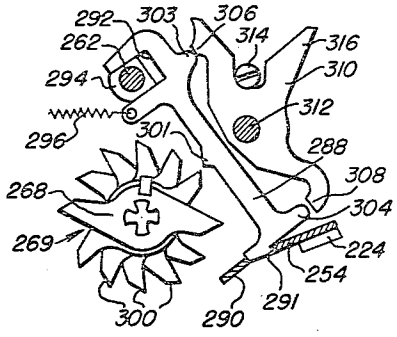


Fig. 18



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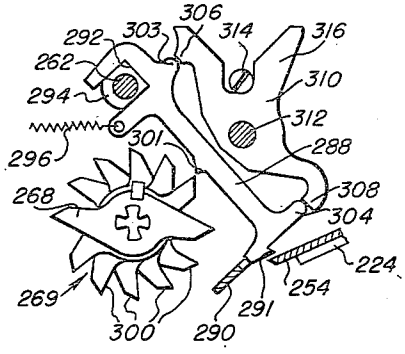

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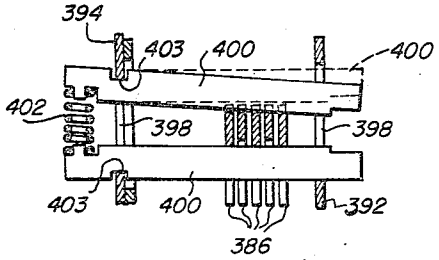

Fig. 19

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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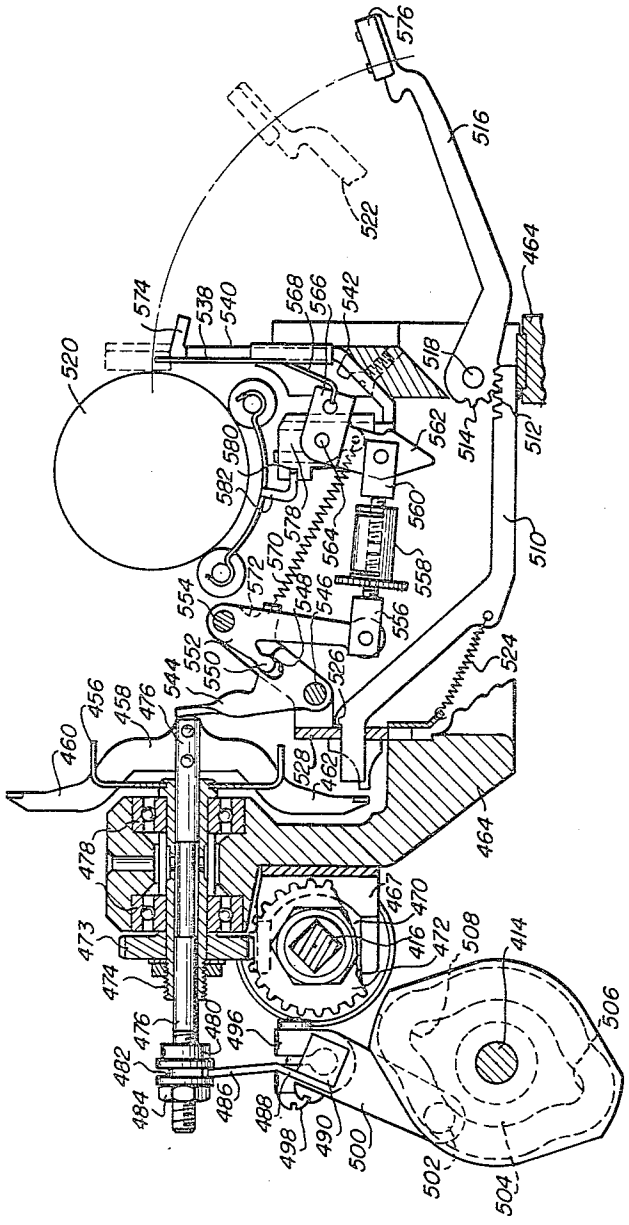

FIG. 22

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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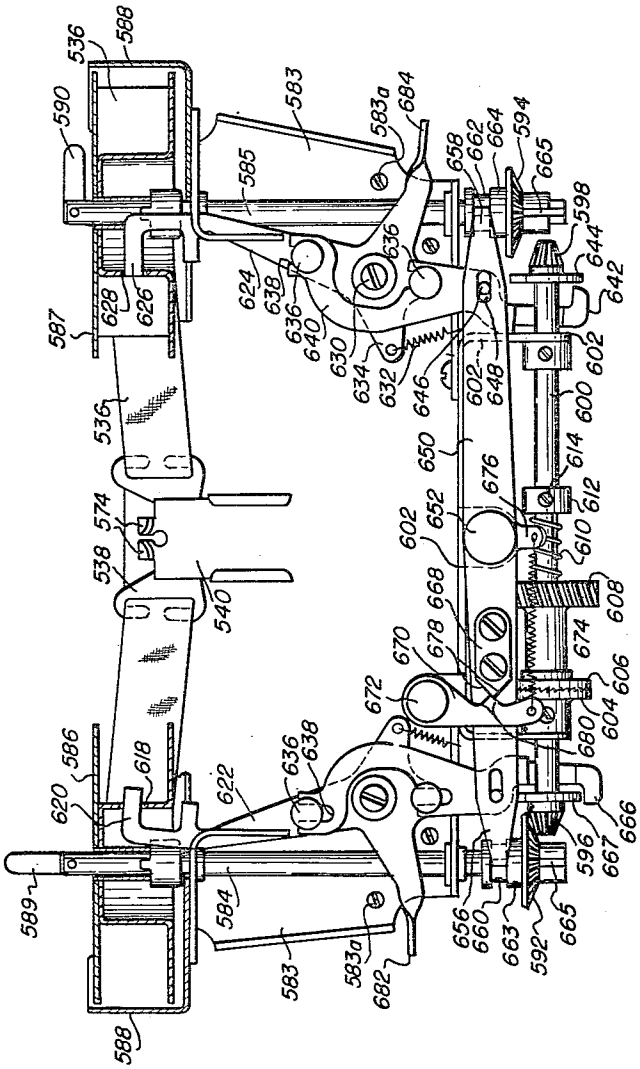

FIG. 2B

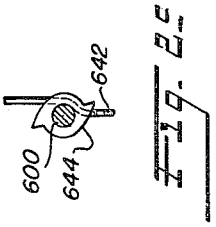

FIG. 2C

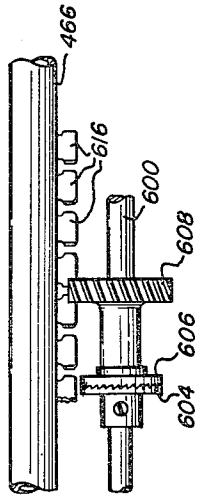

FIG. 2A

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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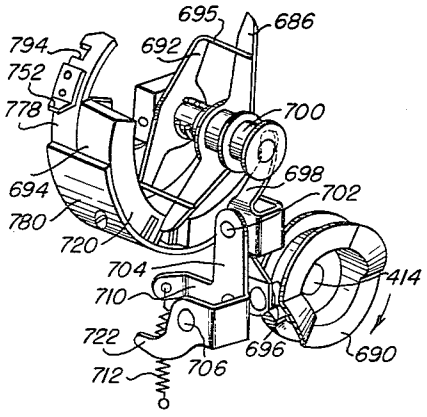

Fig. 26

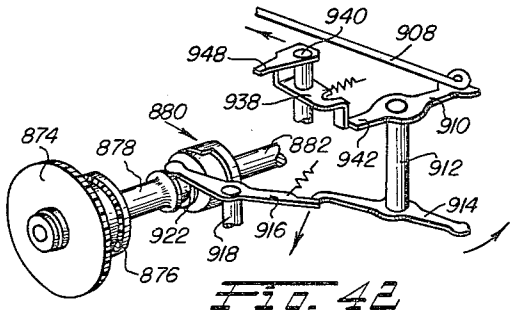

Fig. 42

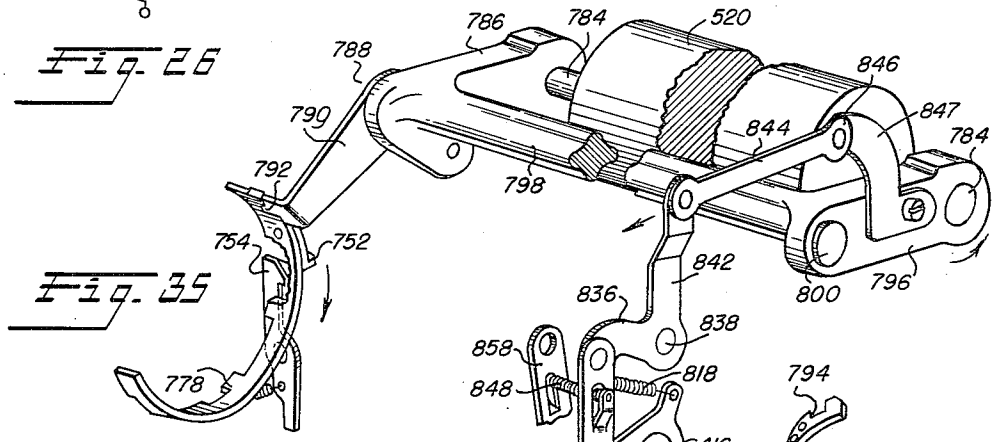

Fig. 35

Fig. 28

Fig. 27

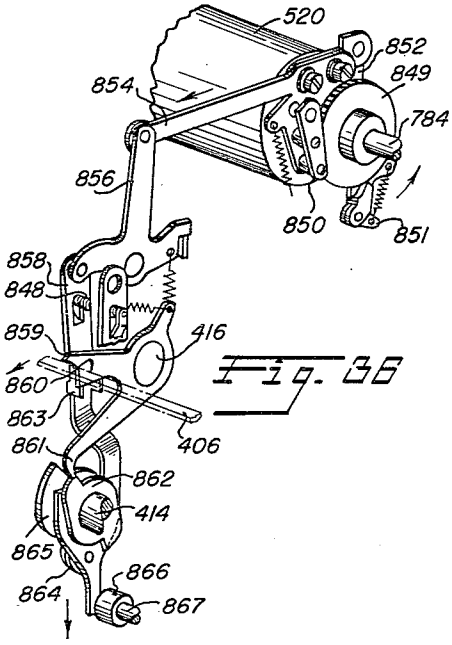

Fig. 36

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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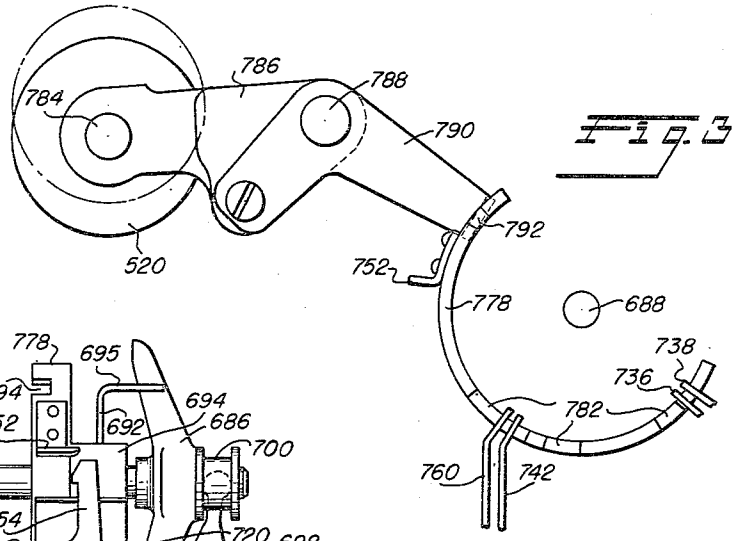

Fig. 34

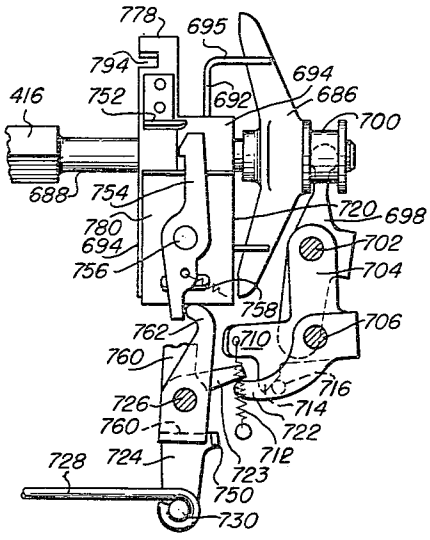

Fig. 29

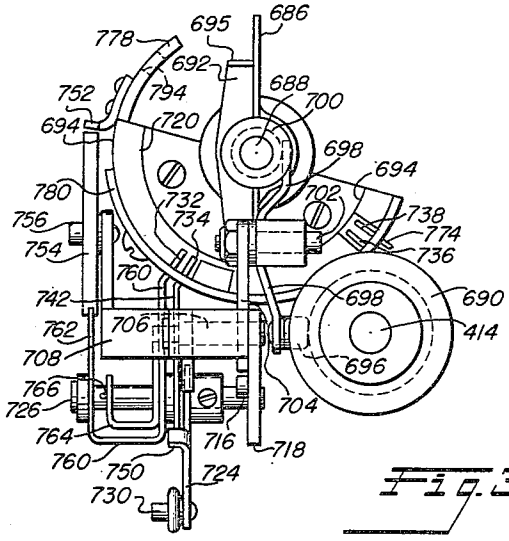

Fig. 30

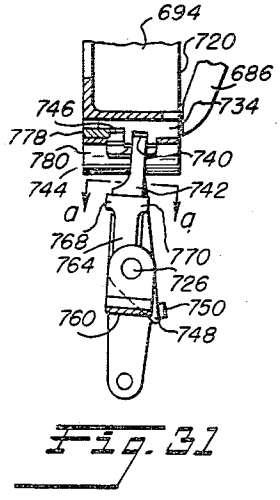

Fig. 31

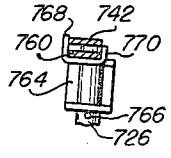

Fig. 32

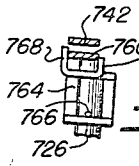

Fig. 33

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON
BY
Strauch, Nolan & Diggins
ATTORNEYS

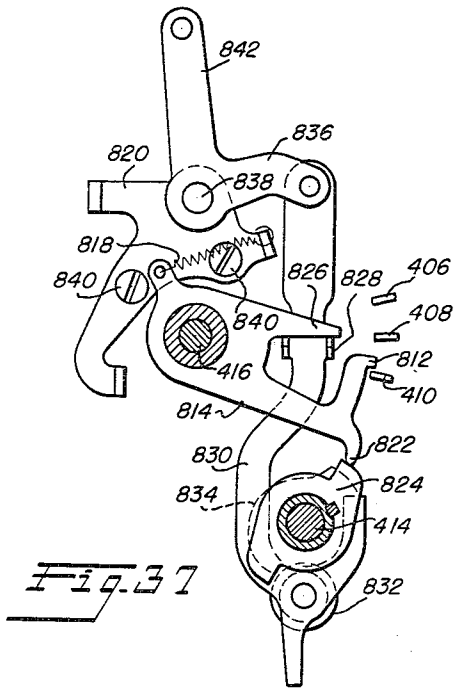

Fig. 37

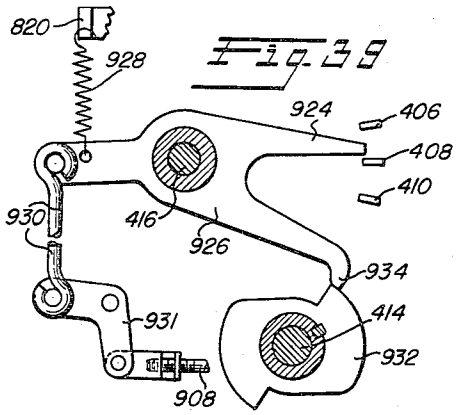

Fig. 39

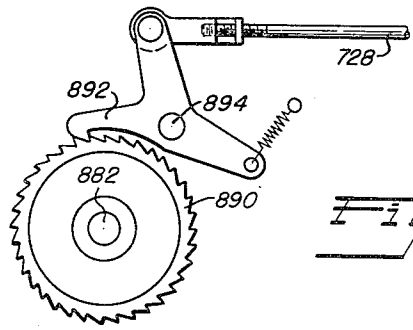

Fig. 40

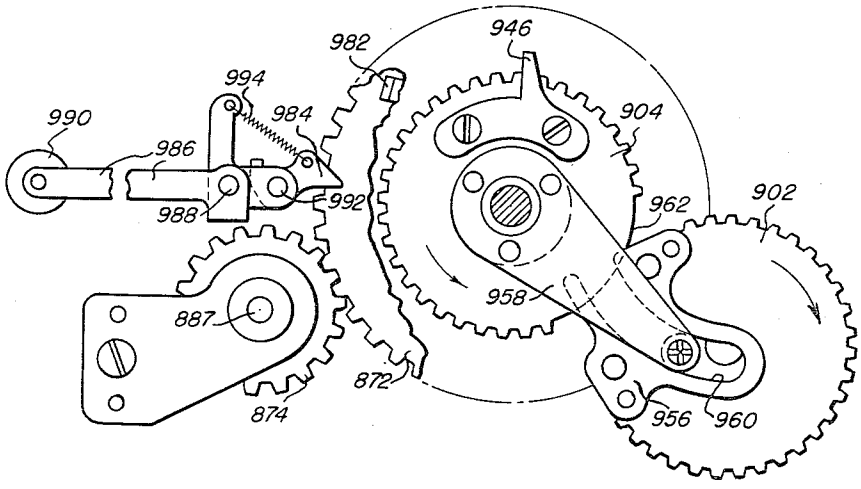

Fig. 41

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON
BY Strauch, Nolan & Diggins
ATTORNEYS

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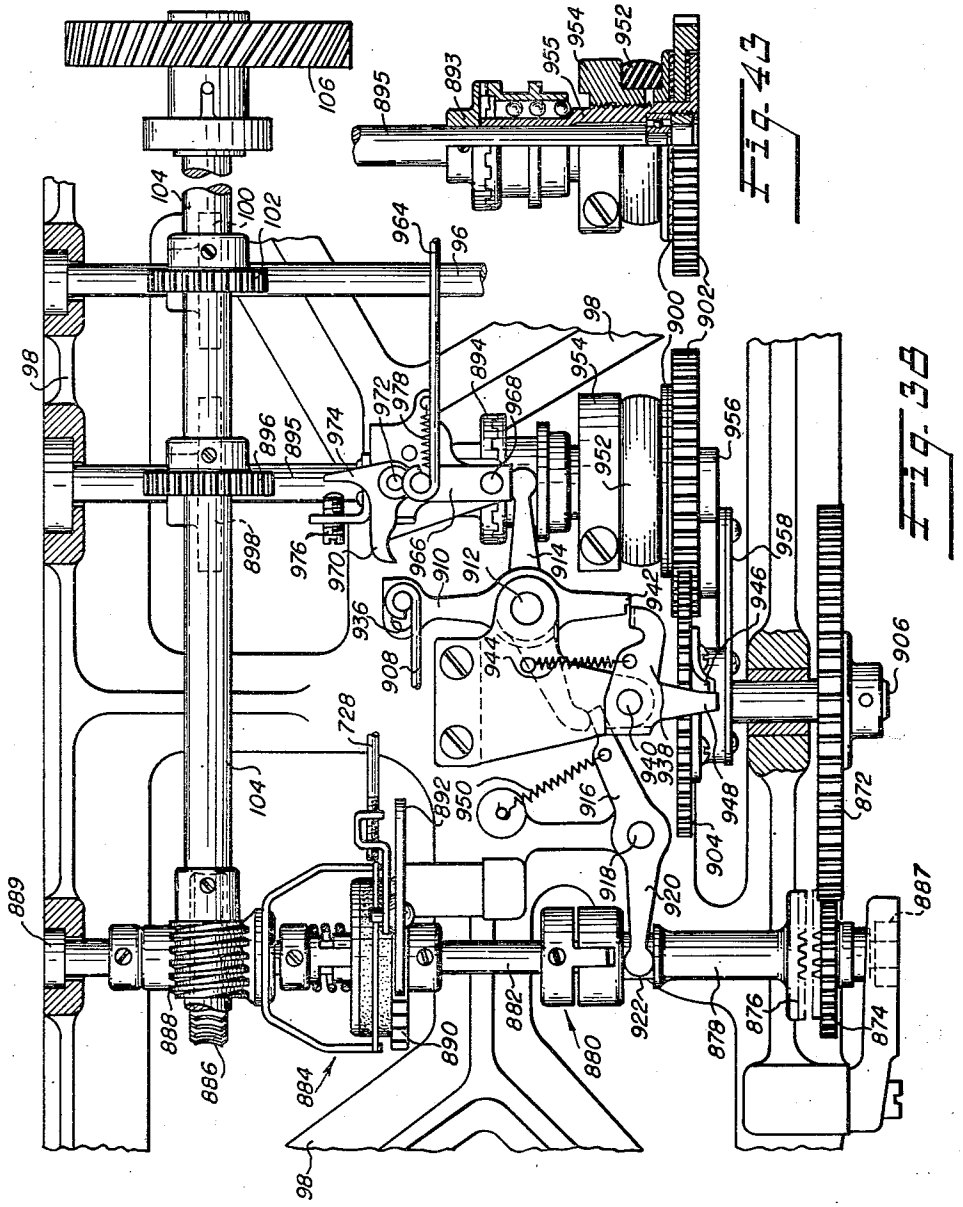

FIG. 4A

FIG. 3A

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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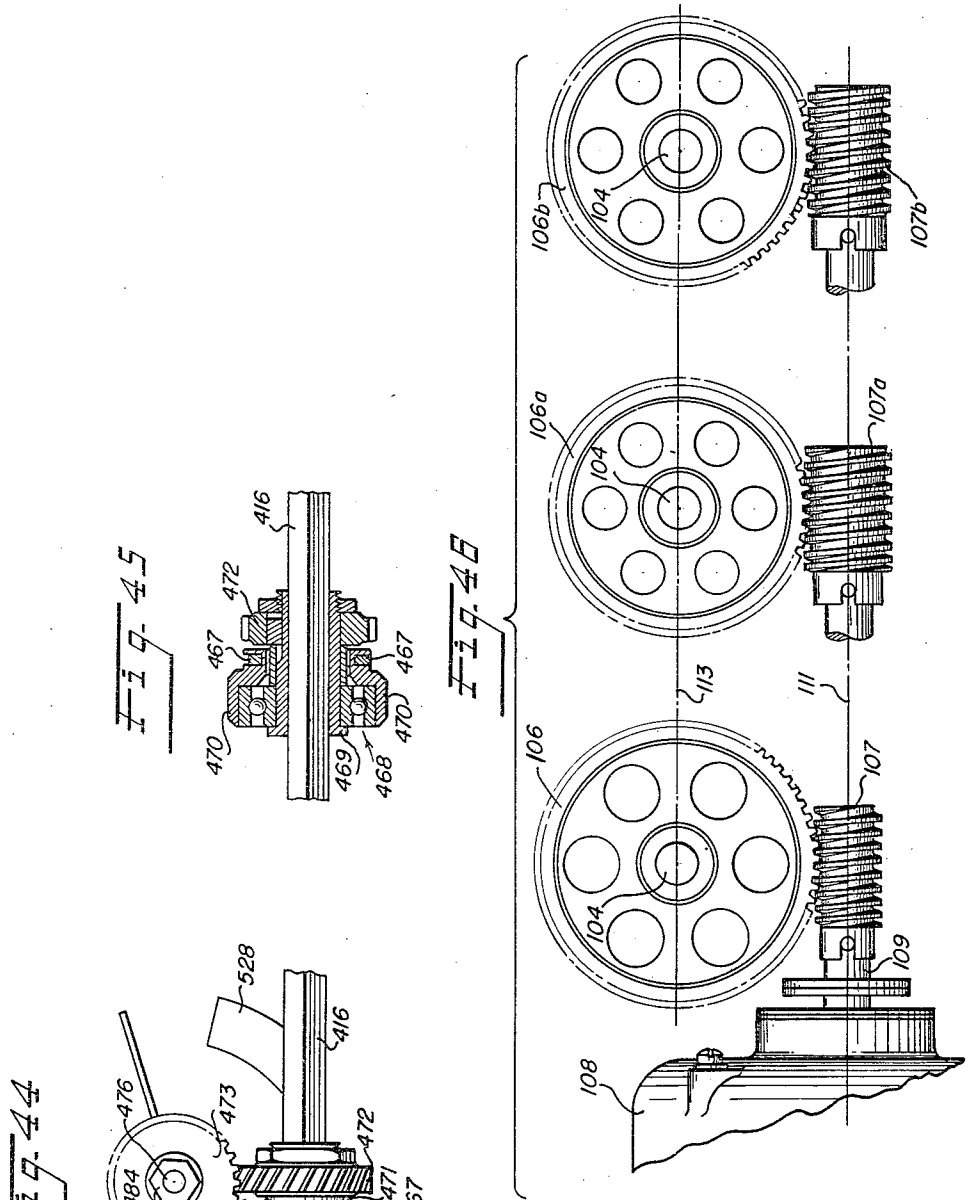

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

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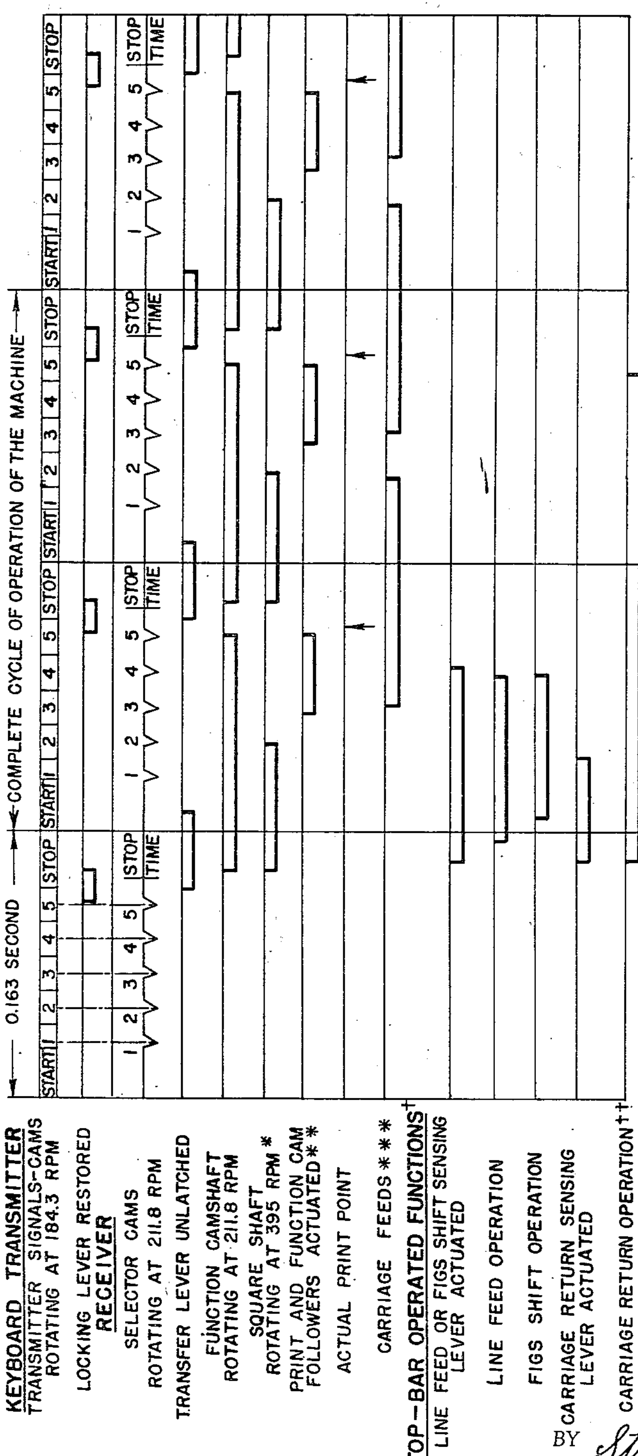

* TIME SHOWN IS MAXIMUM POSSIBLE, BUT CAN BE ANY AMOUNT (EVEN ZERO) DEPENDING ON SEQUENCE OF CHARACTERS.

** EITHER PRINTING OR ONE OF FOLLOWING FUNCTIONS CAN RESULT, UNLESS STOP-BAR OPERATED FUNCTION IS SELECTED: LTRS SHIFT, SPACE, SIGNAL BELL, MOTOR STOP, BLANK.

*** ONLY FOR PRINTED CHARACTERS AND SPACING.

† ONLY ONE FUNCTION STARTS IN ANY CYCLE; THREE FUNCTIONS ARE SHOWN FOR COMPARISON.

†† TIME SHOWN IS FOR RETURN FROM 72ND SPACE.

FIG. 47

INVENTORS
EDWARD E. KLEINSCHMIDT
EDWARD F. KLEINSCHMIDT
CARL P. ANDERSON

BY Strauch, Nolan & Diggins
ATTORNEYS

United States Patent Office

2,773,931

Patented Dec. 11, 1956

2,773,931

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Edward E. Kleinschmidt, Miami Beach, Fla., and Edward F. Kleinschmidt, Wilmette, and Carl P. Anderson, Highland Park, Ill., assignors, by direct and mesne assignments, of five-sixths to Kleinschmidt Laboratories, Inc., Deerfield, Ill., a corporation of Delaware, and one-sixth to said Edward E. Kleinschmidt

Application August 15, 1951, Serial No. 241,916

44 Claims. (Cl. 178—23)

This invention relates to communicating equipment of the type known as printing telegraph apparatus and more particularly to apparatus of the sending-receiving type, designed for interchanging messages between two or more points, which consists of a keyboard transmitting unit and a printing or typing unit in which the selection of the characters to be printed is controlled by permutation code signals and the characters are recorded in page form by means of type bars.

The preferred embodiment of this invention is adapted for use with a telegraph system of the synchronized start-stop type, wherein the signals comprise permutations of intervals or impulses of electrical current corresponding to two different line conditions extending throughout a definite number of time intervals. The selecting intervals or impulses of each signal are preceded by a starting interval or impulse of uniform line condition and followed by a stopping or rest impulse or interval which is always the same and of opposite line condition from that of the starting interval or impulse.

The two different line conditions are customarily referred to as intervals during which marking or spacing impulses are transmitted. The marking impulses correspond to intervals during which current is transmitted and the spacing impulses correspond to intervals during which no current is transmitted. Usually the start interval consists of a spacing impulse and the stop or rest interval consists of a marking impulse. In certain instances polarized systems are used wherein the telegraph signals are formed by reversing the direction of current flow instead of interrupting the flow of current. Then the marking impulse comprises a current flow in one direction and the spacing impulse a flow of current equal in value but in the opposite direction. The start and stop impulses are used to maintain synchronism between the transmitting source and the receiving recorders. The preferred embodiment of this invention is adapted to operate in conjunction with a start-stop five unit signaling code, although it is to be understood that it may be adapted to operate in conjunction with other codes without departing from the spirit and scope of the invention.

A general object of the invention is to provide a sending-printing telegraph apparatus of greatly improved construction and arrangement, materially reduced in weight and size, and of increased efficiency permitting sustained operation at a speed greatly in excess of that reached by machines of the prior art.

The machines of this character heretofore produced, and particularly those in commercial use, are very heavy and cumbersome and cannot be transported readily from place to place. In use they are installed and seldom moved during their useful life. Such machines do not readily lend themselves to installations where the scene of operation is frequently shifted, such as sporting events or field operations of military organizations. Likewise they are not suitable for installation in aircraft where every ounce of weight is of tremendous importance.

Due to great demand for the use of telegraph lines it has become increasingly important to economize in the use of line time. In the past to attain increased output of telegraph printers the operating parts were required to make more and more revolutions per minute thereby increasing the wear and strain on the parts until it became almost impossible to fabricate parts that could withstand the strain. The printers of the prior art in commercial use operate at a speed to produce fifty or sixty words per minute which is no longer satisfactory, particularly where the machine is used by the Armed Forces of the United States.

Another object of the invention therefore is to overcome the above enumerated deficiencies of the prior art by providing a telegraph printer in which the parts are so arranged and designed that the weight has been reduced to one-third the weight of the commercial printers now in extensive commercial use and the output increased to one hundred words per minute without sacrificing the durability of the machine parts.

Another object of the invention is to greatly reduce the manufacturing and maintenance costs of telegraph printers by designing certain of the parts for interchangeable use in various parts of the machine as well as in other types of printing mechanisms so that such parts may be manufactured in large quantities and their cost thereby minimized. In particular the same selecting control levers, and associated parts, are used and the same operating principles are applied in the signal transmitting apparatus and the selector of the receiving mechanism.

In the printers of the prior art it was the practice to have the rotatable members turn a complete revolution for each code combination of impulses transmitted and received. When a greater output was desired the entire machine was speeded up with the result that additional strain was placed upon the parts and the machine became less reliable. The above problem has been overcome in our device by increasing the number of function operations, code transmissions and selections made in one revolution of the rotatable shafts thus maintaining reasonable speeds while accomplishing more work per revolution. Accordingly, it is a further object of the invention to provide a telegraph printer having a very high output without increased operating speed by transmitting and receiving the code combination of impulses representing one character during one-half revolution of the associated rotatable members.

In furtherance of the above general objects the machine disclosed herein radically differs from previous machines by having a movable carriage which supports the type bars and their actuating bars and a selecting spider but does not carry the permutation code bars and cage therefor or the printing bail. Most of the prior art machines have been provided with selector vanes which extend across the front of the machine and are rocked by selecting mechanism to position the code bars carried by the movable type carriage to select the type bar desired to be operated. In the embodiment of the invention herein disclosed the code bars have been removed from the carriage and placed upon the stationary part of the machine. The printing bail also has been removed from the carriage. The resultant reduction of weight in the typebar carriage permits it to be moved at a much greater speed and more positively with the application of less power than was heretofore possible. Furthermore the light carriage may be stopped in its return movement with a minimum of shock. The carriage is positively controlled in its character spacing movement and also in its return movement by an electric motor.

A more specific object of the invention is to provide

a change gear arrangement which will permit the printer to be operated in association with the present commercial printers at a speed of 368.1 operations per minute (approximately 60 words per minute), or with the British teleprinters at a speed of 404 O. P. M. (approximately 66 words per minute), or at the new U. S. Armed Forces standard speed of 600 O. P. M. (approximately 100 words per minute). Thus the mechanism is arranged so that the speed relation between a fixed motor speed and a shaft running in timed relation to printing operations may be changed to a plurality of speed relationsips while retaining the gear center positions of the motor shaft relative to the printer operating shaft.

Another object of the invention is to permit the printer to operate much faster than previous commercial printers by dividing the printer operating cycle into two parts, namely, the selecting cycle and the function cycle, in such a way that additional time is available for the completion of certain functions which require more time to complete their operation than is available in the function cycle alone. At the end of the selecting cycle the control is transferred to the function cycle which conditions the mechanism to print the character or operate the selected machine function at the end of the function cycle. Certain functions such as the carriage return, require more time to complete their movement and the equipment is arranged so that these functions are started at the end of the selecting cycle, instead of at the end of the function cycle, which extends the time element between the start of the carriage return movement and the printing of a following character beyond the time of an operating cycle including the starting of the carriage return movement at the end of the selecting cycle and the printing of a following character at the end of the function cycle. Also at the end of the selecting cycle the selecting mechanism becomes immediately available to make the next selection which takes place while the function cycle of the previous selection is being completed.

A further object of the invention is to provide a novel method of supporting the typebar carriage upon a sliding gear so that a fixed relation is maintained between the supporting sliding gear and a type bar selecting driving gear on the carriage while also permitting the carriage to be readily and easily removed and replaced.

A still further object of the invention is to provide in a telegraph printer a keyboard controlled transmitting mechanism of great simplicity, improved efficiency and prolonged life which will transmit to a telegraph circuit combinations of code impulses corresponding to and representing actuated key levers.

Another object of this invention is to greatly simplify the construction, operation, and maintenance of a keyboard transmitter by providing a single set of contacts for controlling the line condition, thereby eliminating the formerly used plurality of transmitting contacts.

A further object is to provide a novel means for accurately spacing the signals as well as to prevent "bounce" when a contact is made or broken.

Another object is to provide a non-repeat means to prevent repeated transmittal of the same code group if a key is held depressed for too long a time.

A further object is to provide a mechanism to render the non-repeat means ineffective when the space bar is actuated so that the spacing operations will be repeated until the space bar is released.

Another object is to provide a printer selector mechanism which enables substantially higher speed selection than heretofore possible without subjecting the mechanism to damaging speeds.

A further object is to provide a printer selector mechanism in which all the parts are of sturdy construction and positive in their operation at high speed.

A still further object is to provide a single magnet selector mechanism having selector levers so designed

and arranged as to positively position associated levers to mechanically set up and retain the received signals.

Another object is the provision in a single magnet selector mechanism of an improved code plate or ring arrangement in which the usual drop in stop bars are arranged in concentric arcs and the stop arm associated therewith utilizes its ends so that a plurality of selections may be made in one revolution of the stop arm.

A further object is to provide in a printer selector mechanism an orienting or range finding means in which the adjustment may be initiated at a remote point and registered upon a scale to facilitate the adjustment of the mechanism.

A still further object is the provision in a printer selector mechanism of frictional driving means for the selecting shaft which are normally inactive and operate only to drive the selecting shaft during the selecting operation, thereby reducing to a minimum the wear on the slip-frictional parts.

Another object is to provide in a printer selector mechanism a selector lever-armature locking arrangement to insure completion of the selector lever motion even though the magnet has in the meantime become de-energized.

A further object is to provide in a telegraph printer a novel and unique means for feeding the inking ribbon and for automatically reversing the feed while the printing mechanism and associated ribbon feed mechanism are moved across the printed page.

A still further object of the invention is to provide in a printer having a movable type bar carriage, a ribbon feeding and reversing mechanism which derives its operating power as an incident of the character spacing movement of the type bar carriage, thereby reducing the necessary wearing parts and decreasing the weight of the carriage.

Another object is to provide a ribbon reversing mechanism which is controlled by the available unused supply of ribbon rather than by the strain or pull exerted upon the ribbon.

A further object is to provide an inking ribbon feeding and reversing device which may be constructed as a unit and quickly and easily installed on or removed from the printer.

A still further object is the provision in a telegraph printer of an instrument panel adjacent the keyboard and easily accessible to the operator upon which are located all of the indicating devices and regularly used operating controls, except the motor governor.

Other objects and advantages will become apparent from the following description read in connection with the appended claims and the accompanying drawings wherein:

Figure 1 is a perspective view of a preferred embodiment of the combined transmitting and receiving apparatus of the invention;

Figure 2 is a rear elevation of the receiving and printing mechanism;

Figure 3 is a perspective view of a portion of the keyboard transmitter;

Figures 4 and 5 are fragmentary elevations showing essential transmitter elements in position to send marking and spacing impulses, respectively;

Figure 6 is a front elevation of the transmitter showing it in the normal or unoperated position;

Figures 7, 8 and 9 are front elevations of a portion of the transmitter showing various positions assumed by the mechanisms;

Figure 10 is a vertical section through the novel transmitter contact mechanism;

Figure 11 is a side elevation of the selector mechanism, transfer mechanism, and code bar cage of the receiver of the invention;

Figure 12 is a vertical section through the device for orienting the start position of the selector cams in relation to the selector levers;

Figure 13 is a detail elevation of the stop plate and plunger arrangement of the orienting device;

Figure 14 is a rear elevation of the selector end of the printer of the invention illustrating certain of the drive gears and function operating cams and levers;

Figures 15 and 16 are detail elevations of the selecting means showing the selector levers and Y-levers in alternate positions;

Figures 17 and 18 are detail elevations of a portion of the transfer means showing the Y-levers, T-levers and code rings in alternate positions;

Figure 19 is a detail elevation, partly in section, of a portion of the stop cage;

Figure 20 is a detail elevation of the function cam shaft sliding clutch and clutch latch;

Figure 21 is a perspective view of the clutch latch;

Figure 22 is a vertical section through the printing mechanism;

Figure 23 is a front elevation of the ribbon drive and reversing mechanism;

Figure 24 is a plan view of the ribbon drive gear and rack;

Figure 25 is a detail elevation of the ribbon reversing cam and cam follower;

Figure 26 is a perspective view of the function selecting mechanism;

Figure 27 is a perspective view of the punch-bar guide block of the function selecting mechanism;

Figure 28 is a perspective view of the function blocking ring of the function selecting mechanism;

Figure 29 is a front elevation of the function operating spider and certain other associated mechanisms;

Figure 30 is a side elevation of the function operating spider and function push bar segment;

Figure 31 is a front elevation partly in section of the letter space operating lever;

Figures 32 and 33 are sections taken along line *a—a* in Figure 31 showing the two adjusted positions of the unshift intermediate lever;

Figure 34 is a side elevation showing the relation between the function blocking ring and platen shifting mechanism;

Figure 35 is a perspective view of the platen shift mechanism;

Figure 36 is a perspective view of the line-feed mechanism;

Figure 37 is a side elevation of the platen ("Figures") shift cams and operating levers;

Figure 38 is a plan view of the carriage return and spacing mechanisms;

Figure 39 is a side elevation of the carriage return function cam and operating lever;

Figure 40 is a detail view of the carriage spacing detent;

Figure 41 is a front elevation of the carriage return decelerating and spacing mechanism;

Figure 42 is a perspective view of a portion of the carriage return and spacing mechanism;

Figure 43 is a plan view partially in cross-section of the carriage return clutch mechanism shown immediately to the left of Figure 38;

Figure 44 is a rear view of the supporting mechanism for the rear of the typebar carriage;

Figure 45 is a section through a portion of Figure 44;

Figure 46 is a schematic view of the change gear arrangement of our invention; and

Figure 47 is a timing chart for the printer sending and receiving mechanisms.

In order to simplify the drawings, a considerable portion of the frame structure has been omitted. Also various springs which would normally be employed for restoring various operating parts to normal, have been omitted or shown schematically in order to avoid complicating the drawings. It is to be understood, however, that suitable supporting means may be provided for the mechanism, and that suitable springs may be provided wherever necessary for assisting in the operation of parts and for restoring the various parts to normal.

General description

A general description of the teletypewriter coordinated by reference to the several sheets of drawings will first be given, and then a detailed description of the sending or transmitting mechanism and of the receiving or printing mechanism including a detailed description of the respective component elements of these mechanisms will be given.

The preferred embodiment of the invention as disclosed in the drawings and specification is a complete portable sending and receiving machine capable of operating with standard Baudot code signals. The machine (Fig. 1) comprises a standard telegraph printer keyboard which operates a set of permutation code bars to control a single contact transmitter (Fig. 3) driven by a series of successively operating cams mounted on a shaft connected thru a clutch to an electric motor. The motor is provided with a governor to maintain its speed at 3600 R. P. M. The transmitter contact is electrically connected with the telegraph line to transmit the coded signals to a remote telegraph receiving printer and also to the receiving or printing portion of the sending machine.

The receiving or printing apparatus comprises principally a selecting mechanism (Fig. 11) including a single magnet selector which controls permutation code bars in a stop bar cage which in turn control the printing mechanism (Fig. 22) to position a print selecting spider opposite a selected type bar push bar; a power driven cam for effecting printing by actuating a selected type bar; a type bar carriage movable by power driven means for character spacing and for carriage return (Fig. 38); ribbon mechanism (Fig. 23) for feeding an inked ribbon between the actuated type bar and a printing platen and for reversing the direction of movement of the ribbon; other ribbon mechanism (Fig. 22) for raising and lowering the inked ribbon vertically with each typing operation to permit reading of the printed character; and cam controlled and operated mechanisms (Figs. 26, 35, 36, 37 and 39) for performing the usual requisite functions of a printer.

The single magnet selector (Fig. 11) responds to signal impulses sequentially received to correspondingly position a group of Y-levers. When all of the Y-levers are set in their selected positions a print start lever is released and brings a set of T-levers in contact with the Y-levers. The T-levers assume positions which correspond to the positions of the associated Y-levers and in so doing move a set of notched permutation segments into positions corresponding to the signal impulses received. The notched or coded segments are mounted upon a stationary part of the machine in a stop bar cage and are associated with drop-in stop bars which are distributed over the coded segments and are spring pressed thereagainst so that one bar will be pressed into one set of notches aligned due to the positioning of the coded segments. This bar, upon selection, is projected into the path of a stop arm, which is carried by a selecting shaft rotated by the power means, to stop the shaft in a position corresponding to the received signal. This setting is in turn transmitted thru a gearing arrangement to a type selecting spider (Fig. 22) having a pair of diametrically opposed depending legs one of which will be positioned in accordance with the received signal to select the particular type bar which corresponds to that signal.

The setting of the selecting shaft is also transmitted to a function selecting spider (Fig. 26) which initiates the operation of certain of the functions, namely letter shift, motor stop, call bell, and letter spacing. The line feed, figure shift, and carriage return functions (Fig. 14) are controlled directly by drop-in stop bars in the stop bar cage. The rapidity of operation of the printer is

greatly increased by controlling these three functions at this point. A cam shaft rotatably controlled by the selector start lever carries a start lever restoring cam, a print cam, a function operating cam, a line feed cam, a shift cam, and a carriage return cam. The cam shaft rotates for one-half revolution and the print and function spiders are operated by their respective cams at the end of the rotative motion of the shaft. The printing spider is operated by a printing bail on the stationary part of the machine. This bail extends across the rear of the printing mechanism for the length of the printing line and is operated by the print cam.

The printing spider will be positioned in an inoperative position when the function spider is in an operative position and correspondingly the function spider will be in an inoperative position when the printing spider is in an operative position. The function spider when in an operative position cooperates with a function segment block provided with slots in which push bars are located. These push bars are directly connected to the function operating mechanisms. A ring segment, which is moved to shift and unshift positions by the movement of the printing platen is located behind the function push bars for the purpose of blocking their operation in either shifted or unshifted position of the printing platen as may be required. A spacing operation is performed each time a printing operation is completed but this spacing is suppressed during the operation of certain of the function performing means so that undesirable spaces will not occur in the printed matter. The space between words is obtained by the operation of the space bar and normally this operation will also cause the platen to unshift if it happened to be in the "figures shift" position when the space bar was operated. This arrangement reduces the possibility of error in the printed matter should the platen fail to unshift when the "Letters Shift" key is operated. A simple adjustment may be made to prevent the operation of the unshift means and thereby permit the platen to remain in the "figures" shift position when the space bar is depressed.

The type bar carriage is fed to the right step-by-step by power driven means set in operation through a pawl controlled escapement movement operated by the forward and return stroke of the space function push bar. The carriage is returned to its starting position by power means set in operation by the depression of the "Carriage Return" key which disengages the spacing mechanism and engages a clutch between the power shaft and the carriage return mechanism. An intervening slip clutch is provided to take up shock due to the rapid acceleration of the carriage. Near the end of the carriage return movement the driving gears are unmeshed and an arm attached to the carriage return gear enters a slot in a decelerating cam which gradually reduces the speed of the moving carriage until it comes to a stop at which point the carriage return clutch is released and the spacing mechanism reengaged.

Keyboard transmitter

The preferred embodiment of this invention utilizes an electrical transmitting device comprising a set of contacts, instead of the usual distributor member, operated by a rotatable cam drum which is released for one-half revolution at a time by the actuation of any of the keys. During this one-half revolution of the cam drum the contacts are actuated to transmit a code group of impulses which represent the character of the key which is actuated. The rotatable cam member is stopped and started for each character code group transmitted and a non-repeat mechanism is provided to prevent repeated transmittal of the same code group if the key lever is held depressed for too long a time. However another mechanism is provided to render the non-repeat mechanism inoperative when the space bar is actuated so that the spacing operation will be repeated until the space-bar is released. The rotatable cam drum is normally prevented from rotating by a stop latch which is controlled by a universal bar which operates each time a key or the space-bar is depressed, and means are provided for regulating the amount of movement between the universal bar and the stop latch. Other means controlled by the cam drum during its rotation return the stop latch to its normal position so that it will be effective to stop the rotation of the cam drum upon its completing one-half revolution. The keyboard and transmitter are assembled as a complete unit on a frame which is secured to the printer frame in a manner to permit its easy removal for the interchange of keyboard transmitter and printer units.

The rotatable cam drum actuates transmitter selector levers in one of two varieties of motion to open or close the associated electrical contacts. These transmitter selector levers as well as certain other parts are identical to parts used in the printer selector mechanism and the same principles of operation are applied in both mechanisms. These similar parts are designed also for use in various other types of tape and page printers, and the manufacturing costs of all such mechanisms are greatly reduced because quantity production methods may be used to fabricate the interchangeable parts.

The electrical transmitting device (Figs. 1, 3–10) is selectively responsive to the actuation of finger keys **50** (Fig. 1) arranged substantially like the keys of the ordinary typewriter and attached to the upturned ends of key levers **52** which pass thru aligning and guiding slots in comb member **54**, keyboard frame member **56** and a rear frame comb member **58** (see Fig. 2). The keyboard may be removably secured to the printer frame by screws **60**. Springs (not shown) may be secured between the key levers **52** and a turned over portion of rear comb member **58** to position the key levers **52** in the slots and to pull them upwardly in a manner well known in the art.

When a key **50** is depressed against the tension of a spring the associated key lever **52** positions a series of five permutation bars **64** (Figs. 1 and 3) in various combinations which represent, according to the predetermined arrangement, the character assigned to the particular key **50** depressed. Each permutation bar **64** is provided with beveled notches **68** cut therein in a manner well known in the art which allows the bars to be cammed into position by the operation of a keylever **52**.

The permutation bars have elongated slots **70** at their ends which surround mounting studs **72**, secured in the frame in any suitable manner and provided with spacing collars **74** for positioning the bars, so that the bars are free to move transversely under the key levers **52** to either one of two positions. The notches **68** in each bar have variously arranged inclined faces, one such face being provided on each bar for each key lever **52**, so that the bar is adapted to be moved to its right hand position by some of the keys and to its left hand position by the other keys to set the bars into different combinations. A universal bar **76** is mounted in front of the first permutation bar **64** and is provided with notches **78**, each having a similarly inclined face, so that the universal bar **76** is moved to its right hand position whenever any key **50** is actuated.

Each permutation bar **64** is provided at its right hand end with a notch **80** (Figs. 4, 5 and 6) in its upper edge which engages the lower end of a corresponding blocking latch or lever **82**. The five blocking latches **82** extend upwardly and are mounted upon a common pivotal support **84** secured to the frame. The latches **82** control a set of transmitter selector levers **86** and each is provided with a hooked lug **88** at its upper end which, as the associated permutation bar is shifted, is moved into and out of position above the hooked end **89** of the corresponding selector lever **86** to block or unblock the lever and thereby determine the subsequent movement imparted to it by the cam with which it is associated, as will be later ex-

plained. A bracket 90 (Fig. 3) having a turned up comb portion for supporting and guiding blocking latches 82 is secured to frame member 56 by suitable means as screws 91.

A transmitter cam shaft 92 is journaled in the keyboard frame member 56 and connected thru a friction clutch of a type well known in the art, to a shaft 96 (see Figs. 1 and 38) suitably journaled in the machine frame 98 and rotatably connected thru gears 100 and 102 to a constantly rotating power shaft 104, journaled in the machine frame, on which is secured a helical gear 106 which meshes with a worm gear 107 (Fig. 46) on the drive shaft 109 of an electric motor 108 (Figs. 1, 2 and 46) which is mounted on the machine frame 98. The motor 108 is provided with a suitable governor for maintaining its speed constant, the governor being provided with suitable means by which the speed of the motor 108 may be adjusted. Such a governor is disclosed in detail in copending application Serial No. 160,687, filed May 8, 1950, now U. S. Patent No. 2,617,904 dated Nov. 11, 1952, by Carl P. Anderson.

Secured to the camshaft 92 is a cam drum generally indicated at 110 (Fig. 6) provided with a series of cam sections 111 arranged helically around the drum to successively engage and operate the selector levers 86. In the particular embodiment of the invention herein disclosed seven selector levers 86 are provided, one for the start impulse, five for the code impulses, and one for the stop impulse. A cam section 111 is provided for each of the selector levers 86 and in addition a restoring cam section and a latch cam section are provided for purposes hereinafter disclosed. It is to be understood that the number of permutation bars 64, blocking latches 82, selector levers 86 and cam sections 111 is not limited to the number disclosed herein but that the number is variable and determined by the number of current impulses comprising the particular code in use. Each of the cam sections has a pair of diametrically opposed raised portions or cam lobes 112 which, due to the helical arrangement of the cam sections on the cam drum 110, successively engage their associated mechanisms once during each one-half revolution of the cam drum 110. This in turn permits the transmittal of code signals for two characters during each revolution of the cam drum 110.

The transmitter camshaft 92 and cam drum 110 are normally held against rotatable movement by a latch or locking bail 114 (Figs. 3 and 6) which is pivoted on pivot post 116 and has a shoulder 118 arranged to engage either of the two stops 120 formed in the front cam section of the cam drum 110. A spring 122 fastened between the machine frame and the latch 114 tends to disengage the latch and its shoulder 118 and thereby permit the cam drum 110 to rotate but this movement is restrained by the end 124 of the latch 114 which is turned sideways to normally engage the top 126 of a clutch release lever 128 pivoted on a stud 130 secured in the keyboard frame 56. An adjusting screw 132 has screw threaded engagement with an orifice in the clutch release lever 128 to permit the lever to be adjusted relative to the universal bar 76 which the end of screw 132 engages. A spring 134 fastened between a turned over edge 136 of the lever 128 and a post on the frame 56 tends to force the universal bar 76 to the left and to maintain the top 126 of lever 128 under the end 124 of latch 114 as shown in Fig. 3 of the drawings. The adjusting screw 132 permits the release lever 128 to be adjusted relative to the universal bar 76 whereby the amount of movement of the universal bar 76 necessary to effect the operation of the tripping means may be made variable and extremely slight.

As explained above, when a key 50 is depressed its associated keybar 52 engages the inclined face of a notch 78 in the universal bar 76 which invariably moves to the right and pivots the lever 128 against the tension of spring 132. The overturned top 126 of lever 128 moves to the left to the position shown in Fig. 7 and thereby disengages the end 124 of latch 114 which is thereupon lowered to its alternate position by the tension of spring 122. The end 124 engages the side of an ear 138 formed on the top edge of a transmitter repeat block lever 140 pivoted on stud 130 and prevents movement of the block lever 140 because ear 138 extends a few thousandths of an inch higher than the end 124 (Fig. 6). A spring 142 is fastened between an ear 144 on the block lever 140 and ear 146 on the lever 128 and is placed under tension when the ear 146 moves to the left while the ear 144 of lever 140 is blocked. The downward movement of latch 114 is sufficient to remove the shoulder 118 from engagement with the stop 120 on the cam drum 110 which will rotate for one-half revolution due to its connection thru the friction clutch to the constantly rotating motor 108.

Each selector lever 86 (Figs. 4 and 5) has upturned portions 148 and 150 adjacent its ends, a cam follower 152, and a notch 154 which fits around a squared shoe 156 loosely held on the pivot post 116. A spring 157 is secured between the machine frame and the lever 86 to normally hold the lever against the shoe 156 at one end and a stop 158 at the other end. The turned up portions 148 and 150 engage and position a contact bail 160 pivoted at 162 and having a pair of movable contacts 164 and 166 which cooperate with contacts 168 and 170 respectively to control the condition of the line circuit of the associated telegraph system.

Contacts 168 and 170 are mounted in contact supports 172 and 174 (Figs. 6 and 10) which are adjustable screws engaging terminals 175 fitted into a supporting block 176 formed of insulating material. The contacts 168 and 170 are plungers which are pressed downward by coiled springs 178 positioned between shoulders 179 formed on the contact plungers and guide plugs 180 screwed into the upper portion of the contact supports 172 and 174. The supports 172 and 174 may be turned in or out until the contacts 168 and 170 are in proper relationship with the contacts 164 and 166 at which time screws 182 may be set to maintain the adjustment. It is to be noted that the contact bail 160 is not biased or spring pressed in one direction, as is usual in mechanisms of this type, but is operated solely by mechanical means which assures positive operation in the manner desired. The contact bail 160 is engaged near its ends by the upturned portions 148 and 150 of the transmitter levers 86 with just sufficient clearance to permit the levers and contact bail to pivot without excessive lost motion.

As a contact 164 or 166 is raised to meet its associated contact 168 or 170 the initial shock of meeting is cushioned or absorbed by the coiled spring 178 within the contact support which compresses as the plunger moves upwardly in the support. The distance which the contact on bail 160 moves after it first engages its associated contact until it reaches its full extent of movement must be interrelated with the initial tension of the spring and the relatively low weight of the plunger contact as well as the adjusted normal position of the contacts so that the contacts will remain in engagement throughout their prescribed movement without any intermittent opening and closing of the contacts which has become known as "bounce." The initial tension of spring 178 is fixed by its being positioned between shoulder 179 on the contact and guide plug 180. This tension is not changed when the contact support is adjusted in the block 176 to determine the normal position of contacts 168 and 170 in relation to their associated contacts 164 and 166, and is sufficient to cause the closed set of contacts to remain together during an upward movement of bail 160. The contact arrangement disclosed prevents any undesired or unauthorized opening of the contacts due to "bounce" as is usual in spring pressed contacts because the mechanical arrangement is such that the contacts, once closed, are held firmly together until the next operation begins.

In the embodiment of the invention shown herein we provide two sets of contacts to permit use in a telegraph

system of the polarized current type as well as one of the current and no-current type. In a polarized current system the contacts **164** and **166** on the bail **160** are connected by a flexible conductor, not shown, to a terminal on the machine which may be connected to the telegraph line. Contact **168** is connected through a terminal to a current source of a certain polarity while contact **170** is connected through a terminal to a current source having the opposite polarity but equal in value to the first current source. Thus when contacts **164** and **168** are engaged current of the first polarity is connected to the telegraph line and when contacts **166** and **170** are engaged current of the opposite polarity is connected to the line. When the printer is associated with a system having only one source of current the external battery connections to the terminals will be omitted as is well-known in the art. The contact bail **160** is of sufficient width to be operated in turn by each of the selector levers **86** which are capable of pivotable motion in two directions under the control of the blocking latches **82** and cam drum **110** to determine which contacts will be engaged. Thus, if a blocking lever **82** blocks the end **90** of its associated selector lever **86** (Fig. 4) as the latter is engaged by its cam, the opposite end will raise upon the squared shoe **156** to engage contacts **166** and **170**. If the blocking lever **82** does not block the end of the selector lever **86** (Fig. 5) it will pivot upon the shoe **156** and post **116** and raise the end **148** to close contacts **164** and **168**.

In a polarized system it is necessary that one or the other of the movable contacts be in engagement with its associated contact at all times to maintain current of the proper polarity on the line and therefore cams and selector levers must be provided for the start and stop positions of the transmitter. The front or first cam section in Fig. 6 cooperates with the latch **114**; the second cam operates a restoring lever; the third, fourth, fifth, sixth and seventh cams operate the five code selector levers; the eighth cam controls a start selector lever and the ninth cam operates a stop selector lever. In the stop or rest position the cam lobe **112** of the stop cam section raises the associated stop selector lever **86** and as the end of the lever is always blocked by a fixed catch **183** (Fig. 3) the lever will pivot about its right end and its left hand upturned portion **150** will engage the left end of contact bail **160** to close contacts **166** and **170** to connect a "marking" current to the telegraph line.

The first movement of the cam drum **110** causes the lobe **112** of the stop cam to disengage the cam follower **152** of the stop selector lever **86** and immediately thereafter the lobe of the start cam engages the cam follower **152** of the start selector lever and as there is no blocking or latching member provided for the start selector lever it will invariably cause the lever to pivot on post **116** to raise its right or unblocked end to cause upturned portion **148** thereon to press the contact bail **160** upwardly which will close contacts **164** and **168** and open contacts **166** and **170** and thereby place the associated telegraph line in a start condition. The cam drum **110** thereafter continues to rotate and successively operates the code transmitter levers **86** to control the position of the contact bail **160** in accordance with the blocked or unblocked condition of the transmitter levers **86**.

Thus if the key **50** which corresponds to the letter "Y" is depressed the first, third, and fifth permutation bars **64** will be moved to the right and the second and fourth will be moved to the left. The blocking levers or latches **82** associated with the respective bars assume corresponding positions with the first, third, and fifth levers in their latching or blocking position as shown in Fig. 4 and the second and fourth in their unblocking position as shown in Fig. 5. The blocking levers **82** are held in their respective positions by a knife edge **184** (Figs. 3 and 6) formed on the end of a restoring locking bail **186** which is an integrally formed angularly displaced portion of the latch **114**. The knife edge **184** is moved by the pivotal movement of the latch **114** between the ears **188** on the ends of the blocking levers **82** to hold them in position until a complete code is sent by the transmitter. The depression of another key **50** will not be effective to set up another code as the blocking levers **82** cannot move until the code for the first character is completely transmitted.

As the cam drum **110** continues to rotate the first code cam engages the cam follower **152** on the first code selector lever **86** which has its right end blocked by the first latch **82** so as the cam follower **152** rides up on the lobe **112** of the cam the right end of the transmitter lever **86** will be held down to act as a pivot whereby the lefthand upturned portion **150** will press the contact bail **160** upwardly to close contacts **166** and **170** and open contacts **164** and **168** which were perviously closed by the operation of the start selector lever **86**. By the time the cam follower **152** of the first code selector lever **86** is engaged by its associated cam, the cam lobe for the start selector lever has passed beyond the start cam follower so that contact bail **160** is free to move under the influence of the first code selector lever. The second code selector lever does not have its end blocked and so it pivots on the post **116** to raise the right end of contact bail **160** to open contacts **166** and **170** and close contacts **164** and **168** to place the line in a "mark" condition. As the code transmitter levers are successively engaged they will operate the transmitter contacts to alternately (for the letter "Y") place marking or spacing current on the telegraph line in accordance with the blocked or unblocked condition of the selector levers. Immediately upon the operation of the final, in this case the fifth, selector lever **86** a restoring cam lobe **112** engages a cam follower **190** on the restoring locking bail **186** which pivots on the post **116** and disengages the knife edge **184** from the ears **188** of the blocking latches **82** so they may be moved by the depression of a key **50** to set up the transmitter for the sending of another code signal. The restoring bail **186** as stated above is an integral formed angularly displaced portion of the locking bail or latch **114** and as it pivots in a counterclockwise direction on the post **116** the latch **114** is moved against the pull of spring **157** and the shoulder **118** is moved in the path of the cam stop **120** to stop the rotation of the cam drum **110** upon their engagement. At this time the stop selector lever is in an operated position and contacts **166** and **170** are closed to place the line in a "mark" condition.

The raising of the end **124** of locking bail **114** disengages it from the edge of ear **126** of the clutch release lever **128**. If the depresed key **50** has been released by the operator the spring **134** will move the lever **128** in a clockwise direction on the pivot post **130** to place the ear **126** under the end **124** to lock the cam drum **110** against further rotation and to move the universal bar **76** to the left in readiness for the next operation.

Repeat transmission blocked

A second or repeat transmission of the same set of code signals cannot be accomplished by holding the key in a depressed position. If it is desired to repeat a character it is necessary to release the operated key **50** and then reoperate it because if the key **50** is still depressed when the transmitter completes the first cycle the universal bar **76** is in its operated position and the ear **126** of the released lever **128** is maintained in its operated position as shown in Fig. 7. As the end **124** of the latch **114** is raised by the action of the restoring cam as explained above the repeat block lever **140** is pulled to the left to the position shown in Fig. 8 by the tension of the spring **142** to position the ear **138** under the end **124** of the latch **114** which prevents the end **124** from moving downwardly and releasing the notch **118** from the stop **120**. The subsequent release of the key **50** will permit the spring **134** to return the universal bar **76** and the release lever **128** to their normal positions as shown in Figs. 3 and 6 with the end **124** of

latch 114 again resting on the ear 126. The reoperation of a key 50 will start another cycle of operation similar to the one described.

Repeat transmission for spacebar

The spacebar 192 (Fig. 1) is supported by arms 194, secured thereto in any suitable manner, which are pivoted upon a rod (not shown) fastened on the comb 54. A spacebar operating bar 196 (Figs. 7 and 9) is slidably pivoted at one end on one arm 194 and is otherwise positioned and mounted like any keybar 52 and performs similar functions. When spacebar 192 is depressed the bar 196 moves the universal bar 76 and third permutation bar 64 to the right and remaining bars to the left in accordance with the Baudot code. This will permit the cam drum 110 to rotate to transmit the proper code signals for the spacing operation. The operation will be the same as described above until the restoring cam operates the restoring lever 186 to raise the end 124 of the latch 114. When the space bar operating bar 192 was depressed it engaged an offset end 198 of a repeat lever 200 and moved it to the right (Fig. 9) to move the lever 200 in a counterclockwise direction about the pivot 202 and raise the toe 204 of a leg portion of the lever to engage an ear 206 formed on the repeat block lever 140 so that when the end 124 of latch 114 is raised by the action of the restoring cam the repeat block lever 140 will be held against the pull of spring 142. Consequently when the restoring cam lobe passes the cam follower 190, the locking bail 114 will again be moved downwardly by the pull of spring 122, and the end 124 of the locking bail 114 will be positioned between the ears 126 and 138 as shown in Fig. 9. The spacing operation will be repeated so long as the space bar 192 is held depressed and when it is released the universal bar 76 is moved to the left by the stored energy of spring 134 which also pivots the lever 128 to place the ear 126 under the end 124 of the locking bail 114 and thereby prevent the continued rotation of the cam drum 110.

A switch box 208 is suitably mounted on the keyboard frame and contains a motor control switch 210 for controlling the electrical operating circuit for the motor 108 and a line break key 212 for opening the telegraph line.

Selector

The selector mechanism is adapted to receive intelligence in the form of coded electrical impulses and translate it into mechanical movement whereby a print selecting spider and a function selecting spider are positioned in accordance with the received signal. The selector mechanism is mounted on the left end frame of the printer and is of the usual start-stop type in which a rotatable member, in this instance a camshaft, is kept in step or in synchronism with the incoming signals by a start-stop mechanism which initiates the rotation of the camshaft in response to a starting line condition preceding each code group of impulses and stops the rotation of the camshaft in response to a stopping line condition following each code group of impulses. The selector includes a selector magnet responsive to line conditions instigated and controlled by the transmitter of the same teletypewriter or a remote unit, whereupon the magnet operates its armature in conjunction with the rotatable camshaft to control the pivotal movement of a group of selector levers equal in number to the variable line conditions in one signal character code group. Signalling pulses from the line are received in the selector magnet which attracts the armature on marking or current pulses and releases it on spacing or no-current pulses. On attraction the armature blocks one end of the selector fingers, and on release of the armature the fingers are unblocked in a manner similar to the operation of the transmitter. The selector fingers are affected by the rotating cams to position five selector Y-levers in accordance with the signals received and the release of a print start lever brings a set of five T-levers in simultaneous contact with the five selector Y-levers. The T-levers take the setting of the Y-levers and in so doing move a set of permutation notched rings or plates into positions corresponding to the code signal received and permit one spring pressed drop-in stop bar to enter the aligned notches to arrest the movement of a rotatable stop arm and thereby position a selecting spider to select the particular type bar which carries the character to be printed.

The selector electromagnet 220 (Figs. 1 and 11) is supported upon the side frame 222 (Fig. 2) in any suitable manner and is connected electrically to the telegraph line. It is normally energized in accordance with the preferred practice of operating this type of telegraph receiver and holds armature 224 pivoted at 226 in its attracted position as shown in Fig. 11. A tensioning spring 228 has one end secured to the armature 224 and its other end to an armature adjusting lever 230 which has its split end clamped by means of a screw 232 to a shaft 234 journalled in a suitable manner in the end frame 222. The other end of the shaft 234 carries a lever having a toothed end (not shown) which is in engagement with a worm gear 236 (Fig. 1) on a shaft 238 which passes thru the printer control panel 240 to support an adjusting knob 242 and scale 244. Rotation of the knob 242 in a clockwise direction will increase the tension on the armature 224 and rotation in the opposite direction will decrease the tension to permit the armature 224 to respond properly to stronger or weaker line signals. Armature adjusting screws 246 and 248 have screw threaded engagement with ears 250 and 252, respectively on the frame 222 to limit the extent of movement of the armature 224.

When in its normally operated poistion the knife edge 254 of armature 224 engages a shoulder 256 at one end of a selector stop lever 258 which is pivoted at its other end on a post 262 secured to the frame. Near the center of the stop lever 258 is a stop 264 which coacts with either of the ends 266 of a stop plate 268 to prevent the rotation of the cam assembly generally indicated at 269 when the armature 224 is attracted by the magnet 220 and elements 264 and 266 are engaged. The stop plate 268 is loosely mounted on a plunger 270 (Figs. 12 and 13) and has ears 272 which fit in spiral grooves 273 in the plunger to provide means for orienting the start position of the selector cams in relation to the selector levers as will be explained later. The plunger 270 fits within the hollowed enlarged end 274 of a cam shaft 276 and is rotatably pinned thereto by a pin 278 fixed in the camshaft 276 and positioned in a slot 280 in the plunger 270 to cause the plunger to rotate with the camshaft 276 and also to be adjustable longitudinally therein. The camshaft 276 is journalled in the end frame 222 and is connected thru the usual friction clutch 282 (Figs. 2 and 14) to the constantly rotating power drive shaft 104 which is suitably journalled in the hub portions 284 and 286 and connected to the motor 108.

The selector mechanism (Figs. 11 and 14) includes a set of receiver selector levers 288, in this instance five in number, in the form of thin flat fingers arranged in a bank behind stop lever 258 on the pivot post 262 and the comb guide and stop member 290 secured to the frame 222. Each of the selector levers 288 is provided with a shoulder 291 (Figs. 15 and 16) for engagement with the end 254 of the armature 224 when it is in its attracted position. The shoulder 291 on each selector lever 288 is beveled inwardly as shown in Figs. 15 and 16 for the purpose of holding the attracted armature in engaged position so that the selection will always be completed regardless of any intermediate change in current in the magnet 220. This is known as point selection and is very important in obtaining proper operation of the printer. Notches 292 are formed in the other end of the selector levers 288 and fit on squared shoes 294 on the

post 262 to permit sliding as well as pivotal movement thereon. The stop lever 258 and the selector fingers 288 are each secured to one end of a coil spring 296. The other end of each of the springs 296 is fastened to a post 298, and the pull of the springs tends to hold the stop lever and selector fingers against the stop 290 and squared shoes 294.

Cam assembly 269 on cam shaft 276 comprises the cams 300 which are spirally arranged on the shaft to successively engage cam followers 301 on the selector fingers 288 as the cam shaft 276 rotates. Spacers 302 (Fig. 12) are placed between the cams 300. Each selector finger 288 is operated upon by two high cam portions, which are diametrically opposed on each cam 300, to provide a complete cycle of operation with only one-half revolution of the cam shaft 276. Through the action of the cams 300 on the cam followers of the selector fingers 288, one end or the other of each finger 288 must lift. The end which lifts is determined by the position of the armature 224 at the time the cam engages the cam follower of the selector finger. If the armature 224 is up (attracted) the lower end of the finger 288 is blocked and the upper end will be raised and will slide on the squared shoe 294 against the pull of spring 296 as shown in Fig. 15. If the armature 224 is down (released) as shown in Fig. 16 the lower end is unblocked and will be raised as the selector finger 288 pivots on the squared shoe 294 on post 262. As soon as the cam 300 passes the cam follower the stored energy of the spring 296 will restore the selector finger 288 to its normal position with its lower end resting against stop 290 and its upper end against the squared shoe 294. As pointed out hereinabove, due to the angular formation of shoulders 291 on the selector fingers 288, once the armature 224 engages a finger it will be locked in its attracted position until the selection is completed even though the magnet 220 becomes deenergized in the meantime.

When the transmitter sends a marking pulse the electromagnet 220 energizes and attracts armature 224 which blocks the selector finger 288, as above described, to raise the upper end of the finger. A spacing impulse or interval will cause the deenergization of the electromagnet 220 and the retraction of the armature 224 which will permit the synchronously operated selector finger 288 to raise its lower end.

The selector levers 288 are provided at their ends with ears 303 and 304 which engage arm 306 and leg 308, respectively, of Y-shaped selector levers 310 pivotally secured on post 312. One selector lever is provided for each selector finger 288 and will be rocked to the right or left as viewed in Figs. 15 and 16 by the movement of its associated selector lever 288. If the selector finger 288 is blocked by the armature 224 when its cam 300 engages cam follower 301 on the finger, the ear 303 will be raised and will engage arm 306 on Y-lever 310 to move it to the right (clockwise) as shown in Fig. 15 until the inside edge of arm 306 rests against a stop post 314 secured in frame 222. If the selector finger 288 is unblocked the ear 304 will raise against the leg 308 of the Y-lever 310 and cause it to move to the right (counterclockwise) as shown in Fig. 16 until the inner edge of arm 316 of the Y-lever rests against the stop pin 314. The successive operation of cams 300 will operate the selector fingers 288 in accordance with their blocked or unblocked condition and this movement will be transferred to position the selector Y-levers 310 accordingly.

It is desirable and advantageous in start-stop selector mechanisms to provide range finding or orienting means to vary the stop or rest position of the cams 300 related to the selector fingers 288 to compensate for changing line conditions which vary the length and effectiveness of the signal impulses. As is well known in the art the mid-portion of the signal impulse is the most effective, and the range finding or orienting means provided herein enables the operator by adjustment of stop plate 268 to set the selector cams 300 in the proper position to operate the selector fingers 288 at the most effective point. Excessive axial movement of the stop plate 268 is prevented by a turned over hook portion 318 (Fig. 12) formed on one of the spacers 302. This permits a slight axial movement of the stop plate 268 on the plunger 270. The timing relationship between the selector cams 300 and the stop plate 268 is adjusted by altering the angular position of the stop plate with respect to the cam shaft 276. Increasing the angle between the lobes of the cams 300 and stop plate 268 causes the selector fingers 288 to operate later in the cycle. Decreasing the angle causes the selector fingers 288 to operate earlier in the cycle. The angular position of stop plate 268 is adjusted by moving plunger 270 in or out of camshaft 276. Plunger 270 is pinned to the camshaft by pin 278 so that it is prevented from turning with respect to the cam shaft 276, and therefore when it moves axially the spiral grooves 273 in the plunger coact with the ears 272 on stop plate 268 to cause the stop plate to turn. Axial movement of plunger 270 is controlled by a range adjusting lever 320 (Figs. 12 and 14) pivoted on a stud 322 secured in an extension 324 of the frame 222. A cam follower 326 is formed on the lower end of lever 320 and follows a cam 328 fixed to a control shaft 330 (Fig. 1) which is connected through suitable gearing 332 to a control knob 334 having an indicating scale 336 thereon associated with a pointer 338 on the panel 240. With the arrangement herein disclosed it is possible to locate control knob 334 and indicating scale 336 on front panel 240 remote from the actual range finding means so that the scale may be easily viewed by the attendant as he makes the adjustment.

If the control knob 334 is turned so that the shaft 330 and cam 328 rotate in a clockwise direction as viewed in Figs. 12 and 14 the adjusting lever 320 will rotate counterclockwise and force plunger 270 into the hollow end of camshaft 276. This will cause stop plate 268 to turn directly, if it is not held by stop lever 258, to increase the angle between the plate and the lobes of cams 300. If the knob 334 is turned so the cam 328 is rotated in a counterclockwise direction the low portion of the cam is presented to the cam follower 326. Then if stop plate 268 is held, as it is for a stop signal, the friction driven rotation of cam shaft 276 forces plunger 270 outwardly to turn the cams 300 to decrease the angle between the plate and cams, until the end of the plunger again abuts the range finder lever 320.

The range finding or orienting adjustment is preferably made while the selector is running and receiving repeated signals. The control knob 334 should be turned in one direction until the signals fail and the position of the pointer noted on the scale and then turned in the opposite direction until the signals again fail and the scale reading noted, whereupon the equipment should be adjusted so that the pointer is set halfway between the high and low readings. A lock 340 (Fig. 1) is provided on the panel 240 for maintaining the range finder in its adjusted position.

Six yoke shaped friction plates 342 (Fig. 11) are supported on the rod 344 and four of them have their enlarged ends interspersed between the five Y-levers 310. The other two are positioned against the front and back Y-levers respectively. The surface of the enlarged end of the plates 342 are embossed and when the plates and Y-levers are pressed together by a compressed coil spring (not shown) placed on the pivot post 312 between the first plate 342 and the collar 346 the friction between them is sufficient to hold the Y-levers 310 in their adjusted positions.

It is to be noted that the selector Y-levers 310 do not have a normal position to which they are returned by spring means after each operation. Instead they are retained in their adjusted positions by the friction plates 342 and are not moved by the selector fingers 288 unless

their position is to be changed. Their movement is always positive in that either the ear 303 engages the arm 306 or the ear 304 engages the leg 308 of the Y-lever 310 to move it to its new position. The Y-levers 310 do not have a natural movement of their own and consequently their movement is minimized thereby reducing the wear of the parts and eliminating the possibility of error because of vibration or some other unauthorized movement.

After all of the Y-levers 310 are set in their selected positions the innermost cam 300 on the camshaft 276 engages a cam follower 348 (Fig. 11) on a latch lever 350 causing the lever to pivot counterclockwise on pivot post 352 against the pull of spring 354 which has one end secured to lever 350 and the other to spring post 298. This will release the latch end 356 from a latch plate 358 on the end of transfer lever 360 which is pivoted on a shaft 362 (Figs. 2, 11 and 20) journalled in frame 222. A spring 364 tensioned between a post 366 and the transfer lever 360 tends to rotate the lever 360 and shaft 362 in a clockwise direction. The transfer lever 360 has an integrally formed arm 368 which carries a forwardly extending post 370 upon which is pivotally mounted a group of inverted T-levers 372 equal in number to the Y-levers 310 and selector fingers 288. The cross members of the inverted T-levers 372 are provided at their extremities with depending knife edges 374 and 376 (Figs. 17 and 18) adapted to cooperate with knife edges formed at the tips of arms 306 and 316 of the Y-levers 310. When the latch 356 is disengaged from the latch plate 358 the pull of spring 364 will rotate the transfer lever 360 on pivot post 362 to move the arm 368 and post 370 downwardly. The post 370 will enter the space between the opposed arms 306 and 316 of Y-levers 310 and thereby cause the knife edges 374 and 376 to cooperate with the ends of arms 306 and 316 and pivot on post 370 to simultaneously transfer the setting of the Y-levers 310 to the inverted T-levers 372.

If the Y-lever 310 has been moved in a clockwise direction by its associated selector finger 288 the end 374 of T-lever 372 will not strike the end of arm 306 of the Y-lever 310 but will pass beyond as shown in Fig. 17. Likewise if the selector Y-lever 310 has been moved counterclockwise the end 376 will miss the end of arm 316 as shown in Fig. 18. It is to be understood that when the end 374 of a T-lever 372 misses the end of arm 306 of the associated selector lever 310, the end 376 of that same T-lever 372 will engage the end of arm 316 of that same Y-lever, and vice-versa, as the parts are so proportioned and positioned that one end must always make engagement when the transfer movement takes place. To further insure the positive setting of the Y-levers 310 and T-levers 372, the ends 374 and 376 of the T-levers and the corresponding ends of the arms 306 and 316 of the Y-levers have angular faces which cooperate to complete the movement of the Y-lever 310 initiated by the associated selector finger 288. For instance, if a Y-lever 310 has been moved counter-clockwise but not sufficiently for the inside of arm 316 to engage the stop post 314 the first engagement of the angular faces of the ends will move the arm 316 completely against the post 314 after which the T-lever 372 will move to its new position. The action is the same if the movement of the Y-lever 310 and T-lever 372 are in reverse direction in which case the angular face on end 376 and arm 316 will cause the movement. The upright arms 378 of the inverted T-levers 372 terminate in rounded ends 380 which are located in elongated slots 382 of a depending leg portion 384 of a group of five coded permutation rings 386 in segmental form. The permutation segments or code rings 386 are pivotally supported on a hollow post 388 and are separated by spacing washers to permit them to move easily in opposite directions without binding each other. As the inverted T-levers 372 pivot to assume the positions of the Y-levers 310 the ends 380 will slide in the elongated notches 382 and also pivot therein to move certain of the legs 384 to the right and others to the left in accordance with the adjusted positions of the associated T-levers 372. The coded segments 386 accordingly will pivot about the hollow post 388 to assume their proper positions.

The coded segments 386 are a part of the code stop bar cage shown generally at 390 (Figs. 11 and 14) which includes a front guide plate 392 supported on the same hollow post 388 which supports the coded segments 386 and a rear guide plate 394 supported on a bracket 396 secured to the frame 222. The guide plates 392 and 394 each have a plurality of slots 398 arcuately arranged as shown in Fig. 11 with corresponding slots in alignment in each receive a pair of stop bars 400. The bars 400 are placed in the slots 398 so as to form an inner set and an outer set which are in concentric arcs; the rear ends of the bars 400 protrude thru the guide plate 394 and coil springs 402 (Figs. 14 and 19) are placed between the ends of each pair of bars 400 to force the ends apart and push the outer edges of the bars against the inner and outer ends of the respective slots 398. Notches 403 are formed in the edges of the bars and the guide plate 394 fits in these notches to serve as a fulcrum for the bars 400. The inner edge of the outer set of bars 400 and the outer edge of the inner set of bars 400 are pressed against the outer and inner edges respectively, of the coded segments 386 by the tension of the coil springs 402, as best shown in Fig. 19.

The coded segmental rings 386 have notches 404 (Figs. 17 and 18) distributed on their outer and inner edges in a manner well known in the art to permit only one alignment of notches in the five rings for each of the thirty-two possible combinations of positions of the coded rings 386. The notches in the first code ring are so arranged that when the code ring is set in the clockwise (marking) position there will be a low point or notch opposite the stop bars 400 for those characters in the Baudot code in which the first signal impulse is a marking impulse such as A, B, D, etc., and there will be a high point opposite the stop bars 400 for those characters in the Baudot code in which the first signal impulse is a spacing impulse (such as C, G, H, etc.), the reverse is true when the code ring 386 is set in the counterclockwise or spacing position. The second code ring 386 is notched in accordance with the second impulse for each character; the third code bar for the third impulse, and so on. Therefore, when the code rings 386 have been set as a result of the transfer operation, there will be one (except where duplicates are provided as hereinafter explained) position along the outer or inner periphery of the code rings 386 where there will be a notch in each of the five code rings 386 opposite a stop bar 400. The pressure of the spring 402 pushes this particular stop bar into the aligned notches thereby placing it in position to arrest the rotation of a square shaft stop arm 405. The stop bar 400 which was previously pushed into an aligned set of notches 404 is pushed out by the sloping surface at the side of a notch in at least one code ring 386 when the code rings 386 are reset by the transfer operation unless, of course, the same stop bar 400 is selected by repeating a signal. This action releases the square shaft stop arm 405 as will be explained making it free to turn until it strikes the newly depressed stop bar. Three auxiliary stop bars 406, 408 and 410 (Figs. 11 and 14) are provided to duplicate the stop bars 400 assigned to line feed, carriage return, and figures shift functions, as will be more fully explained hereinafter. These bars do not project into the path of the stop arm 405 but extend beyond the rear guide plate 394. Coiled springs (not shown) are fastened between the stop bars 406, 408 and 410 and a bracket 412 (Fig. 14) to cause the inner edge of the bars to press against the outer periphery of the code rings 386. These bars 406, 408 and 410 do not engage the stop arm 405 at any time.

Operation of function shaft

The function cam shaft **414** (Figs. 2 and 14) is suitably journalled in the frame member **222** and arranged to be intermittently power driven one-half revolution every time a complete signal code is received. The shaft **414** provides the intermittent drive for rotating stop arm **405** and a square selecting shaft **416** to the next selected position, actuates the printing and other functional operations, and raises the transfer lever **360**. When the transfer lever **360** (Fig. 11) was rotated by the pull of spring **364** the transfer shaft **362** (Figs. 2 and 20) rotated in a direction to rotate a clutch latch **418** and release a clutch dog **420** which was thereupon moved to the right by the coil spring **422** surrounding the sliding jaws of the clutch **424** and permitted the teeth on the enlarged clutch face **426** to mesh with the teeth formed in the hub of gear **428**. Gear **428** is loosely supported on the function cam shaft **414** and rotates constantly because it is in mesh with drive gear **430** fixed to the constantly rotating power shaft **104**. As the sliding clutch **424** starts to rotate the movement is transferred to the function cam shaft **414**. A flexible coupling **431** (Fig. 2) is provided between cam shaft **414** and clutch **424** to reduce the jar of impact and noise.

When the function cam shaft **414** has turned a few degrees the transfer lever restoring cam **432** (Fig. 11) on the end of the shaft **414** engages a cam roller **434** supported on a stud **436** secured in the upper end of the transfer lever **360** which rotates counterclockwise and becomes relatched by the transfer lever latch **350** the end **356** of which was permitted to raise under the pull of spring **354** when the latch plate **358** moved from its blocking position. The rotation of the transfer lever **360** raises the arm **368** and the T-levers are disengaged from the ends of the Y-levers **310** to condition them for the next setting. The shaft **362** also rotates counterclockwise to raise the clutch latch **418** into the path of clutch stop arm **420** and when the shaft **414** has made almost one-half revolution, the opposite end of the arm **420** on the clutch drum strikes a roller **437** (Fig. 21) on the clutch latch **418** to move the arm **420** and clutch face **426** to the left as shown in Fig. 20 to disengage the teeth on the clutch face from those on the face of the gear **428**. In this disengaging operation the roller **437** on the clutch latch **418** acts as a cam surface with its throw in the axial direction; a roller is provided for this purpose since it reduces wear on the parts. The function cam shaft **414** thus can revolve only one-half revolution at a time and does so each time the transfer operation takes place.

Positioning of selecting shaft

The selecting shaft or square shaft **416** (Figs. 2 and 14) has rounded portions which are suitably journalled in the frame member **222** to permit the shaft **416** to rotate whenever the function cam shaft **414** is rotating and the stop arm **405** is not in engagement with a stop bar **400**. An extension of the rounded portion of shaft **416** passes through the hollow post **388** of the stop bar cage **390** and stop arm **405** is rigidly secured thereto by the clamp **438** (Figs. 11 and 14). An anti-bounce clutch **440** is associated with the square shaft **416** to prevent any backlash of the shaft **416** when the arm **405** engages an operated stop bar **400**. The stop arm **405** has an inner projection **442** and an outer projection **444** on each end of its diametrically opposed arms **446** and **448** for engaging the corresponding rows of stop bars **400** when they are projected into the path of the stop arm. The projections **442** and **444** are separated angularly by a space equal to one and one-half times the space between adjacent stop bars **400** in the same row or arc so that the stop bars in the outer row arrest the projection **444** when the projection **442** is halfway between two of the stop bars of the inner row as shown in Figure 11. In the embodiment of the invention shown there are sixteen stop bars in each concentric arc or row thus making thirty-two stop positions available in one-half a revolution of the square shaft **416**. It is to be understood, however, that changes and modifications may be made without departing from the spirit or scope of the invention. For instance the number of positions in which the selecting shaft **416** may be positioned may be increased by interspersing more stop bars **400** in the present rows or by increasing the number of concentric arcs of stop bars. If more arcs or rows are added another projection such as **442** or **444** must be added to each of the arms **446** and **448** of the stop arm **405** as the projections on each end of the stop arm must be equal in number to the concentric rows of stop bars. The number of selective positions to which the rotatable shaft **416** may be positioned during a complete revolution may thus be increased by providing more rest positions for the function shaft **414** and the associated apparatus so that three, four, or more selections may be made in one revolution of the function shaft.

The square selecting shaft **416** is positioned in accord with the stop arm **405**, and is driven by the function shaft **414** at a geared ratio of almost two to one thru a driven gear **450** (Fig. 14) fixed to shaft **416** and a driving gear **452** connected to function shaft **414** thru a spring loaded felt plate friction clutch, generally indicated at **454**, which permits gear **452** to slip on the shaft **414** as soon as the square shaft stop arm **405** is arrested by an operated stop bar **400**. The friction clutch **454** also permits function cam shaft **414** to continue turning after the stop arm **405** is arrested to actuate the printing and other functioning mechanisms as will be explained. As the function shaft **414** always makes one-half revolution after each transfer operation, the square shaft **416** can make almost a complete turn because of the gearing ratio, but it is never necessary for the stop arm **405** to turn more than one-half revolution before striking a stop bar **400** and it usually will turn less than that.

When the function shaft **414** begins to turn the movement is transmitted through friction clutch **454**, gears **452** and **450** to shaft **416** which turns until the stop arm **405** engages a projected stop bar **400** at which time it stops. The friction clutch **454** will then slip in a manner well-known in the art until the function shaft **414** reaches its next stop position. From then until the next operation of the shaft **414** the friction clutch **454** is inactive completely and as none of the parts is moving there is no wearing of the parts. As there is practically no wear upon the clutch parts when the clutch is driving the shaft **416** it is apparent that the only wear will be during the comparatively short time between the stopping of the shaft **416** by the stop arm **405** engaging a stop bar **400** and the stopping of the function shaft **414** as it completes its cycle, which in the embodiment of the invention shown and described is one-half revolution but which may be one-third, one quarter, or any other fractional part of a revolution which may be suitable and desirable.

It is accepted practice in the art of telegraph printers to arrange the twenty-six letters of the alphabet and six function selections in a group of thirty-two known as the "Letter Shift" group for selection when the paper carrying platen or typebar carriage is in its unshifted position and to arrange figures, punctuation marks, and other function selections in another group of thirty-two called the "Figure Shift" group for selection when the carriage or platen is in its shifted position. In the present embodiment of our invention the platen is shifted as will be hereinafter described. As there are thirty-two possible stop positions of the stop arm **405** it is apparent that any character in either group can be selected in one cycle of the asesmbly which in the present embodiment is one-half a revolution of the stop arm and selecting shaft **416**.

Associated with the square positioning shaft **416**, through means to be described hereafter, is a spider positioning finger **456** (Fig. 22) which cooperates with a type bar operating spider **458** provided with two diametrically

opposed legs 460 and 462. Finger 456 is geared directly to the square shaft 416 in such a manner that it is rotated as the shaft 416 is rotated. Finger 456 in turn causes spider 458 to rotate, and in the course of one-half revolution of the shaft 416 one or the other of the spider legs 460 and 462 is positioned in all of the thirty-two possible selecting positions. Thus it is possible in the course of a complete revolution of the shaft 416 to make two selections. Since there are only twenty-six type bars it will be understood that the legs 460 and 462 may be positioned in six positions in which there are no type bars to be selected, however in these remaining positions non-printing functions are selected by other means, as will be hereinafter described, and the finger 456 and spider 458 will be ineffective.

Printing operation

The positioning finger 456 and spider 458 are carried by a movable type bar carriage frame 464 (Fig. 22) which is positively reciprocated with respect to a stationary platen holding the paper on which the message is printed. The front of the carriage frame 464 is supported by means of rollers or wheels. 465 (Fig. 1) which roll upon a carriage rail 466 removably secured to projections on the printer frame. The rear of the carriage frame is slidably supported on square shaft 416 by means of a fork member 467 (Figs. 22, 44 and 45) suitably fastened to the rear of the frame and a coacting bearing assembly 468 mounted on the shaft 416. The inner sleeve 469 (Fig. 45) of the bearing assembly 468 has a square hole therethrough to receive the square shaft 416 in a slidable fit and still be rotatable with the shaft. The outer sleeve 470 of the bearing assembly is provided with an annular channel 471 which positions and supports the rearwardly projecting arms of the fork member 467. The fork arms abut two diametrically opposed flat portions of the channel bottom to hold outer sleeve 470 against rotation and prevent wear between the fork-bearing connection. Thus, it will be understood that while the complete bearing assembly 468 is free to slide axially along square shaft 416 as the carriage reciprocates only the inner sleeve 469 is rotatable with the shaft. Also rotatable with shaft 416 is the helical gear 472 which is keyed to inner sleeve 469. Gear 472 drives a second helical gear 473 on the carriage to position finger 456 and spider 458 as will be explained. The rear carriage support arrangement just described serves not only as a highly satisfactory means for supporting the rear of the carriage frame 464 but also performs the very important function of keeping the gears 472 and 473 in perfect alignment and mesh throughout the entire distance of travel of the carriage. This arrangement also permits easy removal of the movable carriage from the remainder of the printer.

The helical carriage gear 473 is fixed to one end of a hollow sleeve 474 having positioning finger 456 secured to its other end so that the finger is rotated as gear 473 is driven by square shaft 416 and gear 472. The type selecting spider 458 is secured on a plunger 476 which is slidably mounted within hollow sleeve 474 so that it can be moved axially in and out as well as rotated with the sleeve. Sleeve 474 is suitably journalled in bearings 478 in cariage frame 464. A collar 480 having an annular groove 482 has screw threaded engagement with the plunger 476 and may be secured in its adjusted position by a lock nut 484. The edge of printing bail 486 fits into the annular groove 482 of the collar 480. The bail 486 extends across the rear of the printer a distance equal to the width of the printed line on the paper and has legs 488 (Figs. 2 and 14) which are secured to a pivot shaft 490 which is suitably journalled in hubs 492 and 494 (Fig. 2) secured to the machine frame. Also rigidly secured to the pivot shaft 490 by means of a split end 496 (Fig. 22) and clamping screw 498 is a cam follower 500. A cam roller 502 is secured to the follower 500 and engages the printing cam 504 which is rigidly secured to the function cam shaft 414 and rotates therewith. The cam 504 has two high portions 506 and 508 and therefore the cam follower roller is lifted once for each half revolution of the cam shaft 414.

As the roller 502 rises and falls the pivot shaft 490 rocks forward and back and the printing bail 486 causes the plunger 476 and type selecting arm 458 to plunge to the right as viewed in Fig. 22. This causes end 460 or 462 of the arm 458 to strike the selected push bar 510 which, through the rack 512 and gear 514, causes the type bar 516 to swing about the pivot wire 518 toward the platen 520. The type selecting arm 458 does not push the push bar 510 and type bar 516 all the way to the platen 520; it merely strikes them a blow giving them enough momentum to carry the movement through. The partially shown type bar 522 in Fig. 22 shows the approximate position to which the type bar is pushed by the push bar 510 and arm 458. The movement of the printing bail 486 is so fast that the type selecting arm 458 is already drawn all the way back before the type bar 516 reaches the platen 520. A push bar spring 524 is secured between the push bar 510 and the carriage frame 464 to pull the push bar 510 and type bar 516 back to normal positoin after the type bar 516 bounces away from the platen 520. A shoulder 526 on the push bar 510 strikes the comb guide 528 and prevents excessive movement of the push bar. The return shock of the type bar 516 is absorbed by an arcuate spring plate 530 (Fig. 1) secured at its respective ends to looped springs 532 and 534 which in turn are secured to the ribbon spool supports, to be described.

Ribbon lifting

The typing or inking ribbon 536 (Figs. 1 and 23) is fed through a ribbon guide 538 and normally rests below the printing line so as not to obscure the printed characters. Therefore ribbon 536 must be raised and lowered for each printing operation. This is effected by sliding the ribbon guide 538 up and down on the mounting 540 (Fig. 22), secured to the carriage frame by a screw 542, each time a character is printed. As above explained the type selecting plunger 476 moves to the right as viewed in Fig. 22 to actuate a type bar. At the same time, the end of plunger 476 engages the flattened end of a lever 544 which pivots at 546 and, through the relationship of an elongated notch 548 and rounded end 550, causes a lever 552 to pivot about the pin 554. This pivotal movement is imparted to a clevis 556, adjustable turnbuckle 558, link 560, and bell crank 562 which pivots at 564 to raise its end 566 to which is attached the offset tail portion 568 of the ribbon guide 538. Immediately after the printing takes place the ribbon guide 538 is lowered and the operating linkage is restored to its normal position by the action of the spring 570 connected between a carriage frame extension 572 and bell crank 562. The mounting 540 has two projections 574 (Figs. 22 and 23) which are turned over and form a V-shaped opening into which the actuated type bars 516 enter so that the printed characters are properly centered and evenly spaced across the printed line.

As the twenty-six type bars 516 are suffiicent only for the letters of the alphabet it is necessary to provide type pallets 576 which have one letter (lower case) and a figure or other character (upper case). In order to print the characters in the upper case it is necessary to shift the platen upward. The mechanical means for raising the platen 520 will be hereinafter described. The raising of the platen 520 requires the ribbon 536 to be raised also and for this reason the pivot pin 564 is secured to a pivot holder 578 which is slidably mounted on an upturned portion (shown in dotted lines) of the mounting 540. The holder 578 has a slot 580 formed in one edge which receives one end of an angular slide bar 582 which extends

the width of the platen **520** and is secured to the end plates which support the platen **520**. When the platen is raised for the printing of characters in the upper case the movement is transferred through the slide bar **582** and notch **580** which raises the pivot holder **578**, pivot **564**, and bell crank **562** which in turn raises the ribbon guide **538** and ribbon **536**. Thus the ribbon **536** is in a higher position for both its raised and lowered condition when upper case characters are to be printed.

Ribbon feeding mechanism

In telegraph printers, as well as in other machines of this class, it is desirable to provide uniformly printed impressions, and to accomplish this it is necessary that the inking or typing ribbon be used uniformly over its entire length and that provision be made for reversing the feeding movement of the ribbon when it has been substantially all wound on one spool. In the invention embodied herein the ribbon feeding and reversing mechanism is not connected to the prime mover of the printer but derives its operative movement from the character spacing movement of the movable type carriage.

In the drawings Figs. 1 and 23 show the ribbon feeding and reversing mechanism as a unit structure which can be quickly and easily installed on or removed from the movable type bar carriage **464**. When the unit is in place on a machine the ribbon supply spools are located near the top and front where they are easily accessible for adjustment or removal. The supporting members or brackets **583** of the unit are secured to the carriage frame **464** as by screws **583***a* which engage tapped holes in the frame. Brackets **583** support vertically disposed spindles **584** and **585** upon which are placed, respectively, ribbon supply spools **586** and **587** which fit in cup-shaped shields **588**. Clips **589** and **590** are pivoted in the end of the spindles **584** and **585** and serve to removably secure the spools **586** and **587** in place. Coiled springs (not shown) may be located within the spindles to maintain the clip in either position shown in Figure 23. The ends of ribbon **536** are detachably secured to ribbon spools **586** and **587**. The spindles **584** and **585** are provided at their lower ends with bevel gears **592** and **594** which respectively engage, but not at the same time with pinion gears **596** and **598** secured to the ends of a drive shaft **600** supported in a yoke **602** secured to the brackets **583**. One set of the gears is always in engagement. The drive shaft **600** is rotated by means of a jaw clutch which has its driven member **604** secured to the shaft **600** and its driving member **606** to the hub portion of a helical gear **608** slidably mounted on the shaft **600** but adjustably positioned with respect to the driven member **604** by a spring **610** and a collar **612** which may be positioned on the shaft **600** by a set screw **614**. The helical gear **608** engages a spiral rack **616** (Fig. 24) fastened on the carriage rail **466**. As the successive characters are printed across the page the carriage is moved to the right under the control of power means as is hereinafter described. This movement causes the helical gear **608**, shaft **600** and one ribbon spool (**586** as viewed in Fig. 23) to turn and wind part of ribbon **536** on the spool. The other spool (**587** in Fig. 23) idles and unwinds a like amount of the ribbon **536** so that a different portion of the ribbon **536** is used for printing each successive character. When the carriage is returned to the left to start a new line the helical gear **608** rotates in the opposite direction but the teeth of the jaw clutch slip so that the drive to the ribbon spools is effectively disengaged. As soon as the carriage has reached the position at the start of a new line, and the leftward movement of the carriage and helical gear **608** ceases, the spring **610** will force clutch member **606** into engagement with member **604** to drive the ribbon feed mechanism when the carriage again starts to the right.

Ribbon reversing mechanism

When the inking ribbon **536** is wound substantially entirely on one spool the direction of feeding the ribbon is reversed automatically to rewind the ribbon on the then empty spool. The reversing mechanism is set into operation when the last turn of the ribbon is unwound from the paying-out spool by the pivoting of a sensing lever which then protrudes through a window in the core of the spool, and is completed by a camming action which connects the driving means to the empty spool. As shown in Fig. 23 the supply of ribbon **536** on spool **586** has just been exhausted and the mechanism has just been shifted to reverse the direction of feeding movement of the ribbon **536** by winding it upon spool **586**. The core of ribbon spool **586** has a cut out portion or window **618**, extending partially around its circumference, through which the angularly displaced end **620** of a sensing lever **622** is permitted to protrude when the last turn of the ribbon **536** has been unwound from the spool. So long as one turn of a ribbon is on the spool, the sensing lever is retained in the position shown for the right hand sensing lever **624** associated with spool **587** in which the end **626** of the sensing lever is held in the window **628**. The ends **620** and **626** have curved back portions which bear against the ribbon **536** without injuring it. The first turn of the ribbon **536** on the spool **586** will place the sensing lever **622** in the same relative position as the sensing lever **624** as shown in Fig. 23. The ribbon **536** will then continue to wind on the spool **586** until the last turn of the ribbon **536** is removed from the window **628** of spool **587** at which time the end **626** will pass through the window and the sensing lever **624** will pivot on the post **630** under the influence of a spring **632** secured under tension between an ear **634** on the sensing lever **624** and the bracket **583**.

Affixed to the sensing lever **624** are studs **636** which fit loosely in slots **638** formed in the legs of a substantially U-shaped portion **640** of a cam follower **642**. The pivot post **630** is located between the legs of U-shaped portion **640** and is so arranged with respect thereto and the studs **636** and notches **638** that when the sensing lever **624** pivots about the post **630** this pivotal movement will be transferred to the cam follower **642** which will move to the right as viewed in Fig. 23 until it is under the cam **644** secured to drive shaft **600**. The cam **644** is formed with two lobes diametrically opposite each other (Fig. 25) so within the next half revolution of the drive shaft **600** one of the lobes will engage the cam follower **642** which will slide on the studs **636** and be moved downwardly. A pin **646** is fixed in the cam follower **642** and enters a slot **648** in a beam **650** pivoted substantially at its center on stud **652** secured in a portion of the support yoke **602**. The downward movement causes the beam **650** to rock on the pivot **652** in a clockwise direction so that the beam ends **656** and **658** which respectively engage annular collars **660** and **662** on the gear hubs **663** and **664** cause the gears **592** and **596** to disengage and the gears **594** and **598** to engage. The gear hugs **663** and **664** are slidably mounted on their respective spindles **584** and **585** to permit this shifting movement but are keyed thereto as indicated at **665** so that rotation of the gears **592** and **594** will be transmitted to their respective spindles and spools. The shifting of the gears disconnects the drive shaft **600** from the spindle **584** and connects it to spindle **585** whereupon the then empty spool **587** becomes the take up spool. As soon as one layer of ribbon **536** is wound upon the spool **587** and the sensing lever end **626** is pushed back out of the window **628**, the sensing lever **624** pivots to move the cam follower **642** out of the path of the cam **644** and into the position shown in Fig. 23 of the drawings. Thereafter when the last layer of ribbon **536** is unwound from spool **586** the sensing lever **622** will pivot its cam follower **666** into the path of left hand cam **667** which will move the

mechanism back into the position shown in Fig. 23 to repeat the cycle.

The spindles and gears are held in the position to which they are shifted by a detent mechanism which also imparts a snap action to the movement of the beam **650** to facilitate the action. The detent mechanism consists of a pointed latch plate **668** suitably fixed to the beam **650** and a detent **670** pivoted on a stud **672** secured in a portion of the yoke **602**. To the lower end of detent **670** is fastened one end of a tensioned spring **674** which has its other end fastened to a projection **676** on the yoke **602**. The spring **674** is normally under sufficient tension to maintain the detent **670** against the plate **668** and prevent the unauthorized rocking of the beam **650**. However, the drive shaft cams **644** and **667** in rocking the beam **650** overcome the spring tension, and the angular faces **678** on the plate **668** and **680** on the detent **670** move the detent to the left as shown in Fig. 23 to permit the points of the detent and plate to slide past each other. The additional tension thereby placed on the spring **674** is sufficient to cause a snap action of the beam **650** into its new position to assure the positive disengagement of one set of gears and the positive engagement of the other set of gears. The drive shaft cams **644** and **667** each have two lobes which are diametrically opposed, and the cams are so positioned on the shaft **600** that the lobes on cam **644** are at a 90° angle with respect to the lobes on cam **667**. This arrangement prevents the blocking or binding of the shift mechanism.

Handles **682** and **684** are formed on the sensing levers **622** and **624** respectively to permit the removal of the associated ribbon supply spool from the spindle. Depressing the handle **682**, for instance, pivots the sensing lever **622** and removes its end **620** from the window **618** which permits the removal of the supply spool **586** from the spindle **584**. The action of the handle **684** and its associated parts is similar to that just described.

Operation of functions

The speed of machine operation of the invention embodied herein is greatly increased by a unique separation of the functions into two groups which are operable in different ways and at different times in the cycle of operation of the machine (see timing chart, Fig. 47). All the functions are completed by cams on the function cam shaft **414** but the various cams are effective at different periods within the cycle to complete the function selected. In addition, the operation of the machine is such that the complete cycle of operation is divided into a selecting cycle or period and a function or operating cycle or period. During the selecting period the selector is positioned to select the typebar or the function to be operated, and during the following operating period the selected character is printed or the selected function performed. The printing of the character selected therefore occurs at the end of its operating period. In this manner, the operating period and the selecting period overlap so that while one character is being printed (or a function is being performed) the selecting operation for the next character (or function) is taking place, as shown in Fig. 47.

In the separation of functions into two groups, the operation of one group of functions, namely, carriage spacing, unshift of platen, motor stop, and signal bell are completed at the end of the operating period (see Fig. 47). These functions are set up by a function selecting arm **686** (Figs. 2 and 26) located at the right end of the machine as will be explained. The other group of functions, namely, line feed, shift of platen, and carriage return are set in operation at the end of the selecting period instead of the end of the operating period. These functions are initiated by the duplicate stop levers **406**, **408** and **410** (Fig. 14) located in the selector cage **390**. This arrangement permits the mechanism for completing these three functions to operate throughout the operating period which extends the time available for the operation. The arrangement is particularly advantageous for the carriage return movement which requires more time for completion than the other functions, as the time available for such carriage return movement is almost two complete operations of the function cam shaft. During the operating period for the carriage return movement the following selection is being made, and if a character is selected next the printing of that character will not take place until the end of the operating period for the character. Therefore, since the carriage need not be in position to start a new line until the letter or character is to be printed, the carriage has the time available in its own operating period plus the time available in the operating period for the character before the printing takes place.

The function selecting arm **686** (Figs. 2, 26 and 29), mounted on a rounded extension **688** of the square shaft **416**, and the function operating cam **690**, mounted on the end of the function cam shaft **414**, cooperate to perform certain of the functions very much in the same manner as the type selecting arm **458** and printing cam **504** operate to type characters. A driving dog **692** is secured to extension **688** and causes the function selecting arm **686** to rotate with the square shaft **416** and the stop arm **405** to all thirty-two positions. The arm **686** also moves axially in and out on the extension **688** to operate function punch bars, to be described, which are mounted in cut-away portions (Figs. 26 and 27) in a supporting segment or guide block **694**. The dog **692** has bent over portion **695** at its ends to drive the arm **686** and also permit the arm to move axially. However, the function selecting arm **686** differs from the type-selecting arm **458** in that a complete axial movement does not take place in all thirty-two positions. Such movement takes place when the function selecting arm **686** is positioned in front of one of the function punch bars but is prevented when the arm is positioned opposite the supporting segment or guide block **694** which is the case when one of the type bars **516** is to be operated. Each time the cam shaft **414** makes a half revolution the cam **690** moves a cam follower **696** attached to a lever **698** the upper end of which shifts in an annular groove **700** formed in the hub of the function selecting arm **686**. It will be noted that the function cam **690**, like the print cam **504**, is an enclosed cam to reduce jar and noise. The lever **698** is pivoted on a stud **702** secured on a supporting lever **704** which in turn is pivotally secured on a stud **706** secured in a bracket **708**. An arm **710** formed integrally with the lever **704** has secured to it one end of a spring **712** which has its other end fastened to the machine frame in such a position that the arm **710** and lever **704** tend to move in a counterclockwise direction about the pivot **706** but are limited in this movement by a depending leg **714** (Fig. 29) which engages a stop pin **716** fixed on the bracket **718**.

As the function cam **690** revolves it moves the lower end of lever **698** to the right as shown in Fig. 29 and because of the pivoting action on stud **702** the function selecting arm **686** slides axially to the left on the shaft end **688**. If one of the ends of the arm **686** is positioned so as to engage the face **720** (Figs. 26 and 27) of the guide block **694** the arm **686** will be blocked from further movement but the continued movement to the right of the lower end of the lever **698** as it follows the cam **690** causes the lever **698** to pivot on its upper end in the groove **700** and thereby shift the pivot stud **702** to the right. As the stud **702** is secured in the upper end of the lever **704** this movement will cause the lever **704** to move in a clockwise direction about the pivot **706** and against the pull of spring **712** whereupon a finger **722** formed intergrally with the lever **704** will strike a projection **723** on the spacing lever **724** pivoted

on a stud **726** fixed in the mounting bracket. The spacing lever **724** will rotate in a counterclockwise direction as viewed in Fig. 29 about the pivot **726** and will move the spacing link **728** secured to a stud **730** on the lever **724** to actuate the carriage feed or spacing mechanism as the printing takes place as will be hereinafter described. Full axial movement of the function selecting arm **686** takes place only when functions are to be performed, and complete movement does not take place, causing the supporting lever **704** to move instead, when characters are printed; except for two exceptions which will be explained later.

The guide block **694** has a number of cutaway portions (Fig. 27) forming grooves **731** into which are fitted function push bars; namely "Letters" or unshift bar **732** (Fig. 30), space bar **734**, motor stop bar **736**, and signal bell bar **738**. The function push bars are fitted to slide axially in the grooves under the influence of the function selecting arm **686** as it is moved by the operating lever **698** and cam **690**. If the selecting arm **686** is positioned in front of one of the function push bars when it is moved axially to left as viewed in Fig. 29 lever **698** will continue to pivot on stud **702** and the arm **686** will enter the groove in the guide block **694** in which the selected function push bar is located and push the bar therein to the left to operate the selected function mechanism. The engagement of the arm **686** and the end of the push bar is only momentary and therefor has a punching effect. The continued movement of the cam **690** causes the lever **698** to rotate in a clockwise direction and move the arm **686** to the right, away from the guide block **694**, to its normal position to prepare it for the next selection. After being operated the punch bars are also returned to their normal position by spring means attached to the apparatus associated therewith. As a type or function selection is made for each one-half revolution of the shaft **416** the arm **686** is provided with two operative ends but only one end at a time is effective. The function push bars are coupled to operating levers as shown in Fig. 31 which shows the space push bar **734** in the groove in the guide block **694**. The bar **734** is provided with a notch in its lower edge into which fits the reduced end **740** of an operating lever **742** pivotally supported on the stud **726**. The depending portions **744**, in which the notch is made, enter into a slot **746** in the guide block **694** to prevent excessive movement in either direction of the push bar **734**. As the push bar **734** moves to the left as viewed in Fig. 31 under the impetus of the arm **686** the coupling action between the bar **734** and the lever **742** causes the lever to pivot counterclockwise whereupon its lower edge **748** strikes a lug **750** formed on the edge of the space operating lever **724**. This pivots the lever **724** in a counterclockwise direction to move link **728** to operate the carriage feed or spacing mechanism.

Unshift of platen

When the platen **520** is raised to its "Figures" position for the printing of characters in the upper case, as will be explained hereinafter, it will be held in its raised position by means of a catch **752** (Figs. 29, 30 and 34), associated with the platen shifting mechanism, which engages a latch **754** pivoted on a post **756** fixed in bracket **703**. A spring **758** fixed between the latch **754** and the guide block tends to move the latch in a counterclockwise direction engage the catch **752** and hold the platen **520** in its shifted or "Figures" position. When it is desired to print lower case characters the attendant strikes the "Ltrs" key which causes the function selecting arm **686** to punch the unshift bar **732** (Fig. 30) coupled to a U-shaped operating lever **760**, pivoted on stud **726**, having an upturned portion **762** which normally abuts the edge of the bottom portion of the latch **754** (Fig. 29). Motion imparted to the unshift push bar **732** will pivot the lever **760** in a counter-clockwise direction so that the end **762** will move latch **754** which will pivot on stud **756** against spring **758** and release catch **752** to permit the platen to unshift by its own weight and return to the letter printing position.

Unshift on space

The printer shown in the present embodiment of our invention may be adjusted to "unshift on space" which means that whenever the platen is in the "Figs" or shifted position and a space signal is received, such as at the end of a word, the platen will be returned to its normal position as an incidence of the spacing operation. This movement is obtained through a U-shaped intermediate unshift lever **764** pivoted on the stud **726** as shown in Figs. 30–33 and held in position thereon by a pin or cotter **766**. Lugs **768** and **770** are provided near the top of the lever **764** and extend at a right angle thereto in the direction of the upright portion of lever **742**. The lug **768** is slightly longer than lug **770** so that when the lever **764** is positioned on the pivot **726** as shown in Figs. 30 and 32 the lug **768** will pass beyond the unshift operating lever **760** sufficiently to pass beyond the space lever **742** while the lug **770** will extend only beyond the lever **760**. Thus, when the space push bar **734** is actuated by arm **686** in response to a spacing signal the space operating lever **742** will be pivoted and will strike the lug **768** which will rock intermediate lever **764** and cause lug **770** to engage the front edge of lever **760** and impart sufficient pivotal movement for the end **762** thereof to move latch **754** and release it from the catch **752** to permit the platen to restore to the letter printing or unshifted position.

The operation of the machine may be varied, so that it will unshift only when the unshift signal is received, by removing the pin **766** and moving the intermediate unshift lever **764** to the position shown in Fig. 33 and replacing the pin. In this position lug **768** does not extend behind the space operating lever **742** and therefore will not be hit or moved when the space lever **742** is operated. Since lug **768** is not moved, the intermediate lever **764** integral therewith will not move and consequently the latch **754** will not be released from the catch **752**.

Signal bell

It has become customary in the art of telegraph printing to summon the operator of a machine by signalling on a bell. Such a bell **772** (Fig. 2) is suitably fixed to the frame of the machine so that the punching by arm **686** of the signal bell push bar **738** (Fig. 30) will pivot the lever **774** (Fig. 2) and cause a clapper (not shown) secured to clapper rod **776** to strike the signal bell **772**.

Motor stop

The motor stop push bar **736** (Fig. 30) is linked to an electrical switch (not shown) which controls the electrical circuit for operating the motor **108**. Whenever the motor stop push bar **736** is punched by the selecting arm **686** an associated linkage (not shown) will cause the electrical switch to open its contacts and interrupt the energizing circuit for the motor **108** in a manner well-known in the art.

Function blocking ring

As mentioned above, the function selecting arm **686** does not complete its full axial movement when characters are printed except in two instances. The axial movement of the function selecting arm **686** is governed by the construction of the guide block **694** and a function blocking ring **778** (Figs. 26, 28, and 29) associated therewith. The face **720** of the guide block **694** is cut away in two areas but is left high for the most part. When the function selecting arm **686** is turned to a position in front of any high portions it cannot be moved axially. All the function push bars are mounted in the grooves **731** (Fig. 27) located in the cut-away portions where axial movement for operating them is possible. With two exceptions (the letters H and S) the areas which are not cut-away correspond to the position to which the function selecting arm

is turned when printed characters are selected. The letters H and S print only in the letter shift position of the platen **520**. In the figure shift position of the platen **520** their position under the function selecting arm **686** is used for operating the motor-stop and signal bell push bars. These two push bars must therefore be operable in the figures shift position of the platen **520** and inoperable in the letter-shift position. This is accomplished by means of the blocking ring **778** which slides in an annular channel formed by a groove **779** (Fig. 27) in the guide block **694** and a bottom plate **780** (Fig. 26) suitably secured to the guide block. The blocking ring **778** has three cut-away portions **782** (Figs. 28 and 34) located in such a way that in the letters-shift position the motor stop push bar **736** and signal bell push bar **738** are blocked, and in the figures-shift position the cut-away portions **782** in the ring **778** cooperate with the cut-away portions in the guide block **694** to permit the push bars **736** and **738** to move. All the other function push bars will operate regardless of the position of the blocking ring. The position of the blocking ring **778** is controlled by the platen **520** as shown in Figs. 34 and 35 of the drawings. The platen **520** is rotatably supported by axle **784** journalled in the arm **786** which in turn is pivoted at **788** in the side member **789** (Figs. 1 and 2). A lever **790** is secured to the arm **786** and is provided with a toe extension **792** which fits in a notch **794** formed in the annular blocking ring **778** so arranged that when the platen **520** is raised to the figure-shift position, as shown in dotted lines in Fig. 34, the lever **790** pivots on **788** and through the toe **792** and notch **794** turns the blocking ring **778** in a counterclockwise direction to present an opening **782** to the push bars **736** and **738**. The platen **520** is held in its shifted position by the latch **754**, and the blocking ring **778** is also held in its shifted position. When the unshift lever **762** is operated the latch **754** releases catch **752** and the platen **520** drops to the "Letters" or unshift position thereby shifting the ring **778** so that the closed portion of the ring is presented to the push bars **736** and **738**.

It is to be understood that when the function selecting arm **686** is positioned to operate the unshift push bar **732** or the space push bar **734** the type selecting spider **458** is positioned opposite an open space and no type bar is operated. However, in the case of the functions (motor stop and signal bell) which are ineffective when the platen is in the letters-shift position, the type selecting spider **458** will operate the selected type bar. The type-bars for the letters H and S which correspond to the positions of the punch bars **736** and **738** may be fitted with special type pallets to print a symbol which will indicate the function operated or the upper case character on the pallet may be omitted.

Stop lever controlled functions

Three functions are not operated by the function selecting arm **686**; namely, line feed, carriage return and figures shift. As mentioned above in the description of the selector mechanism, duplicate stop bars **406**, **408**, and **410** respectively operate these functions in response to the corresponding signals. These stop bars operate in conjunction with various levers and special cams on the function shaft **414** to perform the required functions as will be hereinafter explained. These functions are initiated at the end of the selecting period of the machine rather than at the end of the operating period to increase the time available for the function mechanism to complete its operation.

Figure-shift

The platen **520** is shifted or raised in position to print figures and the upper-case characters in response to the reception by the selector of the "Figures" signal. The mechanism principally utilized to perform this function is shown in Figs. 14, 35 and 37. The platen **520** is rotatably supported by the shaft **784** which is journalled in the arms **786** and **796** of the platen carrying frame **798** which is pivotally supported by pivot **783** journalled in side frame **789** (Fig. 2) and pivot **800** journalled in side frame **802** (Fig. 1). Associated with the platen **520** are paper pressure rollers **804** carried on a shaft **806** and a paper chute **808** with paper guide fingers **810** which serve to hold and align the paper upon which the record is to be typed.

The mechanism which shifts the platen **520** to its figure printing position is set into operation by the movement of the stop bar **410** into the aligned notches of code segments **386** (Fig. 14) in response to the reception of the "Figs." signal. The stop bar **410** pivots on rear guide plate **394** of stop cage **390** and disengages its end from a latch **812** (Figs. 35 and 37) of the sensing lever **814** which is freely mounted on the rounded portion of shaft **416**. A spring **818**, placed between an ear on a bracket **820** and the lever **814**, urges the lever **814** in a clockwise direction as viewed in Fig. 37. As the camshaft **414** has partially rotated at this time, a cam follower **822** on lever **814** will engage the low part of a cam **824** on the shaft **414**. This movement lowers a finger **826** on lever **814** which hits the slanted faces of a pair of angular ears **828** on a link **830** which is moved to the right (see Fig. 14) so that a cam follower **832** at the lower end of the link **830** is moved under a cam **834** fixed to cam shaft **414**. As the function cam shaft **414** continues to rotate the cam **834** presents its high portion to the cam follower **832** and forces the link **830** downwardly (see Fig. 37). The link **830** is coupled at its upper end to one leg of a bell crank **836** which is pivoted on a stud **838** secured to a bracket **820** which is secured by means of screws **840** to the frame of the printer. The lower end of link **830** is offset and U-shaped to permit the above action to take place. The upstanding arm **842** of the bell crank **836** is coupled to a link **844** which is secured at **846** to an extension **847** on arm **796** of the platen carrying frame. As the cam **834** moves the link **830** downwardly the bell crank **836** rocks to pull link **844** which pivots platen **520** on pivots **788** and **800** and raises it to the figures printing position. It is held in the shifted position by the action of catch **752** and **754**. After the lobe of cam **834** has passed, the low point of the cam **834** permits the link **830**, bell crank **836** and link **844** to return (by spring action) to the starting position. Almost at the same time, the lobe of restoring cam **824** raises the sensing lever **814** to permit the stop bar **410** to again engage the latch **812** as soon as another stop bar is selected as the result of the next signal. As the lever **814** is raised the pull of a spring **848** moves **830** to the left as viewed in Fig. 14 to remove the cam follower **832** from the path of the operating cam **834**.

Line feed

The platen **520** may be turned to feed the paper one line space as the result of the reception of the line feed signal. The platen **520** may be held in a given position or turned one line space at a time by a detent wheel **849** (Figs. 1 and 36) rigidly attached to the platen **520**. To keep the platen **520** from turning during the printing the detent wheel **849** is held by a detent **850**. When line feeding, the wheel **849** is turned one tooth space by a pawl **851** fastened to a lever **852** which pivots about the platen shaft **784**. Moving the upper end of lever **852** to the left as viewed in Fig. 36 causes the pawl **851** to engage and turn the detent wheel **849** with sufficient force to overcome the grip of the detent **850**, which then catches the next tooth on the wheel to hold the platen **520** in the advanced position. The lever **852** is linked by a link **854** to a bell crank **856** which is coupled to a link **858** similar in conformation to the link **830**.

In response to a line feed signal the stop bar **406** will pivot on rear guide plate **394** (Fig. 14) to disengage its end from a latch **859** (Fig. 36) of the sensing lever **860**, freely mounted on shaft **416**. The operation

of lever 860 and link 858 is similar to the operation of sensing lever 814 and link 830 of the platen shift mechanism just described. Thus, when stop bar 406 is moved from beneath latch 859 the cam follower 861 on lever 814 will drop off the point of cam 862 fixed to function cam shaft 414 as the latter rotates. As lever 860 pivots it will strike a pair of angular ears 863 on lever 858, moving the lever to the left as viewed in Fig. 14 so that cam follower 864 at the lower end of the lever will be moved under the cam 865 fixed to cam shaft 414.

As the cam 865 rotates the link 858 will be forced downwardly to rock the bell crank 856 and cause the pawl 851 to advance the platen and paper one line space. The spring 848 is connected between the links 830 and 858 to return them to their normal positions. A spacer 866 (Fig. 14) fitted on a stud 867 in the member 222 prevents the links 830 and 858 from binding the sensing levers 814 and 860. A knob 868 (Fig. 1) is secured to the end of the shaft 784 for manually advancing the paper one line space.

Power carriage feed

The typebar carriage 464 is moved automatically one letter space to the right each time a character is printed. The movement is controlled, as already described, by the function selecting arm 686 and the spacing lever 724 (Fig. 29) which pull the link 728 to set the power drive, for advancing the carriage, into operation. The typebar carriage 464, which slides along the square shaft 416 and rolls on rail 466, is provided with a rack 870 (Figs. 1 and 2) which meshes with a driving gear 872 driven by a gear 874 (Fig. 38), and a clutch 876 having a hub 878. A jaw clutch 880 rotatably connects the hub 878 to a shaft 882 on which it is slidably supported and which is connected by means of a friction clutch shown generally at 884 and a gear 886 to a worm 888 fixed on the constantly rotating power shaft 104. The shaft 882 is suitably journalled in the frame at 887 and 889.

A ratchet wheel 890 (Figs. 38 and 40) fixed on the shaft 882 is in engagement with a pawl 892 pivoted on stud 894 secured in the machine frame. The pawl 892 is fastened to and controlled by the spacing or carriage feed link 728 which is pulled by the operation of the spacing lever 724 to release the pawl 892 from the ratchet 890. The release of the ratchet 890 permits the friction clutch 884 to take hold and, through the normally engaged clutches 880 and 876, drive the gears 874 and 872 and rack 870 to move the carriage one space to the right. The carriage can move only one space each time the feed mechanism is operated because the length of time during which the pawl 892 is disengaged from the ratchet 890, controlled as it is by the function cam 690, is too short to allow more than one tooth of the ratchet 890 to be indexed.

Power carriage return

The typebar carriage can be returned to the left-hand margin from any point in its travel by the operation of the carriage return key in the keyboard. The carriage 464 is moved to the left as viewed in Fig. 1 by reversing the direction of rotation of the large carriage rack driving gear 872. This is accomplished by uncoupling the carriage feed clutch 876 from the driving gear 874 and engaging the carriage return clutch 893 as shown in Fig. 38. Power from the main shaft 104 is transmitted through gears 896 and 898, shaft 895 suitably journalled in the frame, clutch 893, friction clutch 900, driving gear 902, driven gear 904, shaft 906 journalled in the frame, and gear 872 to the carriage rack 870. The carriage feed clutch 876 is uncoupled to permit the small driving gear 874 to idle while the large carriage rack driving gear 872 rotates in reverse. Clutch 876 and clutch 893 are operated simultaneously, one disengaged, the other engaged, by pulling a link 908 (Figs. 38, 39 and 42) attached to the carriage return operating lever 910 which turns vertical shaft 912, to which it is rigidly attached, and clutch lever 914 on the lower end of shaft 912, to engage clutch 893. The other end of lever 914 hits an end of the carriage feed clutch lever 916 causing it to rotate on post 918 and move arm 920 which has its end pivotally held in an annular portion 922 of the hub 878. The lever 916 turns clockwise as viewed in Fig. 38 and disengages the clutch 876 from gear 874.

The pulling of the carriage return link 908 is accomplished by the mechanism shown in Fig. 39 when the carriage return signal is received by the selecting mechanism and the stop bar 408 is operated. When the end of bar 408 is removed from the path of finger 924 of a sensing lever 926, freely mounted on the round portion of shaft 416, the spring 928 fastened between the bracket 820 and lever 926 urges the lever 926 to rotate in a clockwise direction and lift link 930 fastened to lever 926. In raising, link 930 rocks a bell crank 931 and pulls the link 908 which is also fastened to the bell crank to operate the clutches as above explained. The cam 932, mounted on the function shaft 414, turns one-half revolution every time any stop lever is operated as the result of the transfer operation and this permits a cam follower 934 integral with the sensing lever 926 to drop off the high portion of the cam so that the sensing lever is free to turn about the rounded portion of shaft 416. Before the cam 932 completes its half revolution the cam follower 934 again rides up on a high portion of the cam to restore the sensing lever 926 to its initial position, ready to be held there by the stop bar 408 as soon as the bar 408 moves back as a result of another signal. The slot 936 (Fig. 38) by which the carriage return operating link 908 is attached to the operating lever 910 is elongated to allow the link 908 to move back to its unoperated position when the sensing lever 926 is restored, even though the carriage return operating lever is still latched by a latch 938.

Both clutches are held in the position shown in Fig. 38 throughout the carriage return movement, by the holding action of latch 938 against the carriage return operating lever 910. The latch 938 is pivoted on a stud 940 and its downturned end normally rests against the end 942 of lever 910 which is notched in such a manner that when the lever 910 turns to operate the clutches the spring 944 will pull the end of the latch 938 into the notch in end 942 to retain the clutches in position. When the carriage reaches the end of its travel the latch 938 is disengaged from the notch by a tripping arm 946 secured on the gear 904. Arm 946 hits an extension 948 of latch 938 which pivots the latch on post 940 against the pull of spring 944 and away from the end 942. This permits the spring 950, fastened between the frame and lever 916, to return the levers and clutches to the carriage feeding or spacing position with the clutch 876 engaged and clutch 893 disengaged.

If, for any reason, the carriage return clutch 893 fails to disengage when the carriage drive clutch 876 engages, the friction clutch 900 will slip and permit the gear 902 to turn with the carriage rack gear 872 as it rotates to feed the type carriage. A rubber spring 952 is located behind friction clutch 900 and may be adjusted by positioning the collar 954 on the clutch sleeve 955 (Fig. 43), with which the collar has screw threaded engagement, to adjust the pressure on the friction clutch disc 900. The sleeve 955 is supported on the shaft 895 and in turn supports the driven elements of the clutch 893 and the gear 902. The clutch 900 acts as a safety clutch and also absorbs the initial starting shock when the clutch 893 is engaged to return the carriage to its position at the start of a new line.

Carriage deceleration

A decelerating cam 956 (Fig. 41) is provided to slow down the return movement of the carriage as it approaches its starting position in order to reduce shock and prevent damage. The decelerating cam 956 is mounted on the carriage return driving gear 902 and is

engaged by a follower **958** attached to the carriage return driven gear **904**. The follower **958** enters the curved cam slot **960** only when the gears **902** and **904** have moved the carriage to within a short distance of its starting position. The teeth on the carriage return driven gear **904** are cut away on that portion **962** of the gear **904** which would be in mesh when the follower **958** and the cam **956** are engaged, so that the driving action is transferred from the meshing gear teeth to the cam and follower. In effect, the cam and follower act as a pair of large mating teeth. They continue the driving action between the gears **902** and **904** but as the follower **958** moves further into the cam slot **960**, the turning ratio between the two gears becomes smaller and smaller. That is, the driven gear **904** turns through a smaller and smaller angle for the same angular movement of the driving gear **902**. This action slows down or decelerates the carriage and brings it to a stop without shock or damage.

Manual control of carriage return

A mechanism is also provided for manually initiating the operation of the carriage return means. A control button (not shown) is secured on the end of the link **964** (Fig. 38) which protrudes beyond the end of the machine. The link **964** is secured to a lever **966** pivoted on a fixed post at **968**. When the control button is pushed the link **964** will move to the left and pivot the lever **966** on the pivot **968**. A trip pawl **970** pivoted on the lever **965** is carried to the left into engagement with the lever **910** which pivots in a counter-clockwise direction to engage clutch **893** and disengage clutch **876**. The carriage is thereupon returned to its starting position as previously described. As the trip pawl **970** was moved to the left its rearwardly extending arm **974** engaged an adjustable stop **976** whereupon the pawl **970** pivoted in a clockwise direction about the post **972** and the end of pawl **970** slipped past the end of the lever **910**. This assures the disengagement of the clutch **893** should be carriage return to its starting position and the latch **938** be released before the link **964** is released by the operator. When the operator releases the control button on the link **964** the link and levers **966** and **970** will be returned to their normal positions by the spring **978**.

End of line indicator

An end-of-line indicator or margin bell **980** (Fig. 1) is secured to the frame in any suitable manner and is provided to ring automatically to warn the sending operator that the end of the line is about to be reached. The bell **980** is operated by the tripping arm **982** (Fig. 41) attached to the large carriage rack driving gear **872** when the carriage approaches the right end of the line. As the gear **872** turns clockwise to advance the carriage the tripping-arm **982** first raises a pawl **984**, secured on a clapper lever **986** pivoted on fixed post **988**, which causes a clapper **990** to move downwardly. Further turning of the gear **872** causes the arm **982** to slip past the pawl **984** so that the clapper **990** snaps back swiftly under the influence of a spring (not shown) and strikes the margin bell **980** a resounding blow. The tripping arm **982** is so positioned on the gear **872** that the clapper **990** will strike the bell **980** on the sixty-fifth carriage spacing operation in the line. This warns the operator that only seven more carriage spacing movements may be made on that particular line. The pawl **984** is pivoted on the clapper arm **986** on post **992** and is held in its upward position by a spring **994** which permits the pawl **984** to pivot in a clockwise direction to permit the arm **982** to move past the pawl **984** when the gear **872** moves in a counterclockwise direction to return the carriage to its starting position at the left end of the line.

Change gear arrangement

As is well known to those skilled in the art of telegraph printing, the speed of the commercial printers in the United States has been 368.1 operations per minute (approximately 60 words per minute) while the British printers are operated at 404 O. P. M. or approximately 66 words per minute. The new standard operating speed of printers used by the Armed Forces of the United States is to be 600 O. P. M. which is about 100 words per minute. It is desirable and advantageous that one machine be capable of operating at any of the three speeds, but when synchronous motors are used for driving the printers their speed cannot be varied for the different printer operating speeds desired. To overcome this problem the printer of the invention has been adapted for use in systems operating at any of the above speeds. A very simple gear change can be made to obtain the desired speed and this change may be made without disturbing the gear shaft centers or the motor speed. Shown in Figure 46 of the drawings is a schematic of the change gear arrangement. The main power shaft **104** is in fixed relation, through the various clutches and gears, to the different operating elements of the machine. The motor **108** drives its shaft **109** at a constant speed under the control of the motor governor. The driving worm **107** is affixed to the motor shaft **109** and in mesh with worm gear **106** secured to the power shaft **104** which lies in a plane at right angles to the motor shaft **109**. The gears **106** and **107** will operate the printer at a speed of 60 words per minute. The dotted lines **111** and **113** schematically represent the center position of the motor shaft **109** and power shaft **104**. Also shown are gears **106*a*** and **107*a*** which can be substituted for gears **106** and **107** to give a speed of 66 words per minute and gears **106*b*** and **107*b*** to produce 100 words per minute. The number of threads on the worm **107*b*** are increased over the worm **107*a*** to increase the speed of operation without reducing the gear **106*b*** to an impractical size. The several sets of gears are so proportioned and designed that they will fit upon the shafts **104** and **109** to give the desired speed without disturbing the said shafts **104** and **109**, thereby providing a novel means to enable operation of the printer at any of the standard speeds currently employed.

Instrument panel

The control panel **240** (Fig. 1) is located just above the keyboard on the front of the machine. On this panel are conveniently concentrated the controls which are used for adjusting the machine for ordinary operation. These controls include the adjusting knob **242** and scale **244** which are used to adjust the tension on the armature **224** of the selector magnet **220**; the control knob **334** and scale **336** which regulate the range finding mechanism; the line rheostat control knob **996** which regulates the current flow in the line circuit as indicated on the milliameter **997**; and a switch **998** for controlling a copy light which is not shown. In addition to the above control and indicating devices the panel **240** contains holders **999** for fuses for the line circuit and the motor circuit.

The invention herein disclosed may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoinng description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A printing telegraph transmitting-receiving machine comprising a keyboard transmitter including key levers and adapted to transmit permutated groups of electrical impulses corresponding to the key levers actuated, a selector mechanism to receive and convert permutated groups of electrical impulses into mechanical movement

electrically connected to receive impulses from said keyboard transmitter, recording means including a movable typebar carriage having a relatively stationary slotted segment and a group of typebars pivotally mounted thereon for printing characters at a point fixed relative to said carriage and common to all said typebars, means carried by said movable carriage and controlled by the mechanical movement of said selector mechanism to select a particular one of said typebars corresponding to a received group of electrical impulses, a plurality of function operating means, means controlled by the mechanical movement of said selector mechanism to select a particular function operating means corresponding to a received group of electrical impulses, means to actuate said selected typebar and said selected function operating means, whereby groups of electrical impulses sent out by said keyboard transmitter may be received by the selector mechanism of the sending machine and of other more distant machines to effect the printing of a character or operation of a function of the machines, and a mechanical drive train operative from a common power source for enabling the several mechanical components of said transmitting-receiving machine.

2. A printing telegraph transmitting-receiving machine comprising a keyboard transmitter including key levers and a rotating member and adapted to transmit permutated groups of electrical impulses corresponding to the key levers actuated, a selector mechanism including a rotatable member to receive and convert permutated groups of electrical impulses whereby electrical signals from said keyboard transmitter and from other more distant transmitters may be received and converted into mechanical movement, recording means including a movable type bar carriage having a relatively stationary slotted segment and a group of type bars pivotally mounted thereon for printing characters at a point fixed relative to said carriage and common to all said type bars, means carried by said movable carriage and controlled by the mechanical movement of said selector mechanism to select a particular one of said type bars corresponding to a received group of electrical impulses, a plurality of function operating means, means controlled by the mechanical movement of said selector mechanism to select a particular function operating means corresponding to a received group of electrical impulses, means to actuate said selected type bar and said selected function operating means, whereby groups of electrical impulses sent out by said keyboard transmitter may be received by the selector mechanism of the sending machine and of other more distant machines to effect the printing of a character or operation of a function of the machines, a mechanical drive train operative from a common power source for enabling the several mechanical components of said transmitting receiving machine, said transmitter and selector mechanisms each including means associated with the respective said rotating members, whereby one complete revolution of the rotating members comprises an operating cycle of the machine said operating cycle of the machine comprising a selecting period followed by an operating period, and the next succeeding selecting period occurs during the operating period for the preceding selecting period, whereby the periods overlap and at least two selections and operations may take place in a given operating cycle of the machine.

3. A printing telegraph machine as defined in claim 1, wherein the operating cycle of the machine comprises a selecting period followed by an operating period, and the next succeeding selecting period occurs during the operating period for the preceding selecting period, whereby the periods overlap and at least two selections and operations may take place in any given operating cycle of the machine, and wherein said means to actuate a selected function operating means include a function selecting arm and selector mechanism stop levers, and said function operating means actuated by said function selecting arm are actuated within said operating period and actuation of said function operating means actuated by said stop levers is initiated during said operating cycle prior to actuation of said function operating means actuated by said function selecting arm.

4. A printing telegraph machine as defined in claim 3, wherein said function operating means actuated by said stop levers include a carriage return mechanism for said movable typebar carriage, and means are provided for extending the time element between the actuation of the carriage return movement at the end of a selecting period and the printing of a succeeding character beyond the time of a single operating period so that said movable typebar carriage may always be returned to start position before said succeeding character is printed.

5. A printing telegraph machine as defined in claim 1, wherein: said keyboard transmitter and said selector mechanism each include in their component parts, squared pivoted shoes and selector levers notched at one end to receive said squared shoes, said levers and shoes being identical and interchangeable; said levers in said keyboard transmitter together with other components of said keyboard transmitter being operative to convert mechanical movement to electrical impulses; and the levers in said selector mechanism, functioning in a manner distinct from that of the keyboard transmitter levers, together with other components of said selector mechanism being operative to convert electrical impulses to mechanical movement.

6. A printing telegraph machine as defined in claim 1, including a front panel adjacent the keyboard transmitter and machine operating controls which comprise at least one control selected from the group consisting of a selector magnet armature tension control, a range finding mechanism control, and a line current control, and manually adjustable actuators for the operating controls, all manually adjustable actuators being located on said front panel.

7. A printing telegraph machine comprising a transmitter adapted to transmit permutated groups of electrical impulses; a selector mechanism adapted to receive and convert the permutated groups of electrical impulses into mechanical movement; recording means controlled by the mechanical movement of said selector mechanism to record characters in accordance with the received groups of impulses; and means for operating the machine in timed relation to received signal combinations including a constant speed motor, a motor drive shaft, a constantly rotating main power shaft geared to said motor shaft and driven thereby in timed relation to machine operations, the axes of said two shafts being fixed relative to each other and mechanism to change the speed relation between said constant speed motor and said power shaft while said shaft axes remain in fixed relation to each other to enable the power shaft to operate at a plurality of different and distinct predetermined printing telegraph operating speeds.

8. A printing telegraph machine as defined in claim 7, wherein said mechanism to change speed relation comprises a plurality of interchangeable gear sets of different speed ratios, whereby the gear connections between said motor shaft and said power shaft may be changed to change the speed ratio with no relative change in the gear center positions of said shafts.

9. A printing telegraph machine comprising a selector mechanism to receive and convert permutated groups of electrical impulses into mechanical movement, said selector mechanism including a plurality of coded permutation members, recording means including a typebar carriage movable relative to said selector mechanism, a rotatable typebar selecting finger carried by said movable carriage, a rotatable shaft, means operatively cooperating with the coded permutation members and said shaft to selectively position said shaft in accord with the positions of said coded permutation members, a drive gear

connection between said finger and said shaft to position said finger for selection of a typebar, and means to maintain said drive gear connection in fixed relation throughout the movement of said carriage.

10. A printing telegraph machine as defined in claim 9 wherein support means coact with said drive gear connection to support the rear of said movable carriage.

11. In a printing telegraph machine, a selector mechanism to receive and convert permutated groups of electrical impulses into mechanical movement including a code bar stop cage, a rotatable shaft selectively positioned by said selector mechanism, a first group of function operating means coacting with said stop cage to actuate certain of the machine functions, and a second group of function operating means coacting with said rotatable shaft to actuate others of the machine functions.

12. A printing telegraph machine as defined in claim 11, wherein said function operating means coacting with said stop cage are actuated earlier in the machine cycle of operation than said function operating means coacting with said rotatable shaft.

13. In a printing telegraph machine adapted to transmit and receive coded groups of electric signals: a constant speed motor; a motor drive shaft; a main power shaft to be drive connected to said motor shaft and constantly driven thereby in timed relation to machine operations, the axes of said two shafts being fixed relative to each other; and means, including driving gears adapted to be selectively individually fastened on said motor shaft and mating driven gears for each driving gear adapted to be selectively individually fastened on said main power shaft whereby the individual driven gear will be in meshed engagement with its mating driving gear, said mating gears constituting sets of gears providing various speed ratios betwen the motor shaft and the main power shaft, to change the speed relation between said motor and said power shaft to enable the power shaft to be operated at a plurality of different and distinct predetermined printing telegraph operating speeds.

14. A printing telegraph machine as defined in claim 13 wherein said two shafts are disposed at right angles to each other on non-intersecting axes and one gear of each set is a worm gear and the other gear is a worm wheel, the threads of said worm gears and the teeth of said worm wheels of each set being so disposed relative to their direction of rotation and structurally formed for interengagement to maintain said gear and wheel on their respective shafts by their operative intermeshing engagement.

15. In a printing telegraph machine, a selector mechanism to receive and convert permutated groups of electrical signals into mechanical movement, said selector mechanism including a plurality of coded permutation members, a rotatable shaft, means operatively cooperating with the coded permutation members and said shaft to selectively position said shaft in accord with the positions of said coded permutation members, a carriage support bar, a typebar carriage supported for reciprocable movement relative to the selector mechanism on said rotatable shaft and said support bar, and typebar selecting means on said carriage positioned by said rotatable shaft to select a typebar in accordance with signals received as said carriage reciprocates on said shaft and bar.

16. A printing telegraph machine as defined in claim 15, wherein said carriage is supported on said rotatable shaft by means of a support member on said carriage coacting with a bearing member slidable on said shaft.

17. A printing telegraph machine as defined in claim 16, wherein said bearing member is geared to said typebar selecting means.

18. In a printing telegraph machine for transmitting and receiving coded electrical signals and recording the signals transmitted and received, a transmitter adapted to convert mechanical movement into electrical signals, a selector mechanism adapted to convert received electrical signals whereby electrical signals from said transmitter and from remote transmitters may be converted into mechanical movement, recording means including a movable carriage, means carried by said carriage and controlled by said selector mechanism to record characters in accordance with the received signals, and means connectable to a common power source for normally moving said carriage one character space for each recording operation and for returning it to its starting position.

19. A printing telegraph machine as defined in claim 18, wherein said connectable means includes a carriage return drive train having interposed therein a pair of coactive leverage elements so shaped and interconnected as to transfer a decreasing amount of carriage driving power to decelerate the movement of said carriage in its approach to starting position.

20. In a printing telegraph machine, a stationary selector mechanism adapted to receive and convert permutated groups of electrical signals into mechanical movement, said selector mechanism including a plurality of coded permutation members, a rotatable shaft, means operatively cooperating with the coded permutation members and said shaft to selectively position said shaft in accord with the positions of said coded permutation members, a carriage support bar, recording means including a stationary page supporting platen and a typebar carriage supported for reciprocable movement relative to the selector mechanism on said support bar and said rotatable shaft, means on said carriage coacting with said rotatable shaft to select a particular typebar corresponding to a received group of signals, and means to actuate the selected typebar to print a character on the page of said platen.

21. A printing telegraph machine as defined in claim 20, wherein said recording means includes a ribbon feeding and reversing device mounted on said carriage and comprising means operable as an incidence of the movement of said carriage to cause ribbon feeding, and automatic means operable as an incidence of said ribbon feeding to cause ribbon reversing.

22. In a printing telegraph machine, a function shaft having typebar and function operating means thereon; a rotatable function selecting finger operatively coupled to said function operating means; a rotatable typebar selecting finger operatively connected to said typebar operating means; said typebar and function operating means include levers, connected with said fingers and having cam followers, and enclosed cams engaging said cam followers to positively move and return said function selecting finger and said typebar selecting finger to their normal positions during operation; a motor driven main power shaft; means to intermittently drive said function shaft from said power shaft including clutch means on said function shaft; and flexible coupling means coacting between said clutch means and said function shaft to reduce jar of impact and machine noise when said clutch means is engaged to cause said function shaft to be driven by said power shaft and thereby actuate said typebar and function operating means.

23. In a printing telegraph machine, a function shaft having typebar and function operating means thereon, a motor driven main power shaft, means to intermittently drive said function shaft from said power shaft including clutch means on said function shaft, and flexible coupling means coacting between said clutch means and said function shaft to release jar of impact and machine noise when said clutch means is engaged to cause said function shaft to be driven by said power shaft and thereby actuate said typebar and function operating means, an electrical code receiving means, a selector mechanism having transfer means adapted to coact with said code receiving means to transfer a code setting to the selector mechanism, and means coacting with said transfer means to operate said clutch means.

24. In a printing telegraph: a stationary selector mech-

anism adapted to receive and convert permutated groups of electrical signals into mechanical movement; a rotatable shaft selectively positioned by said selector mechanism; a carriage support bar; recording means including a stationary page supporting platen, a typebar carriage supported for reciprocable movement on said support bar and rotatable shaft, and a ribbon feeding and reversing device mounted on said carriage and comprising means operable as an incidence of the movement of said carriage to cause ribbon feeding, and automatic means operable as an incidence of said ribbon feeding to cause ribbon reversing; means on said carriage coacting with said rotatable shaft to select a particular typebar corresponding to a received group of signals; and means to actuate the selected typebar to print a character on the page of said platen.

25. In a printing telegraph machine, a selector mechanism to receive and convert permutated groups of electrical impulses into mechanical movement, means positioned in accord with the mechanical condition of said selector mechanism, a first group of function operating means coacting with said positioned means to actuate certain of the machine functions, and a second group of function operating means structurally independent of said positioned means coacting with said selector mechanism to actuate others of the machine functions.

26. In a printing telegraph machine, a selector mechanism including a plurality of permutatively settable members to receive and selectively convert permutated groups of electrical impulses into mechanical movements of said members, an element selectively positioned by said selector mechanism in accordance with the settings of said members, a first group of function operating means separate from said selector mechanism and structurally coacting with said element to actuate certain of the machine functions, and a second group of function operating means coacting with said selector mechanism in certain settings of the members thereof to actuate others of the machine functions, and a second group of function operating means coacting with said element to actuate others of the machine functions.

27. A printing telegraph machine as defined in claim 11, wherein one of said function operating means coacting with said stop cage actuates the carriage return function and one of said function operating means coacting with said rotatable shaft actuates the character printing function whereby said carriage return function is actuated immediately at the end of a receipt of a group of coded electrical impulses corresponding to a carriage return signal and the carriage return occurs during the entire next selecting period and during that portion of the next succeeding selecting period ahead of a character printing actuation.

28. In a printing telegraph machine, a selector mechanism including a plurality of permutatively settable members to receive and convert permutative groups of electrical impulses to mechanical movement including a code bar stop cage, a plurality of bars retained in said cage and coacting with said settable members whereby one of said stop bars is displaced corresponding to each permutative setting of said settable members, means including a rotatable shaft selectively positioned by coaction with certain of said displaced stop bars, a first group of function operating means coacting with other of said displaced stop bars to actuate certain of the machine functions, and a second group of function operating means coacting with said rotatable shaft to actuate others of the machine functions.

29. In a printing telegraph machine as defined in claim 28 wherein the majority of said plurality of said stop bars are utilized to coact with said first group of function operating means for actuation of certain of the machine functions.

30. A printing telegraph transmitting receiving machine comprising: a keyboard transmitter including key levers and adapted to transmit permutated groups of electrical impulses corresponding to the key levers actuated; a selector mechanism to receive and convert permutative groups of electrical impulses into mechanical movement; recording means including a movable type bar carriage having a relatively stationary slotted segment and a group of type bars pivotally mounted thereon for printing characters at a point fixed relative to said carriage and common to all said type bars; means carried by said movable carriage and controlled by the mechanical movement of said selector mechanism to select a particular one of said type bars corresponding to a received group of electrical impulses; a plurality of function operating means; means controlled by the mechanical movement of said selector mechanism to select a particular function operating means corresponding to a received group of electrical impulses; means to actuate said selective type bar and said selected function operating means whereby groups of electrical impulses sent out by said keyboard transmitter may be received by the selector mechanism of the sending machine and of other more distant machines to effect the printing of a character or operation of a function of the machine; a mechanical drive train operative from a common power source for enabling the several mechanical components of said transmitting receiving machine; the operating cycle of the machine comprising a selecting period followed by an operating period, and the next succeeding selecting period occurring during the operating period for the preceding selecting period, whereby the periods overlap and at least two selections and operations may take place in a given operating cycle of the machine; said means to actuate a selected function actuating means including a function selecting arm and selector mechanism stop levers, said function actuating means actuated by said function selecting arm being actuated within the succeeding operating period and actuation of said function operating means actuated by said stop levers being initiated during said operation cycle prior to actuation of said function operating means actuated by said function selecting arm; and said function operating means actuated by said stop levers including a carriage return mechanism for said movable type bar carriage; and said selecting and operating periods being so arranged whereby actuation of said carriage return function occurs immediately following a carriage return selection and the carriage return operation overlaps the entire next succeeding selecting unit and that portion of the second succeeding selecting period which elapses before a character printing actuation occurs which had been selected during the said next succeeding selecting period.

31. A printing telegraph receiver comprising a selector mechanism, including stop levers, to receive and convert permutated groups of electrical impulses to mechanical movement, recording means including a movable type bar carriage having a relatively stationary slotted segment and a group of type bars pivotally mounted thereon for printing characters at a point fixed relative to said carriage and common to all said type bars, means carried by said movable carriage and controlled by the mechanical movement of said selector mechanism to select a particular one of said type bars corresponding to a received group of electrical impulses, a plurality of function operating means, means controlled by the mechanical movement of said selector mechanism to select a particular function operating means corresponding to a received group of electrical impulses, means to actuate said selected type bar and said selected function operating means, whereby the operating cycle of the machine comprises a first selecting period followed by an operating period, and the next succeeding selecting period occurs during the operating period for the preceding selecting period and wherein the selection and operations overlap and at least two selections and operations may take place in any given operating cycle of the machine,

and wherein said means to actuate a selected function operating means includes a function selecting arm and said selector mechanism stop levers, and one group of said function operating means are actuated by said function selecting arm within said operating period and actuation of a second group of said function operating means is initiated by said stop levers independently of said function selecting arm during said operating cycle prior to actuation of said one group of function operating means actuated by said function selecting arm.

32. In a printing telegraph machine adaped to transmit and receive coded groups of electric signals; a constant speed motor; a motor drive shaft; a main power shaft; said motor shaft and main power shaft being fixed relative to each other with their axes lying in spaced apart parallel planes; a set of two mating gears; and means structurally enabling one of said gears to be drivingly connected to said motor shaft and the other of said gears to be drivingly connected to said power shaft whereby said gears will intermesh to enable the motor shaft to constantly drive the power shaft in timed relation to machine operations, the operative engagement between said gears creating a force maintaining said gears interconnected to their respective shafts and enmeshed with each other; and said means enabling the gears to be slidably disconnected from their respective shafts and replaced by a separate set of functionally similar mating gears having a different speed ratio than said set of two mating gears to thereby enable a different rate of machine operation.

33. A machine as defined in claim 32 wherein said shafts are fixed with their axes transverse, the sets of gears comprise a worm gear slidable on the end of the motor shaft and a worm wheel slidable on the power shaft, and the threads on the worm gear are so formed relative to the direction of motor shaft rotation that the resultant force from the enmeshed worm wheel maintains the worm gear on the end of the motor shaft.

34. In a selector mechanism, a function shaft, a selector shaft, a power input shaft, means to intermittently drive said function shaft from said power input shaft including a controllable positive drive means and a pivoted lever having a roller journalled in one end thereof for coacting with said positive drive means to render said positive drive ineffective after a given increment of rotation and means to frictionally drive said selector shaft from said function shaft in increments less than said given increment.

35. In a selector mechanism, a first continuously rotating shaft, a second shaft, disengageable clutch means interconnecting said two shafts, transfer means shiftable between active and inactive positions, means for shifting said transfer means to active position, means operable upon rotation of said second shaft to shift said transfer means to said inactive position, and means including a pivoted lever and a roller journalled on one end thereof cooperating between said clutch means and said transfer means to engage said clutch means when said transfer means is shifted to said active position and thereby shift said transfer means to said inactive position and to disengage said clutch means upon a predetermined angle of rotation of said second shaft.

36. The apparatus set forth in claim 35, wherein: said clutch means includes a first jaw rotatably journalled on said function shaft and drivingly connected to said power shaft, a spring biased second jaw rotatable with and axially slidable on said second shaft, and including at least two radial arms; and said lever means cooperating between said clutch means and said transfer means includes a shaft for rotating said lever into or out of the path of rotation of said clutch arm whereby said journalled roller selectively moves said second jaw axially on said second shaft out of engagement with the first jaw and permits the biasing means to move said second jaw into engagement with the first jaw.

37. A telegraph machine as defined in claim 11 wherein said first group of function operating means comprises a power operated rotatable shaft having cam means thereon, at least one loosely pivoted function operation lever and means adapted to be actuated by said selector mechanism to engage a function operating lever and urge it into engagement with said cam means whereby rotation of said power operated shaft will cause said cam means to operate said function operating levers, thereby actuating the function operating means.

38. The mechanism as defined in claim 37 wherein said operating lever includes a journalled roller for engagement with said cam means when the lever is engaged and urged by said selector mechanism actuated means.

39. The mechanism as defined in claim 37 wherein said selector actuated means comprises at least one pivoted spring biased lever having a projection, and a detent normally engaged by said selector mechanism to latch the pivoted lever against the bias of said spring, and said operating levers include an inclined portion positioned in the path of movement of said pivoted lever projection whereby upon actuation by said selector mechanism the pivoted lever is released from latching engagement and is spring biased into engagement with said operating lever to urge said operating lever into operative engagement with said cam means.

40. The mechanism as defined in claim 39 wherein said pivoted spring biased lever has a cam follower portion and said cam means includes a cam surface engaged by said pivoted lever cam follower portion when the lever is released from latched engagement, whereby rotation of said rotatable shaft will pivot said spring biased lever against the spring bias and into latched engagement with said selector mechanism.

41. A printing telegraph comprising: power operated means; a selector mechanism to convert coded conditions into predetermined rotary mechanical positions; a rotatable shaft selectively rotatably positioned by said selector mechanism; a type bar carriage supported on and axially movable relative to said rotatable shaft; a type bar selecting spider rotatably mounted on and axially shiftable relative to said carriage and rotatably coupled to said rotatable shaft whereby the angular position of said shaft will position said spider in a predetermined position corresponding to a selected type bar; and pivotable means coacting with said power operated means and said selecting spider to positively reciprocate said spider axially each time the selector mechanism converts a coded condition into a predetermined rotary position.

42. A printing telegraph as defined in claim 41 wherein: said pivotable means comprises a pivotally mounted shaft having a horizontally extending print bail and a radially extending cam follower arm; said power operated means includes a rotatable cam positively engaging the cam follower arm on said pivotable shaft; and said axially shiftable spider includes means structurally coacting with said print bail and slidable horizontally therealong, whereby when said cam is rotated by the power means to pivot the cam follower, the pivoted shaft and the print bail axially reciprocate the type bar spider during each cam actuation.

43. A printing telegraph as defined in claim 42 wherein, said cam follower comprises a projection on said cam follower arm and said rotatable cam includes an enclosed radial cam track receiving said cam follower projection for positive actuation.

44. A printing telegraph as set forth in claim 43 wherein, said enclosed cam track comprises a double cam whereby said shiftable spider will be axially reciprocated twice during each complete revolution of said enclosed cam.

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