July 6, 1943. C. J. FITCH ET AL 2,323,388

TELEGRAPH PRINTER

Filed Nov. 18, 1941 5 Sheets-Sheet 1

FIG. 2.

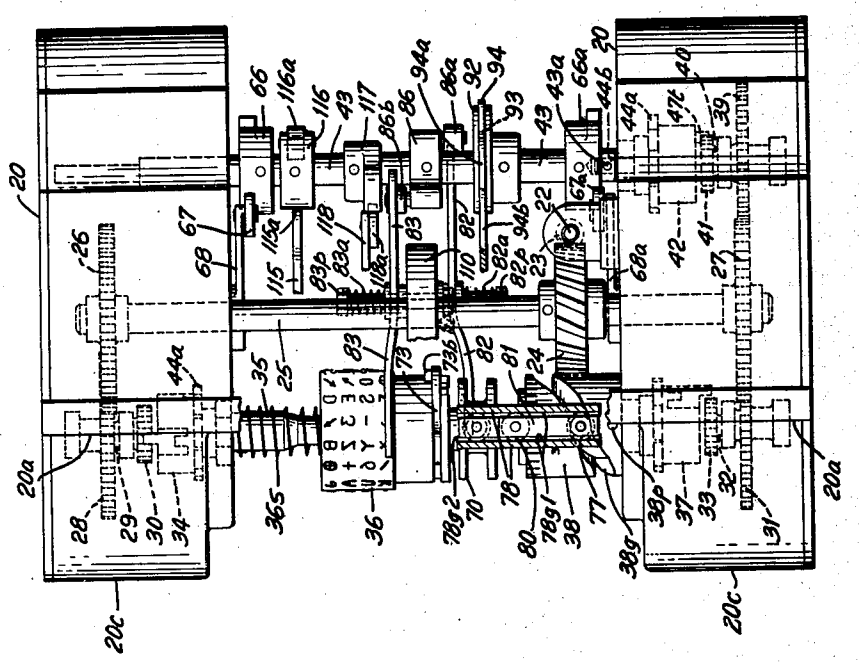
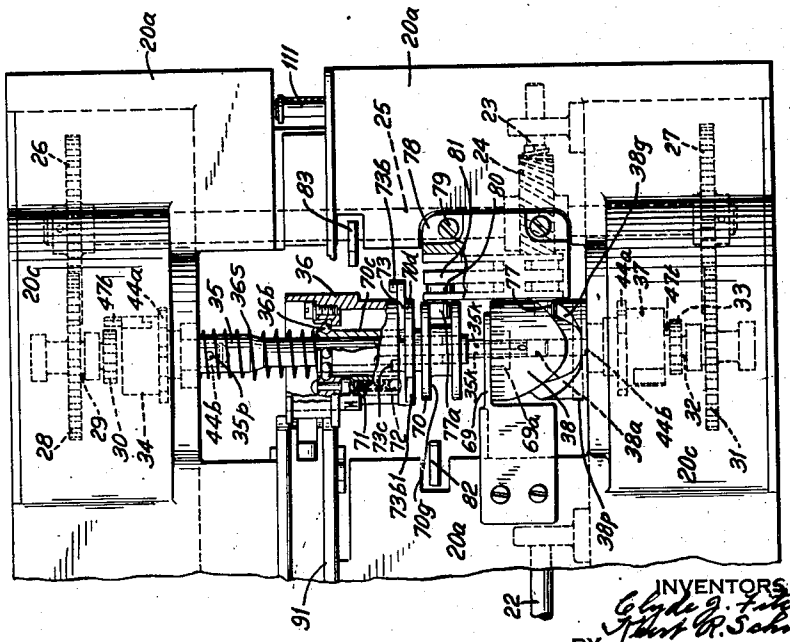


FIG. 1.



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Filed Nov. 18, 1941 5 Sheets-Sheet 2

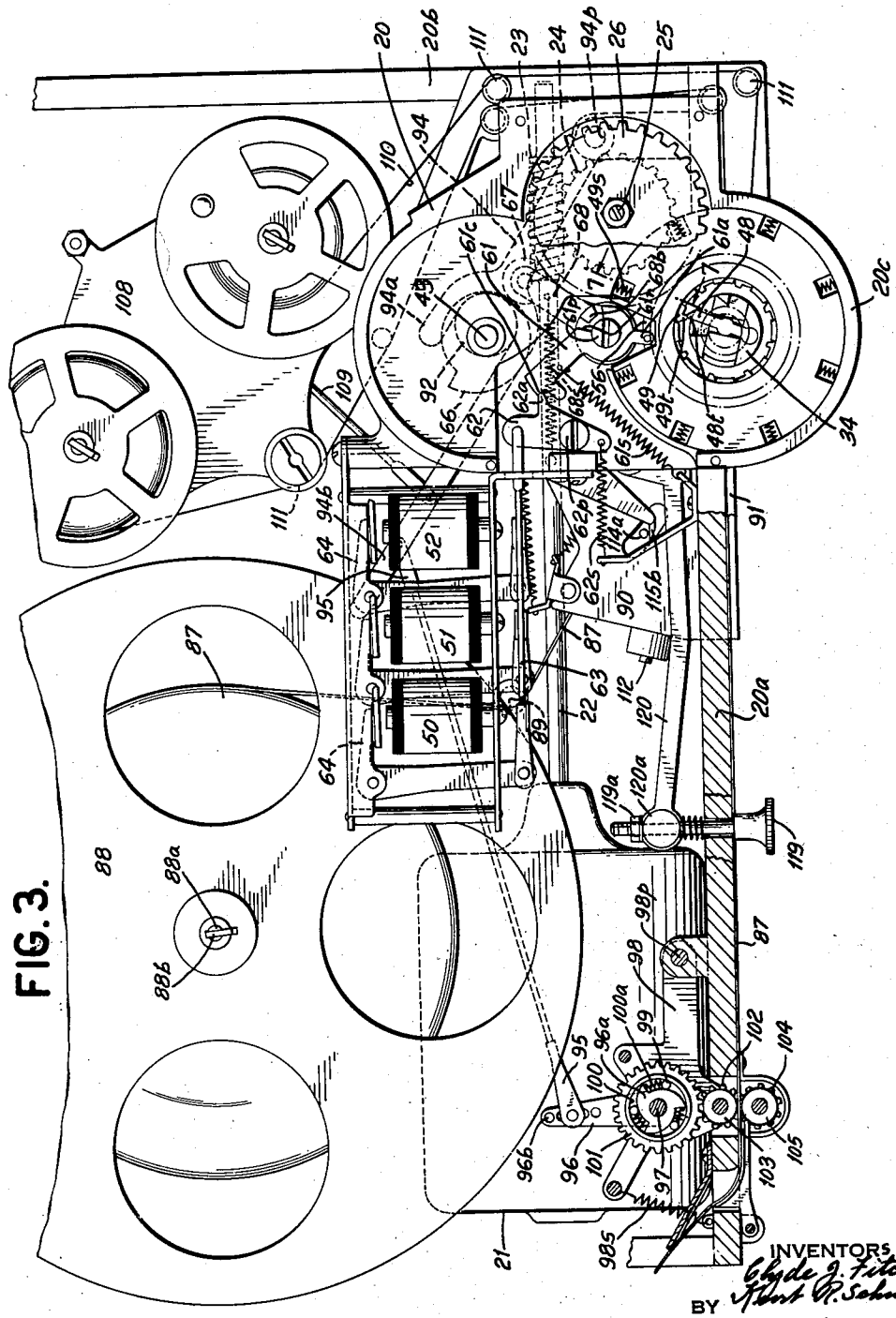


FIG. 3.

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Filed Nov. 18, 1941 5 Sheets-Sheet 3

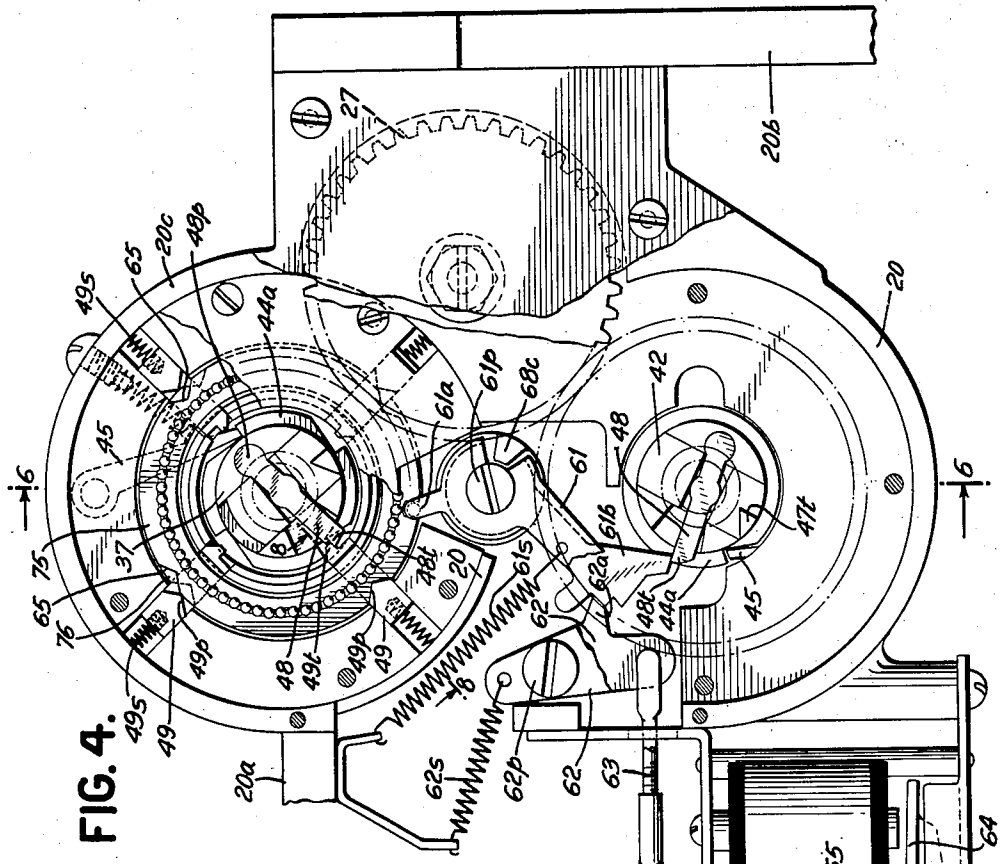


FIG. 4.

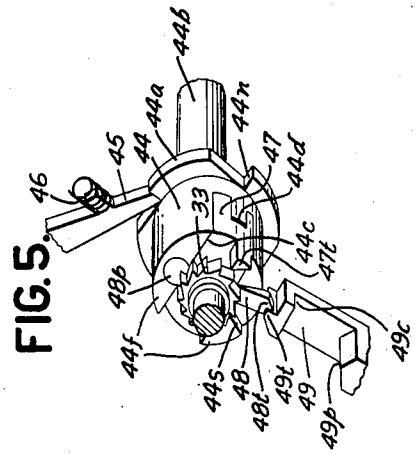


FIG. 5.

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Filed Nov. 18, 1941 5 Sheets-Sheet 4

FIG. 6.

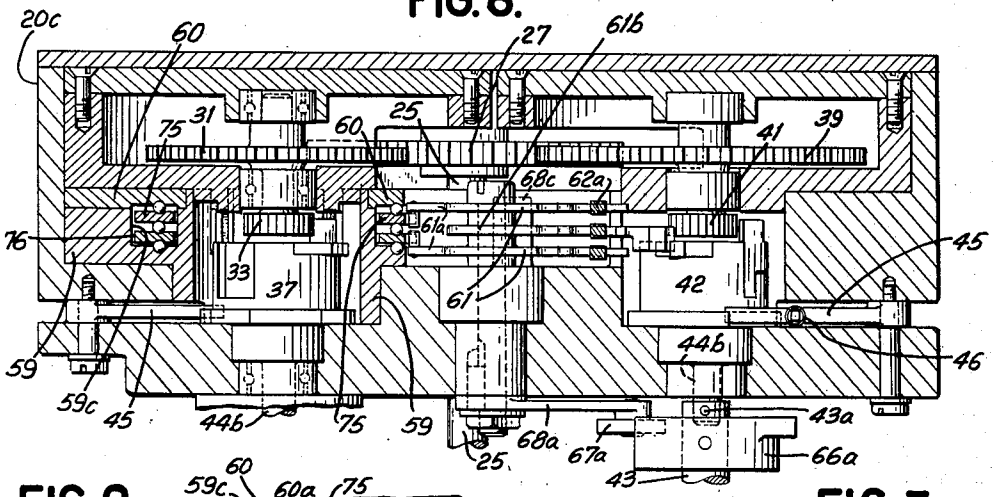


FIG. 8.

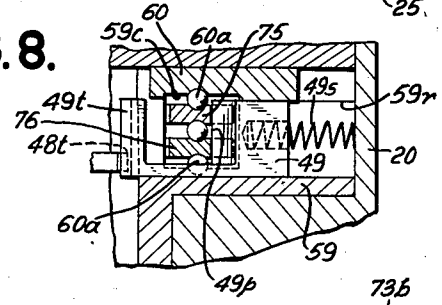
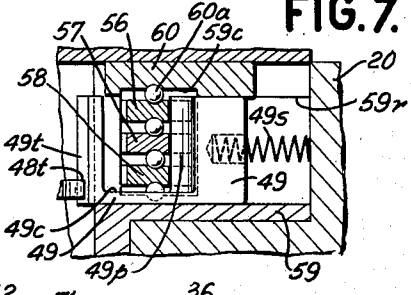


FIG. 7.



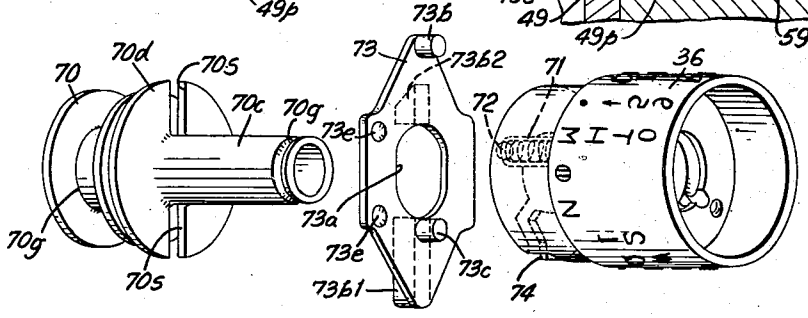


FIG. 9.

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Filed Nov. 18, 1941 5 Sheets-Sheet 5

FIG. 10.

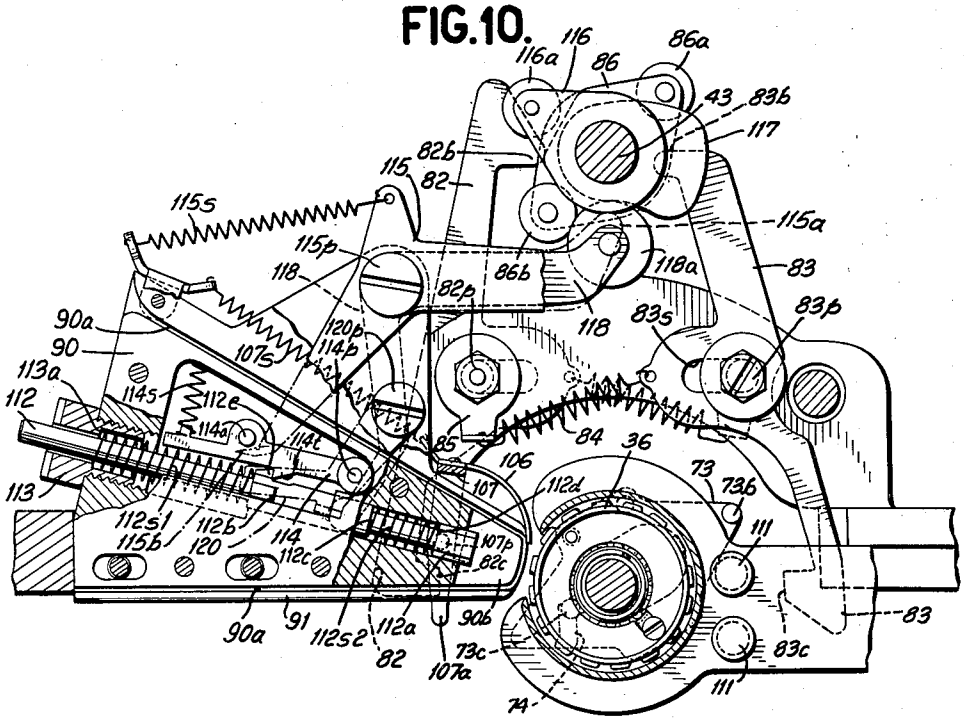


FIG. 10a.

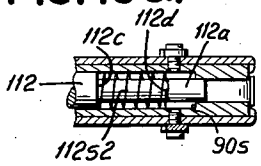


FIG. 11.

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Patented July 6, 1943 2,323,388

UNITED STATES PATENT OFFICE

2,323,388

TELEGRAPH PRINTER

Clyde J. Fitch, Endwell, and Kurt R. Schneider, Endicott, N. Y., assignors to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application November 18, 1941, Serial No. 419,577

4 Claims. (Cl. 197—49)

The present invention relates to printing telegraphy and more particularly to a receiving printer wherein a message is recorded by impressing characters upon a tape.

The invention embodies novel printing and novel printing control mechanism particularly adapted for performing the printing operation of such a receiving printer.

One of the objects of the present invention is to provide in a telegraph receiver, novel printing mechanism including novel printing hammer operating devices.

Another object is to provide, in combination with a telegraph receiver, novel printing mechanism, and novel mechanism for controlling the effectiveness of such printing mechanism.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a front elevational view, partly in section, illustrating the typewheel positioning mechanism.

Fig. 2 is a side elevational view, partly in section, illustrating the typewheel positioning mechanism and drive means therefor.

Fig. 3 is a top, plan view of the complete novel printer, including the tape feed mechanism.

Fig. 4 is a bottom, plan view, on an enlarged scale, of a portion of the novel printer.

Fig. 5 is a perspective view, on an enlarged scale, illustrating the details of the clutch mechanism utilized in positioning the typewheel.

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4, and rotated 90 degrees counterclockwise.

Fig. 7 is a sectional fragmentary view, on an enlarged scale, taken on line 7—7 of Fig. 3.

Fig. 8 is a sectional fragmentary view, on an enlarged scale, taken on line 8—8 of Fig. 4.

Fig. 9 is an exploded view, on an enlarged scale, illustrating the details of the shift mechanism for rotatably shifting the typewheel.

Fig. 10 is a detail view, on an enlarged scale, illustrating the printing and shift mechanism.

Fig. 10*a* is a detail view illustrating a portion of the mechanism of Fig. 10.

Fig. 11 is a perspective view, on an enlarged scale, illustrating the details of the adjusting and operating mechanism for the printing hammer.

Referring to the drawings and more particularly to Figs. 1, 2, 3 and 4, the novel printer comprises a supporting frame 20 (Figs. 2, 3 and 4) including a front panel 20*a*, a side frame member 20*b* and protruding semicircular front portions 20*c*.

A motor 21 (Fig. 3) carried by the frame 20 drives shaft 22 carrying the worm 23 meshing with worm wheel 24 carried by shaft 25 (Fig. 2). Shaft 25 is suitably journaled at each end in frame 20 and carries at one end thereof the fiber driving gear 26 (Figs. 1 and 2) for driving the mechanism controlling the rotative positioning of the typewheel. At its other end, the shaft 25 carries the fiber driving gear 27 for driving the mechanism that axially positions the typewheel.

By the mechanism just described, motor 21 drives shaft 25 at 900 R. P. M., which is not synchronous speed but is faster than the speed of the incoming signals.

Gear 26 meshes with gear 28 carrying a shaft 29 on which is mounted ratchet gear 30.

Gear 27 meshes with gear 31 carrying a shaft 32 on which is mounted ratchet gear 33.

Gears 30 and 33 are thereby driven at 1200 R. P. M. Gear 30 drives the eight position clutch mechanism 34, which in turn is controlled by permutation disk mechanism, all as described presently, to rotatably position shaft 35 and typewheel 36, while gear 33 drives the four position clutch mechanism 37, also controlled by permutation disk mechanism, to rotatably position the cylindrical cam member 38 which, as described later, by its rotative positioning controls the axial positioning of the typewheel.

Clutch 34 rotatably positions the typewheel 36 in any one of eight uniformly distributed rotative positions whereby any one of eight vertical columns of characters (Fig. 2) may be selectively positioned in printing position. Novel shift mechanism is also provided, as described later, to further rotatably position the typewheel 36, in positions respectively intermediate each of these eight rotative positions, whereby the typewheel is selectively adjusted to alternate ones of two rotative positions corresponding to each of the above eight rotative positions.

Gear 27 (Fig. 2) also meshes with gear 39 carrying a shaft 40 on which is mounted ratchet gear 41 for driving the clutch 42, which clutch is controlled by single revolution mechanism, described later, to permit rotation of shaft 43 under the control of clutch 42 for one complete revolution only. Shaft 43 carries a plurality of cams, so distributed circumferentially of shaft 43 as to operate in proper time sequence, the ribbon feed, tape feed, printing hammer cocking and release

mechanism, restoring mechanism and shift mechanism of the novel printer, all as described in detail later.

Clutch mechanism

The clutch devices **34**, **37** and **42** may be of the type, as fully shown and described in Patent No. 2,206,646, granted to Kurt R. Schneider July 2, 1940. Referring to Fig. 5, there is illustrated therein the construction of such a clutch, which in the particular instance, may be rotatably positioned in any one of four different positions (such as clutch **37** of Fig. 2) but it is to be understood that the construction of each of the clutches **34**, **37** and **42**, respectively, is the same, with the sole exception of the number of rotative positions to be assumed by the clutch. As illustrated in Fig. 5, the clutch comprises a cylindrical member **44** provided with a series of four notches **44***n* distributed about a flange member **44***a* integral with member **44**. A shaft portion **44***b*, also integral with member **44**, is provided, which internests with the associated driven member, as described later, to transmit the rotation of the member **44** to the associated driven member and thereby rotatably position the driven member similarly to the rotative positions assumed by member **44**. A pivoted pawl member **45** (see also Figs. 4 and 6) is urged by spring element **46** into engagement with the flange member **44***a* to cooperate with a notch **44***n* and thus prevent back rotation of the clutch, when stopped in any one of its four positions. The face **44***f* of member **44** of the four position clutch illustrated in Fig. 5, is located adjacent its cooperating ratchet gear **33** (see also Fig. 1), driven by shaft **32**, as described above. A channel **44***c* is provided in face **44***f*, in which channel is slidably mounted a dog member **47** provided with an axially extending tooth **47***t* which also extends radially towards the toothed periphery of ratchet gear **33**. A member **44***d*, integral with member **44**, extends axially into the channel **44***c*, as shown in Fig. 5 and also part way diametrically of member **44**. A spring member, as disclosed in said Patent No. 2,206,646, abuts member **44***d* and spring biases member **47** so that the tooth **47***t* tends to engage the teeth of ratchet gear **33**. A dog lift lever **48** (see also Fig. 4) is pivoted by its ball-shaped end **48***p* fitted into a socket in the face **44***f*, and extends crosswise of dog **47** and engages dog **47** with its center portion. The other end of lever **48** is cut diagonally to form a tooth **48***t* projecting beyond the circumference of member **44**. A slot **44***s* is formed in the face of member **44**, generally at right angles to channel **44***c*, to permit oscillation of dog lift lever **48** with respect to **44**, about the ball and socket connection, when **48***t* is engaged by a stop member **49** controlled by the permutation disk members, as described later. This oscillatory movement of lever **48** is transferred to dog **47** to move the dog, longitudinally of itself against the force of its biasing spring, and into the position as illustrated in Fig. 5. When a stop member **49** is moved radially to release tooth **48***t*, lever **48** will thereupon permit dog **47** to be moved to the left, as viewed in Fig. 5, under the influence of its biasing spring, to thereby engage tooth **47***t* and associated ratchet gear **33**, whereby the rotation of gear **33** is transmitted to member **44** and shaft **44***b*.

Typewheel positioning

Novel means are now provided for completely positioning the typewheel, which comprise means for rotatably positioning the typewheel, means for axially positioning the typewheel and means for zone positioning or shifting the typewheel, which zone positioning comprises rotatively positioning the typewheel intermediate each of the eight assumed rotative positions mentioned above, to determine which character out of two primary groups of characters will be printed. These three sets of means will now be described in detail.

Rotative positioning of the typewheel

As illustrated in Figs. 3 and 4, a plurality of five permutation magnets and also a printing magnet are provided. Each of the five permutation magnets is responsive to one element of a 5-unit code signal received. Three of the magnets **50**, **51** and **52** (Fig. 3), controlled, respectively, by the first, second and fifth code signal elements, are utilized to control permutation disk or ring members which in turn regulate the rotative positioning of the typewheel. Two of the magnets **53** and **55** (Fig. 4) controlled, respectively, by the third and fourth code signal elements are utilized to control the permutation ring members which in turn regulate the axial positioning of the typewheel. The print magnet **54** controls mechanism for regulating the rotation of clutch **42** to produce a single revolution only, of clutch **42** and its associated shaft **43**, which in turn controls the zone positioning of the typewheel and also controls, in proper sequence, the tape and ribbon feed, the print hammer cocking and releasing functions and the reset functions. When sequential code signal elements are utilized, as may be assumed in the instant application, print magnet **54** is controlled by the stop element of the permutation of code elements of a full complete signal which complete signal when the 5-unit code is utilized comprises a start element, five code signal elements proper, and a stop element.

Referring to Figs. 3 and 7, there is illustrated the permutation means associated with clutch **34** for selectively rotatively positioning the typewheel. As is seen in Fig. 3, clutch **34** is stopped by engagement of tooth **48***t* of its dog lift lever **48** with a tooth **49***t* of a stop member **49** (Fig. 5). Each stop member **49** is provided with a laterally projecting support member carrying its tooth **49***t* and also with a laterally extending support member carrying projection **49***p* (see also Fig. 4) which cooperates with notches in the permutative members, as described presently. The laterally extending support members for **49***t* and **49***p* provide a channel **49***c*. Eight such stop members **49** are distributed circumferentially about clutch **34**. A set of three permutation selector rings **56**, **57** and **58** (Fig. 7) are disposed coaxially with clutch **34**, the annular portion of the rings being located within each of the channels **49***c* of the eight stop members, respectively. These rings are maintained in position, coaxial with clutch **34**, by a projecting circular front portion **20***c* of casing **20** (Fig. 3) and by the eight stop members **49**, distributed circumferentially of the permutation ring members. Each of the stops **49** is mounted for movement radially of the annular permutation members and is constantly urged toward the center of the annular members by means of an individual spring **49***s*. Each of the three permutation rings is held against bodily lateral movement by means of a member **59** (see also Fig. 6) provided with an annular channel **59***c* in which the rings are located. Member

59 is also provided with a series of radially extending openings 59r in which are located the respective stops 49. An annular cover plate 60 serves to hold the rings in place within the channel 59c and a plurality of ball members 60a serve as antifriction members for rotatively mounting the respective rings.

Each of the rings 56, 57 and 58 may be rotated by means of a lever 61 (Fig. 3) pivoted at 61p and biased by spring 61s for counterclockwise rotation. A lug 61a on lever 61 is pivotally connected to its corresponding permutation ring (ring 56, for example) whereby the ring is rotated clockwise upon counterclockwise rotation of lever 61. Each lever 61 is maintained in the cocked position, as illustrated in Fig. 3, by a trigger element 62, pivoted at 62p and biased by spring 62s for clockwise rotation. A lug 62a on trigger 62 engages a shoulder 61c on lever 61 to hold the lever 61 in cocked position. A link 63 is pivotally attached to each trigger 62 and is also pivotally connected to a pivoted armature 64, one for each of the magnets 50, 51 and 52, respectively, (Fig. 3) and likewise one for each of the magnets 53, 54 and 55 (Fig. 4). Upon energization of any magnet, its associated armature 64 is rotated clockwise (as viewed in Fig. 3) to move the link 63 to the left, to rotate trigger 62 counterclockwise, to thereby release the cocked lever 61 for counterclockwise rotation under the influence of its spring 61s, which furnishes the motive power to in turn rotate the associated ring clockwise. It is obvious that only a short, relatively weak signal is required to actuate the magnets and thereby the rings, since the work required to rotate the rings is actually performed by the springs 61s, the magnets merely controlling the trigger elements.

The relative rotation of the rings 56, 57 and 58 aligns a single set of individual notches 65 (Fig. 4) formed in the outer peripheries of the respective rings. Since each ring can be operated to any one of two positions and since there are three rings provided, a total of eight permutative positions may be obtained. Each of the three rings (Fig. 7) is therefore provided with eight notches (as compared to the four notches as illustrated in Fig. 4) the notches on the respective rings being so positioned relatively to each other that a plurality of three notches, and three only; one only on each of the rings respectively; will be aligned for each of the eight rotative positions of the three rings, and such alignment occurs directly beneath one only, of the resiliently biased stops 49 cooperating with these three rings. The projection 49p of the particular stop, thus selected, will enter the three aligned notches of the three rings, respectively, while any previously aligned stop will be cammed out of its cooperating notches, and all of the stops, except the one now aligned, are held in their most remote radial position by the outer peripheries of the three rings.

A different stop is, therefore, permitted to move radially inward for each of the eight permutation positions of the three rings.

Furthermore, the notches on the respective rings are so arranged, that clutch 34 will be rotated to any one of its several assumed positions, in the least possible time. For example, it may be assumed, as stated above, that under ordinary sequential code signal element operation, magnets 50, 51 and 52 (Fig. 3) are energized by the first, second and fifth actual code signal elements, respectively, of a five element code. Upon energization of magnet 52, ring 58 will be released and that stop member 49, now illustrated in Fig. 3 as engaging dog lift lever 48, will be cammed out of its associated notches 65, by point 49p riding up the sides of the notches as the ring 58 is rotated clockwise, and dog lift lever 48 will therefore be released. The notches of the three rings 56, 57 and 58 are so chosen and arranged, that when magnet 52 only is energized, and ring 58 only is rotated, the immediately adjacent stop, in a counterclockwise direction from the stop now illustrated as engaging lever 48 in Fig. 3, will be aligned with three notches in the respective rings 56, 57 and 58. Therefore, when dog lift lever 48 is released from the position as shown in Fig. 3, dog 47 (Fig. 5) of clutch 34 is moved by its spring to engage tooth 47t and the associated rotating ratchet gear 30 of clutch 34 (Fig. 2). Clutch 34 is thereupon rotated until dog lift lever 48 (Fig. 3) engages tooth 49t of the immediately adjacent stop 49, and the clutch is thereby stopped after having completed one-eighth of a revolution. If magnet 51 only is energized, ring 57 only is released for rotation and clutch 34 will rotate one-quarter of a revolution from the position as shown in Fig. 3. If magnet 51 is first energized and magnet 52 is sequentially energized, the clutch will be permitted to rotate three-eighths of a revolution. If magnet 50 alone is energized, the clutch will be permitted to rotate a full half revolution. If magnets 50 and 52 are both energized, the clutch will be permitted to rotate five-eighths of a revolution, if magnets 50 and 51 are both energized the clutch will be permitted to rotate six-eighths of a revolution and if magnets 50, 51 and 52 are all sequently energized, the clutch will be permitted to rotate seven-eighths of a revolution. It is seen, therefore, that upon sequential operation of the magnets 50, 51 and 52, the clutch 34 will always advance to its selected position in the shortest possible time. This is likewise true of magnets 53 and 55 and their associated clutch 37 (Fig. 4).

Novel means are also provided whereby all of the levers 61 associated with magnets 50, 51, 52, 53 and 55 are reset to cocked position, as illustrated in Fig. 3, following the reception of each group of code signal elements comprising one complete signal, and lever 61b, associated with print magnet 54, is also reset. Upon release of the single revolution clutch 42 (Fig. 2), as described presently, shaft 43 is allowed to rotate one single complete revolution. During the rotation of shaft 43, a reset cam 66 (Figs. 2 and 3) carried by shaft 43 for rotation therewith is engaged by a roller 67 on reset lever 68 (Fig. 3) which roller is continually biased against the cam 66 by means of spring 68s acting on lever 68. Upon this rotation of cam 66, the reset lever is rotated clockwise, as viewed in Fig. 3, and a lug 68b integral with reset lever 68 engages the sides of notches 61n formed in each of the three levers 61 (Fig. 3) to rotate these levers clockwise about their pivots against the force of their respective springs 61s until the levers are restored to cocked position and locked by the triggers 62, as illustrated in Fig. 3. Levers 61 and 61b (Fig. 4) associated with magnets 53, 54 and 55 are similarly reset by cam 66a, roller 67a and lever 68a with its lug 68c. Continued rotation of cam 66 permits the lever 68 to rotate to the position, as shown in Fig. 3, so that rings 56, 57 and 58 are free to rotate when the triggers 62 are released

and levers 61 are operated. Restoration of the rings again aligns that particular stop 49, as illustrated in Fig. 3, to permit clutch 34 to rotate until dog lift lever 48 engages the tooth 49t of stop 49, in the position as illustrated. It is to be noted that the clutch 34 during this last portion of its movement, moves counterclockwise or in the same direction as during its previous operation, so that the restoration of the clutch 34 and its controlled shaft 35, which determines the rotative position of the type wheel 36, is always in the same direction. It is seen, therefore, that the clutch 34 can assume any one of eight rotative positions, determined by the permutations of code signal elements received, and is returned to a chosen normal position after reception of each complete code signal. Similarly clutch 37 can assume any one of four positions, and is returned to a chosen normal position while clutch 42 is limited to one complete revolution.

As illustrated in Fig. 5, each clutch is provided with a shaft 44b integral with the clutch body 44. Shaft 44b of clutch 34 (Fig. 1) is inserted in an axial opening in the shaft 35 and is connected to the shaft for rotation thereof by a pin 35p. Upon rotation, therefore, of clutch 34, to any one of its eight positions, this rotation is transmitted to shaft 35.

A lower end of shaft 35 is reduced in diameter and passes through bracket 69 attached to the front panel 20a and also passes through an axially extending bored portion 69a integral with bracket 69 and into an axial opening 38a formed in the cylindrical cam 38 whereby the cam 38 is aligned with shaft 35. A spring 36s surrounds the upper end of shaft 35 and resiliently biases the typewheel 36 downwardly, as viewed in Fig. 1. Shaft 35 is provided adjacent its reduced portion with a pair of axially extending key ways 35k, 35k. A groove collar member 70 (see also Fig. 9) is provided with radially inwardly extending lugs extending into the key ways 35k, respectively, whereby the rotation of the shaft 35 is transmitted to member 70, but with member 70 free to move axially of shaft 35. Integral with collar 70 is a disk 70d provided with opposite, radially extending slots 70s, 70s (Fig. 9). A cylindrical member 70c, also integral with collar 70, extends axially of and surrounds the shaft 35 (Figs. 1 and 9). A circumferentially extending groove 70g (Fig. 9) formed in the end of member 70c provides a bearing race for the ball bearings 36b (Fig. 1) which also engage a race formed in the interior of typewheel 36, to provide an antifriction mounting for the typewheel, so that the typewheel can be easily rotated, with respect to shaft 35, as described presently. Typewheel 36 is also provided with an axially extending opening in which is inserted a spring 71 and a retaining ball 72. The end of the axially extending opening in typewheel 36 is smaller than the diameter of the ball so that only a portion of a hemisphere of ball 72 extends externally of the bottom face of typewheel 36 (Fig. 1). A radially slidable, zone selection or shift member 73 (Fig. 9) is mounted on cylindrical member 70c by means of an elongated or elliptical opening 73a formed in the slide 73. Slide 73 is provided on one face with a pair of projecting lugs 73b1, 73b2, disposed on opposite sides diametrically of slide 73, which lugs fit into and abut the sides of slots 70s when member 73 is mounted in position on member 70c, as illustrated in Figs. 1, 2 and 10. The opposite face of slide 73 is provided with a cylindrical operating lug 73c which rides in and engages the sides of slot 74 (Figs. 9 and 10). Upon radial movement of slide 73 in such a direction that operating lug 73c is moved radially inward, the lug engaging the sides of groove 74 will rotate the typewheel 36 one-sixteenth of a revolution in one direction, while upon movement of slide 73 radially, in such a direction that lug 73c moves radially outward, the typewheel 36 is rotated in the opposite direction one-sixteenth of a revolution. A single lug 73c only, cooperates with a single radial groove 74 only, and serves to rotate the typewheel in either one of two required directions. A pair of indentations 73e, 73e, is provided on the same face of slide 73 as operating lug 73c (Fig. 9) adjacent the typewheel 36. Upon radial movement of slide 73 in one direction, ball 72 engages one indentation, and upon radial movement in the opposite direction, ball 72 engages the other indentation, to thereby retain slide 73 in either of its assumed positions. Ball 72 and the indentations 73e also serve to retain the typewheel 36 in one or the other of its rotative positions with respect to shaft 35. An abutting lug 73b, for cooperation with shift operating mechanism, to be described presently, is also provided on this same face.

As is seen in Fig. 2, typewheel 36 is provided with sixteen vertically extending columns of characters, each column comprising alternately "Figures" and "Letters" characters. By rotation of the typewheel 36 under control of shaft 35 and clutch 34, any one of eight uniformly, circumferentially distributed columns of characters is selected, and upon further rotation of the typewheel one-sixteenth of a revolution, with respect to shaft 35, one of two adjacent columns of characters, namely "Figures" or "Letters," is chosen, so that the final rotative positioning of the typewheel with respect to shaft 35 is a zoning or shift function. This zoning or shift function will be described in detail presently, and is produced by engagement of shift operating mechanism with the abutting lug 73b (Fig. 9) or the lug 73b1, which last lug serves the dual purpose of an abutting and a guiding lug.

Novel means for axially positioning the typewheel will now be described.

Axial positioning of typewheel

The two magnets 53 and 55 (Fig. 4) and the associated permutation ring members 75 and 76, which are similar to the ring members 56, 57 and 58, described above, control mechanism which in turn controls the axial positioning of the typewheel. Magnets 53 and 55, respectively, control the rings 75 and 76 by means of armatures 64, links 63, triggers 62 and pivoted levers 61, in the same manner as magnets 50, 51 and 52 control their respective rings 56, 57 and 58. Relative rotation of rings 75 and 76 selectively aligns their notches 65 in different permutations, so that the four stops 49 (Fig. 4), cooperating with rings 75 and 76, may be selectively rendered effective, and the dog lift lever 48 of clutch 37 can be selectively positioned at any one of four different rotative positions and in the shortest possible time. The control of clutch 37 is, therefore, the same as that of clutch 34 with the sole exception that clutch 37 can be stopped in only four different positions instead of the eight of clutch 34.

The permutation disks 75 and 76 are reset to their normal positions under control of their associated levers 61, by means of cam 66a (Fig. 2),

roller 67*a*, lever 68*a* and lug 68*c* in the same manner as the permutation disks 56, 57 and 58 are reset by means of their associated cam 66, roller 67 and arm 68, all as described above.

A plurality of four notches 44*n* (Fig. 5) cooperates with pawl 45, as stated above, to prevent back rotation in any one of these four positions.

Similarly, as is seen from Fig. 4, the magnet 54, which may be designated as the print magnet, controls its trigger 62 by means of its associated armature 64 and link 63. Trigger 62 of the print magnet 54 controls a pivoted lever 61*b*, generally similar to the levers 61, and pivoted for rotation about pivot 61*p*. Lever 61*b*, however, is not attached to any permutation ring member but projects into the path of rotation of the dog lift lever 48 of clutch 42, and is held in position to intercept the lever 48, by coaction with its trigger 62. Upon energization of print magnet 54, its trigger 62 releases lever 61*b* for rotation clockwise under control of its associated spring 61*s* until the end of lever 61*b* is moved out of the path of rotation of lever 48, and the single revolution clutch 42 is released for rotation. Also, lever 61*b* is reset to the position, as indicated in Fig. 4, by means of the reset cam 66*a*, roller 67*a*, reset arm 68*a* and lug 68*c* employed in resetting the permutation disks 75 and 76. The cam 66*a* (Fig. 2) is so positioned on shaft 43, controlled by the single revolution clutch 42, that the permutation disks 75 and 76 and the lever 61*b*, are reset prior to completion of one complete revolution of clutch 42, so that lever 61*b* is returned to the position, as illustrated in Fig. 4, in time to intercept the dog lift member 48 and halt the lever 68 in the position, as shown, to thereby terminate the single revolution of clutch 42. The shaft 44*b* (Fig. 5) of clutch 42 is inserted into an opening in the shaft 43 (Fig. 2) and is connected to the shaft 43 by a pin connection 43*a*.

The shaft 44*b* of clutch 37 (Fig. 1) is inserted into the axial opening 38*a* of cylindrical cam member 38 (Fig. 1) and is attached to cam member 38 by pin 38*p* so that the rotation of clutch 37 is delivered to the cam member 38 to rotatably position the cam member in any chosen one of four possible positions. Cam member 38 is provided with a cam groove 38*g*. A thick roller 77 engages the sides of cam groove 38*g*, as seen in Fig. 1, and means are provided whereby roller 77 is moved up and down, or axially of shaft 35, upon rotation of cam member 38. A thick plate member 78 is attached by screws 79 to the front panel 20*a*. Cut into the edge of plate 78, adjacent the cam element 38, is a large groove 78*g*1 (Fig. 2). In the opposing side walls of groove 78*g*1 there are also cut two pairs of small guide grooves 78*g*2, the respective grooves of each pair being aligned in the direction of the thickness of plate 78. A plurality of thin rollers 80, of slightly larger diameter than roller 77, is carried by a member 81 and these rollers ride in the groove 78*g*2, to provide an antifriction mounting for the member 81 and to retain it within the large groove 78*g*1 of plate 78. Roller 77 is also attached to member 81 and upon rotation of the cam member 38, since the roller 77 is restrained, by means of member 81, against bodily rotation with member 38, the roller 77 is moved upwardly or downwardly as it rides upon the sides of cam groove 38*g*. The upward and downward motion of roller 77 is transmitted to member 81, which also carries a second roller 77*a*, similar to roller 77, adjacent its upper end (Fig. 1). Roller 77*a* is located within the groove 70*g* of the grooved collar 70, which collar, as stated above, is mounted for rotation with shaft 35 but is free to move axially thereof. Roller 77*a* transmits the axial movement of roller 77 and member 81 to the collar 70. Since, as described above, the collar 70 is integral with disk 70*d* (see also Fig. 9) while 70*d* and slide 73 carry the typewheel 36, the typewheel is selectively positioned axially, in any one of four chosen axial positions upon rotation of cam member 38 and consequent axial movement of member 81. As is seen from Fig. 2, typewheel 36 is provided with four horizontal rows of characters extending circumferentially about the periphery of the typewheel so that any one row can be chosen by the axial positioning of typewheel 36. By the rotative positioning of the typewheel under control of clutch 34, as described above, any one of eight circumferentially, uniformly distributed vertical columns of characters can be selected. It is therefore seen, that by the combined axial and rotative movement of typewheel 36, any one character, out of any one of eight vertical columns of characters, can be selectively located in position for printing. In order, however, to select one of two characters out of one of two adjacent vertical columns, novel shift or zone positioning mechanism is provided, which will now be described.

Zone positioning or shift

Novel means are now provided cooperating with novel means on the typewheel, as shown and described in applicants' copending application Serial No. 419,575 filed November 18, 1941, which matured into Patent No. 2,307,123, January 5, 1943, for producing zone positioning or shift. In one extreme axial position of the typewheel, the zone positioning or shift slide element 73 is so located axially and also oriented circumferentially that the shift operating mechanism can radially shift slide 73 to rotate the typewheel one-sixteenth of a revolution in one direction, which operation comprises one shift function of the typewheel from "Letters" to "Figures" or vice versa. In the other extreme axial position of the typewheel, slide 73 is so located axially and also circumferentially that the shift operating mechanism can rotate the typewheel one-sixteenth of a revolution, in the opposite direction, which comprises the other shift function.

As described above, slide 73 is mounted for radial movement by means of the lugs 73*b*1 and 73*b*2 (Fig. 9) cooperating with slots 70*s* in member 70*d*. A single operating lug 73*c* is also provided, as described above, cooperating with the sides of the generally radial slot 74 in the typewheel 36 to rotate the typewheel one-sixteenth of a revolution, either in one direction or the other depending upon the direction of movement of slide 73. When the shift operating mechanism cooperates with lug 73*b*1 to move slide 73 so that operating lug 73*c* is moved radially inward, the lug 73*c* cooperates with the sides of slot 74 to rotate the typewheel in one direction and when the shift operating mechanism cooperates with the abutting lug 73*b* to move slide 73 so that operating lug 73*c* is moved radially outward, the typewheel 36 is rotated one-sixteenth of a revolution in the opposite direction.

As shown in Figs. 2 and 10, a pair of shift operating levers 82 and 83 is provided. When standard teletype shift signals are employed, the "Figures" signal places the typewheel 36 in its extreme lower position, as viewed in Fig. 2, while

the "Letters" shift signal places the typewheel 36 in its extreme upper position. Lever 82 cooperates with lug 73b1, in the extreme lower position of typewheel 36, to radially move slide 73 so that lug 73c is moved radially inward to rotate typewheel 36 and perform the "Figures" shift function. Lever 83, on the other hand, cooperates with abutting lug 73b, in the extreme upper position of typewheel 36, to move lug 73c radially outward and thus rotate typewheel 36 to perform the "Letters" shift function.

As is seen in Fig. 10, levers 82 and 83 are each pivotally mounted for oscillation about pivots 82p and 83p, respectively.

An elongated slot 83s is formed in lever 83. Spring 84, attached at one end to a lug 85 firmly fixed to the frame 20, is hooked at its other end to lever 83 and urges lever 83 to the position, as shown in Fig. 10, with the pivot 83p engaging the wall at one end of slot 83s. If, for any reason, lever 83 is prevented from rotating about pivot 83p upon operation of its operating cam, as described presently, lever 83 and slot 83s are moved to the right, as viewed in Fig. 10, and against the force of spring 84 whereby breakage of the lever 83 is prevented. Lever 82 is similarly resiliently mounted on pivot 82p. Further, levers 82 and 83 are respectively mounted for movement axially of pivots 82p and 83p, respectively, and against the force of associated springs 82a and 83a (Fig. 2) so that the levers 82 and 83 are further protected against breakage due to strain.

Each of the levers 82 and 83 is provided with an operating lug 82b and 83b, respectively (Fig. 10). A cam 86 (Figs. 2 and 10), mounted on shaft 43 for rotation therewith, is provided with a pair of oppositely extending cam rollers 86a and 86b, cooperating respectively with lugs 82b and 83b of the shift operating levers 82 and 83. As shaft 43 is rotated, cam 86 rotates its cam rollers 86a and 86b to simultaneously engage the lugs 82b and 83b, respectively, to simultaneously oscillate levers 82 and 83 about their respective pivots.

Upon reception of the "Figures" shift signal, the typewheel is positioned in its extreme lower position, so that upon oscillation of lever 82, its operating end 82c will engage lug 73b1 (Fig. 9) of slide 73 to radially move this element and thereby rotate typewheel 36 one-sixteenth of a revolution in one direction, as described above, to perform the "Figures" shift function. On the other hand, upon reception of the "Letters" shift signal, typewheel 36 is located in its extreme upper position, and the operating end 83c of lever 83 will engage the cylindrical abutting lug 73b (Fig. 10) of slide 73 and the typewheel 36 will be rotated one-sixteenth of a revolution in the opposite direction, to thereby perform the "Letters" shift function.

Tape feed

Novel tape feeding and tape guiding mechanism, as shown and described in applicants' copending application Serial No. 419,576, filed November 18, 1941, which matured into Patent No. 2,307,123, January 5, 1943, is provided for feeding the tape, step by step, past the printing position and for guiding the tape. A roll of tape 87 (Fig. 3) is mounted within the tape roll support 88 attached to frame 20 by a bolt 88a and slotted link 88b. Tape 87 unwinds from its roll and passes under a guide roller 89 to a printing hammer support member 90 and within the upper tape guide slot 90a (Fig. 10), beneath a novel arcuate-shaped tape guiding member, described presently, and around the end 90b of the hammer support 90, and into lower guide slot 90a and tape guide 91 (see also Fig. 1), across the front panel 20a of the printer, so that as the characters are printed by the printing mechanism, the printed characters appear immediately in easily readable position on the face of the printer. Tape 87 (Fig. 3) is then fed between the knurled feed rollers of the novel tape feeding mechanism, which will now be described.

Mounted on shaft 43 for rotation therewith is an eccentric disk cam 92 (Figs. 2 and 3) provided with a peripheral and radially extending slot 93 (Fig. 2). An unequal Y-arm lever 94 pivoted at 94p is provided with a short arm 94a and a long arm 94b fitting into the slot 93 in the disk cam 92 and embracing the small eccentric center of this cam (Fig. 3). Long arm 94b is pivotally connected, adjacent its free end, to a link 95 for operating the tape feed device. A lever 96 is integral with the eccentric three point star member 96a mounted for oscillation about shaft 97 journaled in member 98 attached to the front panel 20a by pivot 98p. A series of holes 96b are provided in lever 96 whereby the connection of link 95 to lever 96 can be varied, to change the amount that the tape is fed for each oscillation of lever 96. In this manner, the spacing of the characters on the tape can be varied at will.

Lever 96, upon oscillation in a counterclockwise direction, similarly oscillates eccentric 96a. Balls 99 located between the outer periphery of member 96a and an inner race 100 of gear 101, mounted freely on shaft 97, lock the member 96a and race 100 together upon such counterclockwise rotation, due to the eccentricity of the periphery of member 96a. Balls 100 are constantly urged towards engaging position by the spring elements 100a abutting the straight ledge portion of the fingers, respectively, of member 96a. Upon the return stroke, in a clockwise direction, of lever 96, the balls 100 no longer wedge together eccentric member 96a and the race 100 of gear 101, and gear 101 will not be rotated in the opposite direction. It is seen, therefore, that upon each complete back and forth stroke of link 95, the gear 101 will be rotated a predetermined amount in a counterclockwise direction only. Gear 101 meshes with gear 102, mounted for rotation on frame member 98, which gear 102 carries a pair of knurled rollers 103 (only one shown in Fig. 3) engaging the tape 87. Gear 102 meshes with gear 104, suitably mounted for rotation on panel 20a, and carrying another pair of knurled rollers 105 (only one shown) aligned respectively with the knurled rollers 103, so that the feed rolls are rotated to feed the tape past the printing position, the amount of tape feed, and the spacing of the characters on the tape, being determined by the particular connection between link 95 and lever 96, as described above. The tape 87 can also be pulled by hand to feed the tape past the printing position, since this action rotates gear 101 counterclockwise, so that the balls 99 do not lock with eccentric member 96a.

Frame 98 is pivoted at 98p, as stated above, and is urged constantly counterclockwise by spring 98s so that the respective knurled feed rollers 103 are held tightly in engagement with the tape 87 and force the tape 87 tightly into engagement with the respective rollers 105. To feed a new tape, frame 98 can be forced clock-

wise, against the force of spring 98s, to release the pressure between the knurled rollers 103 and 105.

As is seen from Fig. 10, the end 90b of the printing hammer support, provides a sharp turning bend for the tape. To guide the tape around the end 90b when the tape is being threaded into position, a novel tape guiding member is provided. An arcuate-shaped member 106 (Fig. 10) is attached to member 107 pivoted at 107p and provided with a finger operating portion 107a. A spring 107s is attached to the printing frame 99 at one end and to member 107 at the other end to bias the tape guide member 106 to the position, as shown in Fig. 10. When a tape is inserted into the upper tape guide slot 90a and fed to the right, by hand, member 107a is urged manually to the left, to rotate the arcuate member 106 clockwise to a position between the end 90b of member 90 and the typewheel 36. The arcuate member thereby serves as a guide to thread the tape around the sharp bend of end 90b of member 90 and into the lower guide slot 90a of member 90 and the tape guide 92 on the front panel of the printer. Member 107a is thereupon released and assumes the position, as shown in Fig. 10, and tape 37 (Fig. 3) is fed by hand between the knurled rollers 103 and 105, by clockwise rotation of frame 98, as described above. The tape is then ready for automatic feed under control of the tape feed mechanism as controlled in turn by the rotation of shaft 43.

Ribbon feed and ribbon reversal mechanism 108 (Fig. 3) is provided, which may be of the type as shown and described in applicants' copending application Serial No. 354,035, filed August 24, 1940, to which reference may be had for a more detailed description. The ribbon feed mechanism is operated by link 109 (Fig. 3) connected to the long arm 95b of the unequal Y-arm operating lever 94. Upon oscillation of lever 94, as previously described, the ribbon 110 is fed, in one direction or the other, over guides 111 and between the typewheel 36 and the tape, as it bends around the end 90b of hammer support 90.

Printing mechanism

Novel printing and printing control mechanism is provided, as will now be described. A reciprocable hammer member 112 (Figs. 10 and 11), provided with a printing head 112a, is mounted for reciprocation in printing hammer support member 90. A threaded member 113 (Fig. 10) threaded into support 99 provides an interiorly located abutting surface 113a against which rests one end of a coil spring 112s1 surrounding the hammer 112 and abutting the lugs 112b, 112b, integral with hammer 112 and urging hammer head 112a to engage the tape 37, ribbon 110 and typewheel 36. A pair of opposed shoulders 112c and 112d (Fig. 11) is also provided on hammer 112. A spring 112s2 (Fig. 10) surrounds hammer 112 and rides freely between shoulders 112c and 112d, in the cocked position of hammer 112, as illustrated in Fig. 10, and the coiled spring extends above and below the flat top and bottom surfaces of hammer head 112a (Fig. 10a). Upon release of the hammer from its cocked position, shoulder 112c moves spring 112s2 into engagement with a shoulder 90s (Fig. 10a) of member 90, and the spring 112s2 is compressed as hammer head 112a impinges against tape 37 to engage the tape, ribbon 110 and typewheel 36. The compressed spring 112s2 thereupon exerts its force against shoulder 112c and moves the released hammer out of engagement with the tape, to thereby release the tape, ribbon and typewheel.

Hammer 112 is also provided with a latching shoulder 112e (Figs. 10 and 11) which engages a tooth 114t of a trigger lever 114 pivoted at 114p. Trigger 114 is biased in a counterclockwise direction by a spring 114s. A cylindrical lug 114a is provided on trigger 114 for releasing the trigger. Bell-crank 115 (Fig. 10) is pivoted at 115p and is biased in a counterclockwise direction by spring 115s. The bell-crank 115 is provided at one end of one arm thereof with an operating lug 115a which is engaged by cam roller 116a of cam 116 mounted for rotation with shaft 43, and at the end of its other arm, bell-crank 115 is provided with a triggering lug 115b located beneath the cylindrical lug 114a (Fig. 10) of trigger 114 (see also Fig. 11). Upon rotation of shaft 43, cam 116 is rotated to engage cam roller 116a and operating lug 115a of bell-crank 115, to oscillate the bell-crank 115 clockwise against the tension of spring 115s, whereby triggering lug 115b engages lug 114a to oscillate trigger 114 clockwise against the force of spring 114s so that tooth 114t of trigger 114 and shoulder 112e of hammer 112, are released, to release the hammer for movement to the right under the force of compressed spring 112s1.

Means are provided to compress the spring 112s1 to thereby cock the hammer 112 comprising a cam 117 mounted for rotation with shaft 43 and cooperating with a roller 118a on the end of one arm of a bell-crank 118 pivoted directly beneath pivot 115p (Fig. 10). The other end of bell-crank 118 is provided with an operating lug 118b (Fig. 11) cooperating with one lug 112b of hammer 112. Bell-crank 118 is spring-biased in a counterclockwise direction in the same manner as bell-crank 115. As shaft 43 rotates, cam 117, in engagement with roller 118a, oscillates bell-crank 118 clockwise to engage lug 118b of its lower arm with a lug 112b of the hammer 112 whereby the hammer is shifted to the left (Fig. 10) against the force of spring 112s1, to compress this spring and cock the hammer. When the hammer is cocked, it assumes the position, as illustrated in Fig. 10, with lug 112e of the hammer engaging tooth 114t of trigger 114 and the trigger 114 therefore holds the hammer in cocked position until trigger 114 is oscillated clockwise by bell-crank 115, as described above, to release hammer 112 to perform its printing function.

Novel means are also provided for adjusting the degree of effectiveness of the printing hammer during the printing function which determines the clearance between the hammer head 112a and the typewheel 36 when the hammer is released from its cocked position for impact against the tape to compress the tape and ribbon against the typewheel 36. A micrometer screw 119 (Fig. 3) passes through a hole in the enlarged end 120a of lever 120 and is engaged by a cooperating nut 119a. By adjusting the screw 119, the lever 120 can be oscillated about its pivot 120p (Fig. 10) so that a stop lug 120b (Fig. 11) of lever 120 can be adjusted in position between a lug 112b of hammer 112 and the hammer head 112a. As lug 120b is moved to the left, as viewed in Fig. 11, the degree of effectiveness or the intensity of impact of the hammer head 112a, is decreased, but as the position of lug 120b is adjusted to the right, as viewed in Fig. 11, the ham-

mer head 112a is permitted to approach closer to typewheel 36, when hammer 112 is triggered, and the degree of effectiveness or of impact of the hammer 112 is increased.

General operation

While the operations of the various elements of the complete printer have been described in connection with the individual elements, a brief description of the operation of all elements of the device will now be presented in order to clarify the coaction of the relative parts in producing printing of characters upon a tape in response to code signal permutations received, each permutation being representative of a character to be printed or a function to be performed.

It is assumed that the tape 87 has been threaded between tape guide member 106 (Fig. 10) and the end 90b of hammer support 90 and also between the printing hammer head 112a and typewheel 36 and across the face of the printer front panel 20a and between the tape feed rollers, so that the tape will be automatically fed, step by step, as the printing functions are performed, and the ribbon 110 is assumed to be wound from one spool, between the paper tape and typewheel, to the other spool and is ready for its automatic feeding operation.

Upon energization of the motor 21 (Fig. 3) the respective ratchet gears 20 and 33 (Figs. 1 and 2) of the clutches 34 and 37 are rotated at 1200 R. P. M. and ratchet gear 41 (Fig. 2) of clutch 42 is rotated at 900 R. P. M.

Upon reception of a complete signal, comprising a start element, five signal elements of the signal proper, and a stop element, well known start-stop mechanism is released for rotation in synchronism with the received code signal elements so that the five signal elements of the signal proper, or any permutations thereof, are provided at the receiver, in accordance with the permutations of signal elements received.

Upon reception of the five signal elements, comprising a code signal permutation proper, certain of the magnets 50, 51 and 52 (Fig. 3), 53 and 55 (Fig. 4) will be energized. Upon energization of any one of the magnets 52, 51 or 52, the permutation rings 56, 57 and 58 (Fig. 7) will be released by the triggers 62 (Fig. 3) for relative rotation, to align certain of the notches 65 so that a chosen stop element 49 will be permitted to enter the aligned notches, and as the rings are operated to align these notches the stop element, previously aligned, will be cammed out of its notches and dog lift lever 48 will be released and clutch 34 will be engaged by engagement of tooth 47t (Fig. 1) and the teeth of ratchet gear 30 which, as stated above, is rotated 1200 R. P. M. Shaft 35 will therefore be rotated until dog lift lever 48 (Fig. 3) engages the newly aligned stop 49 to thereby rotatively position the clutch 34, shaft 35, and typewheel 36, in accordance with the permutation of code signals controlling the magnets 50, 51 and 52. Similarly, magnets 53 ad 55 (Fig. 4) are energized selectively, by the received code signal permutation, and permutation rings 75 and 76 (Fig. 8) will be relatively rotatively positioned to permit entry of a stop element 49 (Fig. 4) into the newly aligned notches 65, while the previously aligned stop element is cammed out of the notches and dog lift lever 48 is released for further rotation. The associated clutch 37 will be thereupon rotated until the newly selected stop is engaged by dog lift lever 48 and clutch 37 will rotate the cylindrical cam 38 (Fig. 1) to rotatively position it in accordance with the particular permutation of code signal elements controlling magnets 53 and 55.

Rotation of cylindrical cam 38 will axially position the follower 77 and slidable element 81 to thereby similarly axially position the roller 77a and grooved collar 70 attached to the typewheel 36, to axially position the typewheel in one of four axial positions, to select one of the four horizontal rings of characters (Fig. 2).

Since shaft 35 and typewheel 36 were rotatively positioned to choose one of sixteen uniformly spaced vertical columns of characters and since rotation of cylindrical cam 38 has axially positioned the typewheel to select one of the horizontal rings of characters, one character only will be selectively located in printing position and this character is that one represented by the permutation of 5-code signal elements of the signal received.

Upon energization of magnet 54, which may be designated as the print magnet, its associated clutch 42 (Figs. 2 and 4) will be released for one complete revolution, and since ratchet gear 41 (Fig. 2) which drives clutch 42, rotates at 900 R. P. M., the shaft 43 rotated by clutch 42 will also rotate at this speed.

Since shaft 35 which rotatively positions the typewheel and since cylindrical cam 38 which axially positions the typewheel are both driven at 1200 R. P. M. while shaft 43 is rotated at 900 R. P. M., regardless of which stop elements are selected, the shaft 35 and cylindrical cam 38 will always have completed their rotation and will be halted by the time the shaft 43 has completed three-quarters of a revolution. With the sequential system of signal transmission, as assumed in the instant application, the typewheel will be completely positioned even quicker with respect to the rotation of shaft 43.

As shaft 43 rotates its one complete revolution, the cams attached thereto will be also rotated, in fixed time sequence. The ribbon 110 and tape 87 will be advanced by rotation of disk cam 92 (Figs. 2 and 3), the printing hammer 112 will be cocked by cam 117 (Figs. 2 and 10) and the trigger 114 will be released to cause printing, by operation of cam 116 (Figs. 2 and 10). The intensity of impact of the printing hammer is adjusted by screw 118 (Fig. 3) and the spacing of the characters on the tape is controlled by the particular hole 96b utilized in connecting link 85 to the tape feed lever 96. After printing has been performed, the cams 66 and 66a reset the permutation rings 56, 57, 58, 75 and 76 to the normal position, preparatory to reception of the next code signal permutation, and likewise the lever 61b (Fig. 4) controlled by the print magnet 54 will be reset to the position, as indicated in Fig. 4, to engage the dog lift lever 48 and stop the single revolution clutch 42 at the end of its single revolution.

If the code signal permutation is received and is representative of the "Figures" shift function, the permutation rings will be so positioned that the cylindrical cam 38 will axially locate the typewheel in its extreme lower position and shaft 35 will so rotatively locate the typewheel that lug 73b1 of slide 73 will be engaged by the operating lug 82c of shift lever 82, when lever 82 is oscillated by roller 86a of cam 86 (Fig. 10) upon rotation of shaft 43. Slide 73 will thereby be shifted to rotate the typewheel 36 one-sixteenth of a revolution to produce the "Figures" shift

function and the permutation rings will be subsequently reset to normal position and the lever 61*b* of the print magnet 54 to the position, as illustrated in Fig. 4, by operation of the reset arms 68 and 68*a*.

If the permutation code signal received is representative of the "Letters" shift function, the permutation rings will be so positioned that the typewheel 36 will be located in its extreme upper position and so positioned rotatively that lug 73*b* on slide 73 will be engaged by operating lug 83*c* of shift lever 83, upon rotation of shaft 43 and consequent rotation of cam roller 86*b* on cam 86, to rotate the typewheel one-sixteenth of a revolution to perform the "Letters" shift function. Subsequently, the permutation rings will be returned to normal position and the lever 61*b* of the print magnet 54 to the position, as indicated in Fig. 4, by means of the reset levers 68 and 68*a*. In the two shift positions of the typewheel, there are no characters opposite the hammer 112 so that no character is printed upon the tape 87 during performance of the shift functions.

Novel printing mechanism, and novel mechanism for controlling the effectiveness of such printing mechanism are therefore provided.

While there has been shown and described and pointed out the fundamental novel features of the invention, as applied to a single embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation, may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a device of the character described, a typewheel, a printing hammer, means biasing said hammer toward said typewheel, and means for controlling the operation of said printing hammer comprising a rotatable cam, a bell-crank lever engageable with said cam at one end of said lever and with said hammer at the other end of said lever whereby upon rotation of said cam said bell-crank lever is oscillated to move said hammer against the force of said biasing means to thereby cock said hammer, latch means, means biasing said latch means towards said hammer, means on said latch means cooperating with means on said hammer to lock said hammer in cocked position, a second bell-crank lever, and cam means controlling said second bell-crank lever for moving said latch means against the force of its biasing means to release said hammer for printing operation.

2. In a device of the character described, a typewheel, a printing hammer, means biasing said hammer toward said typewheel, and means for controlling the operation of said printing hammer comprising a rotatable cam, a bell-crank lever engageable with said cam at one end of said lever and with said hammer at the other end of said lever whereby upon rotation of said cam, said bell-crank lever is oscillated to move said hammer against the force of said biasing means to thereby cock said hammer, latch means, means biasing said latch means towards said hammer, means on said latch means cooperating with means on said hammer to lock said hammer in cocked position, means opposing said latch biasing means for releasing said latch means to thereby release said hammer for impingement against said typewheel, and means constantly engaging the hammer for biasing said hammer away from said typewheel to move said hammer away from said typewheel after the printing function is effected.

3. In a device of the character described, a typewheel, a printing hammer, means biasing said hammer toward said typewheel, means for cocking said hammer against the force of said biasing means, a pivoted member, means on said member engageable by means on said hammer upon release of said cocked hammer, and means for adjusting the rotative position of said pivoted member to thereby adjust the degree of effectiveness of said hammer upon said typewheel.

4. In a device of the character described, a typewheel, a printing hammer, means biasing said printing hammer toward said typewheel, means for cocking and releasing said printing hammer to produce a printing operation, and means for adjusting the degree of effectiveness of said printing operation comprising a bell-crank, means pivotally mounting said bell-crank at one end thereof, a threaded member on the other end of said bell-crank, means cooperating with said threaded member to oscillate said bell-crank about its pivot, a member on said bell-crank extending toward said hammer, and means on said hammer abutting said member upon release of said cocked hammer, said member being adjustable in position between said means on said hammer and said typewheel, upon said oscillation of said bell-crank.

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