Dec. 31, 1940. E. E. KLEINSCHMIDT 2,227,141

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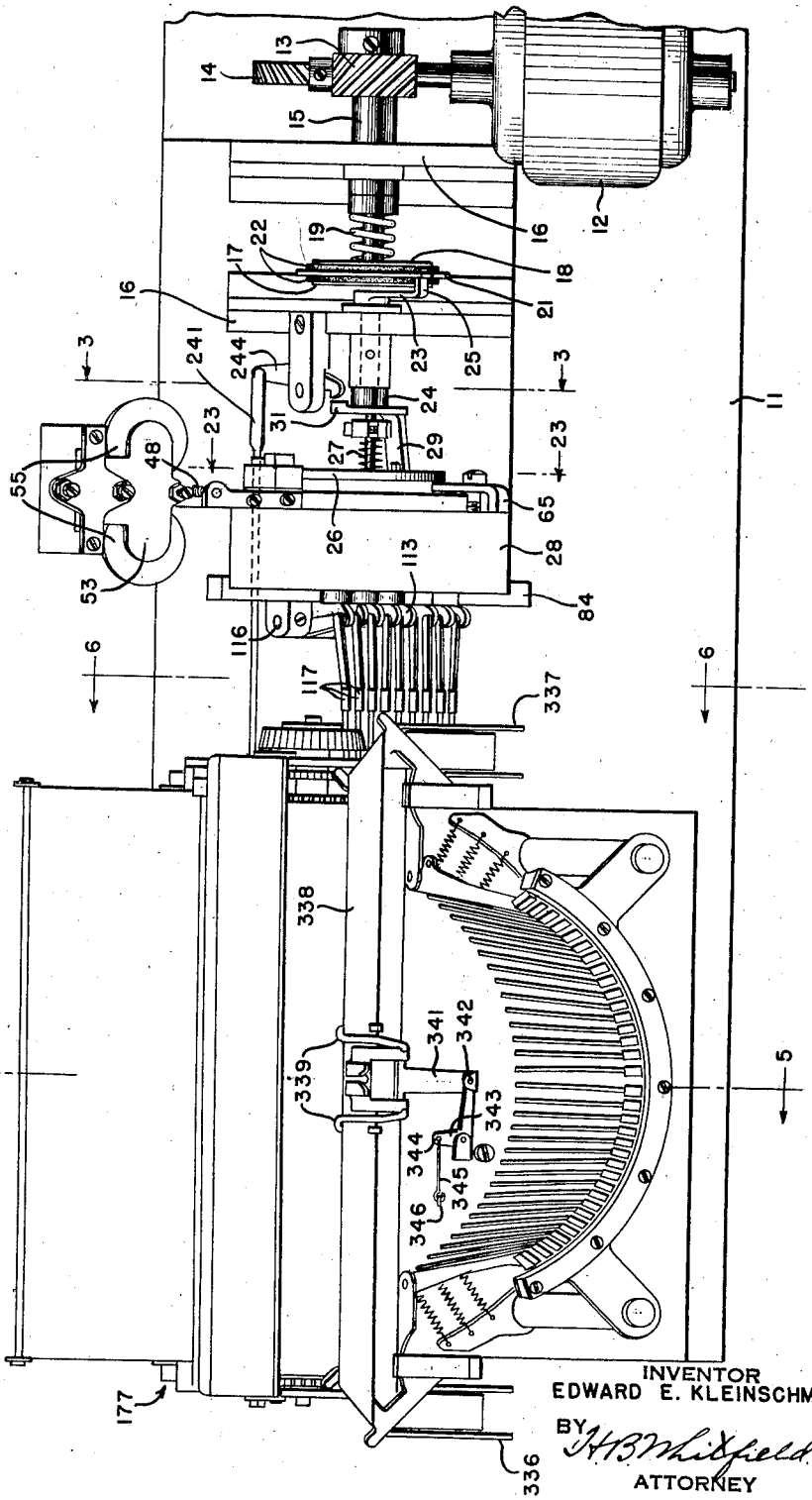


FIG. 1

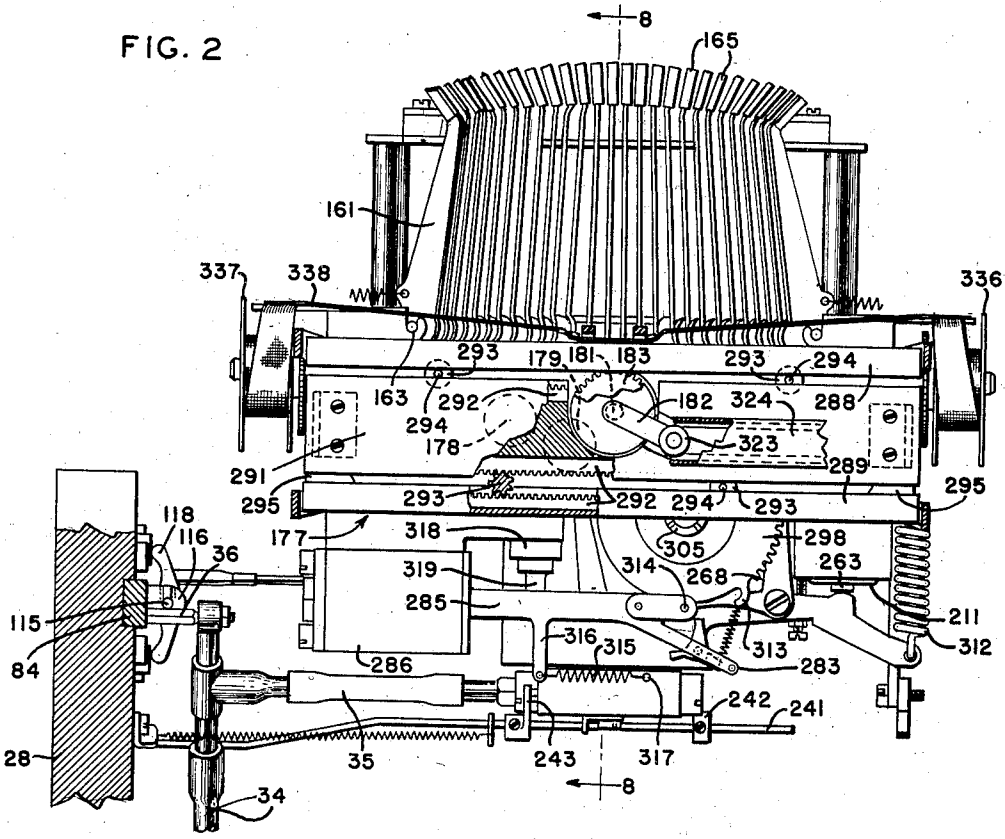
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FIG. 2



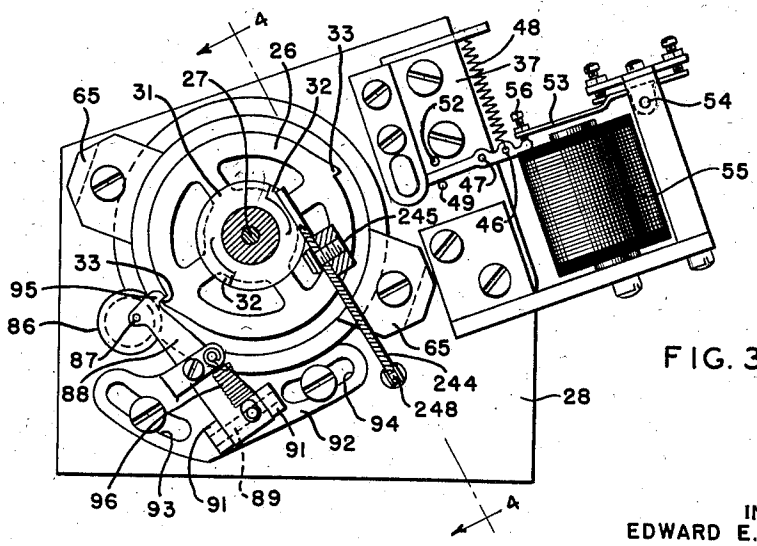


FIG. 3

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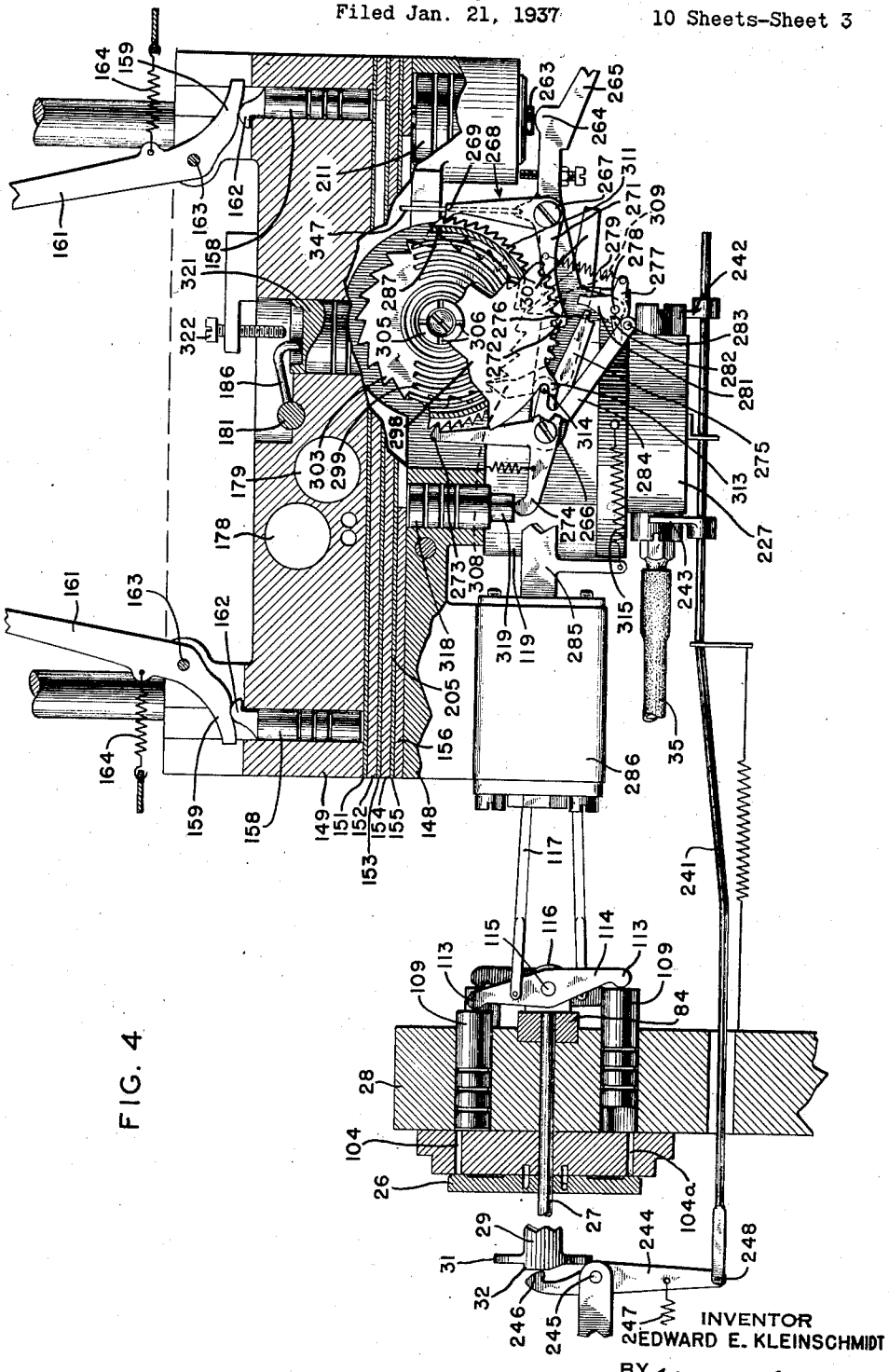


FIG. 4

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FIG. 5

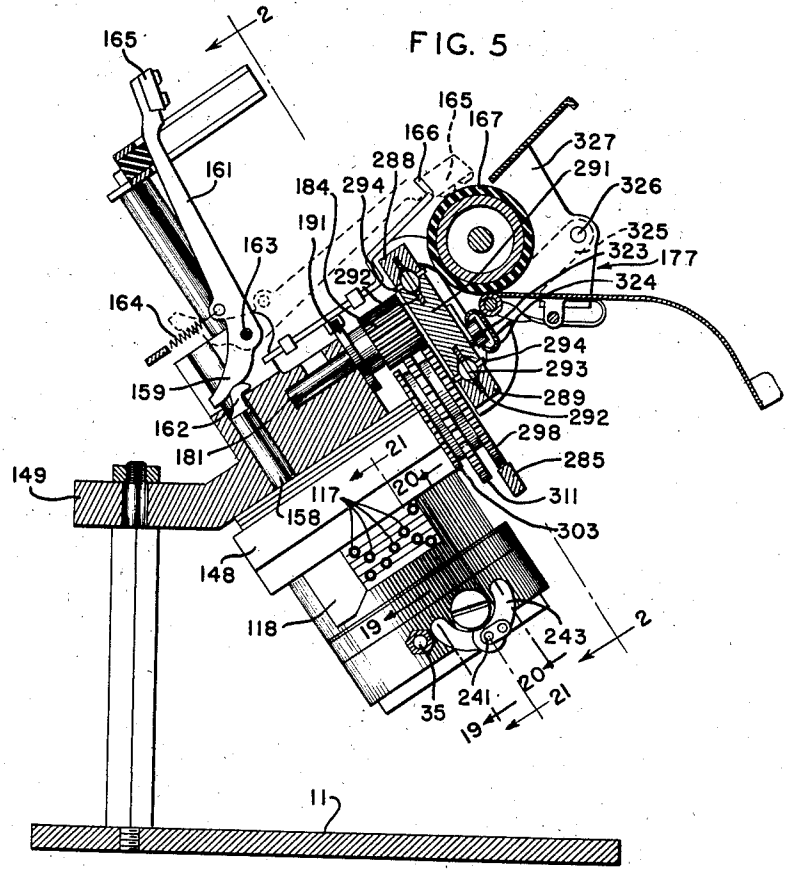
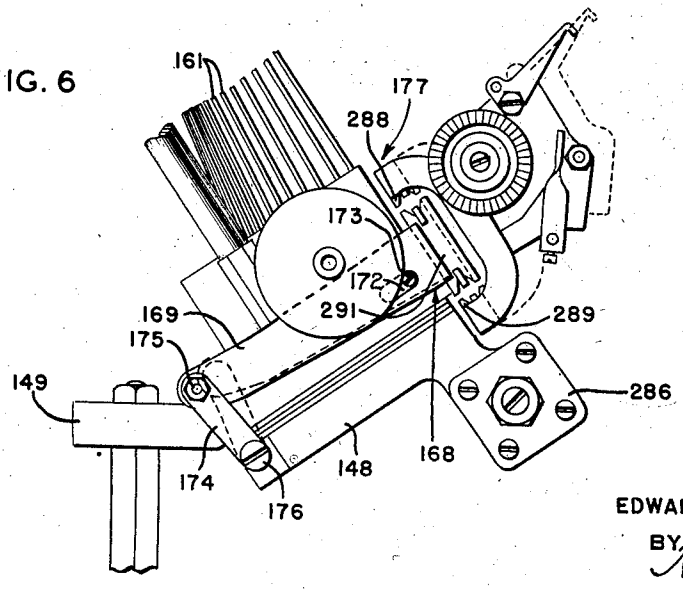


FIG. 6



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FIG. 8

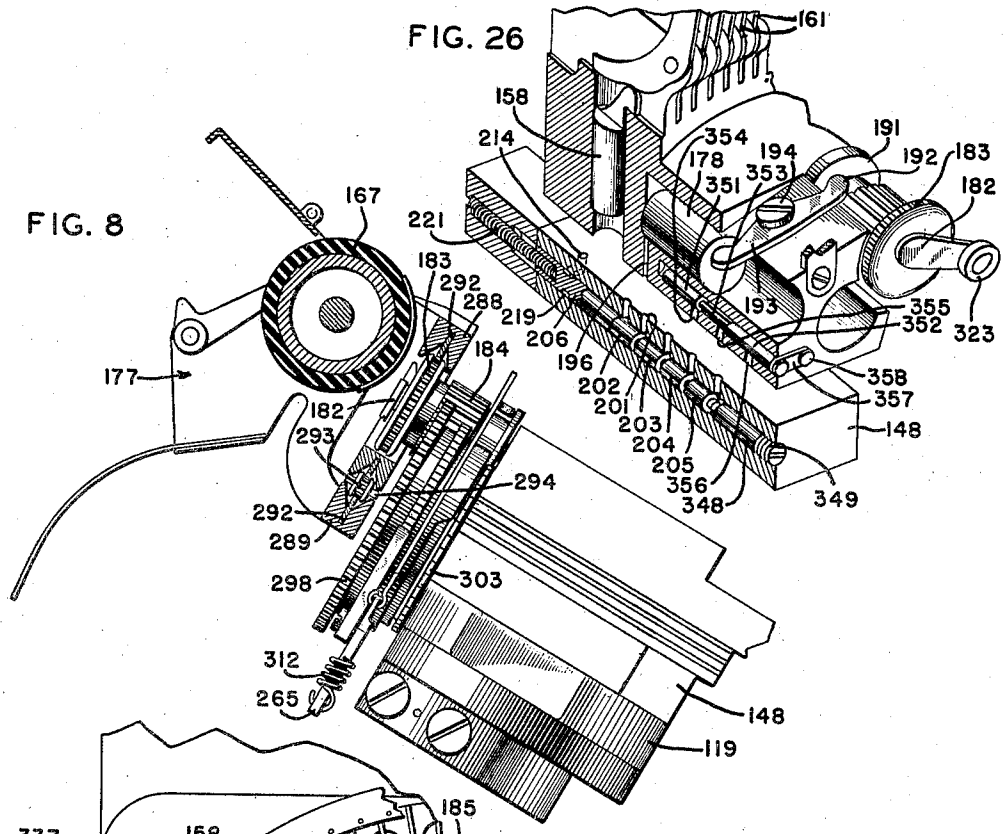
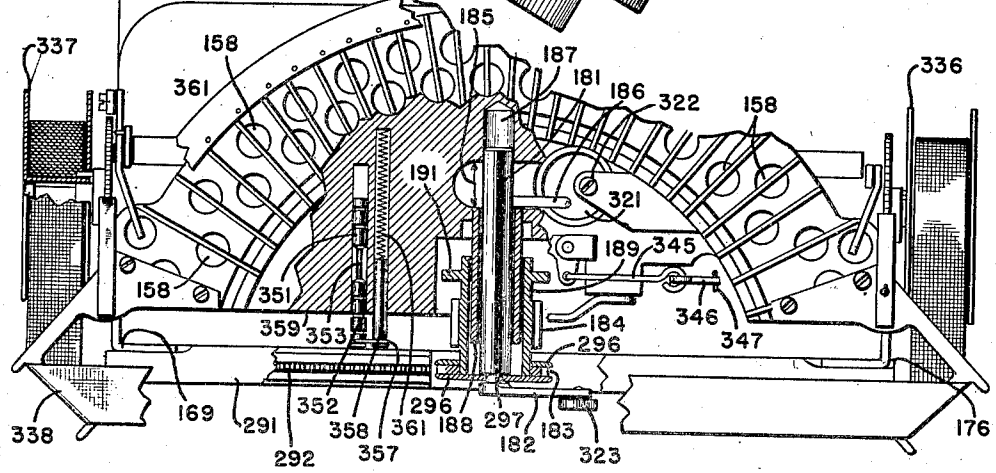


FIG. 7



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FIG. 24

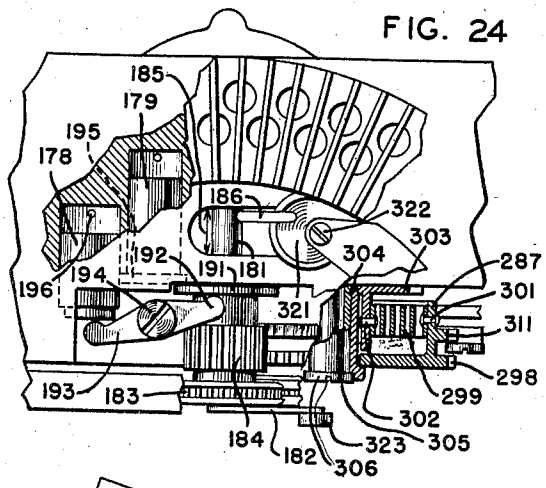
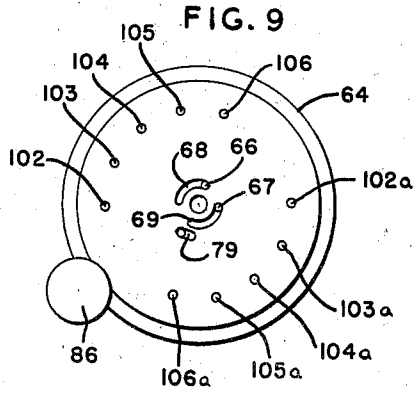


FIG. 9



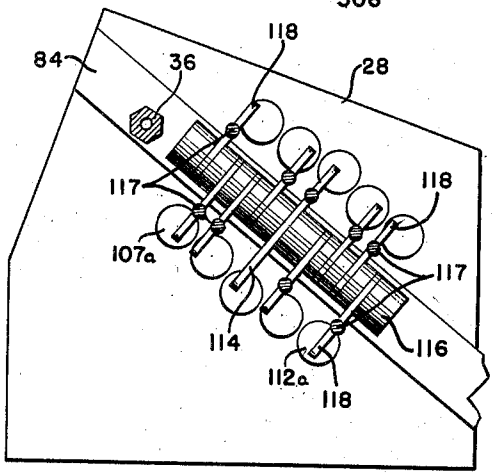


FIG. 22

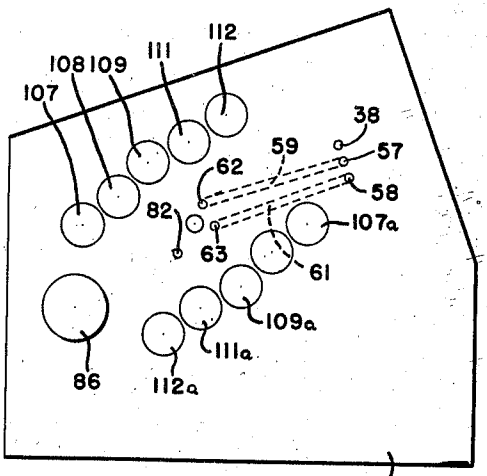


FIG. 23

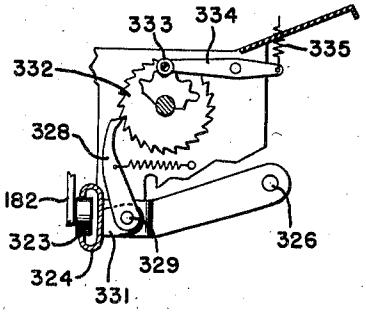


FIG. 27

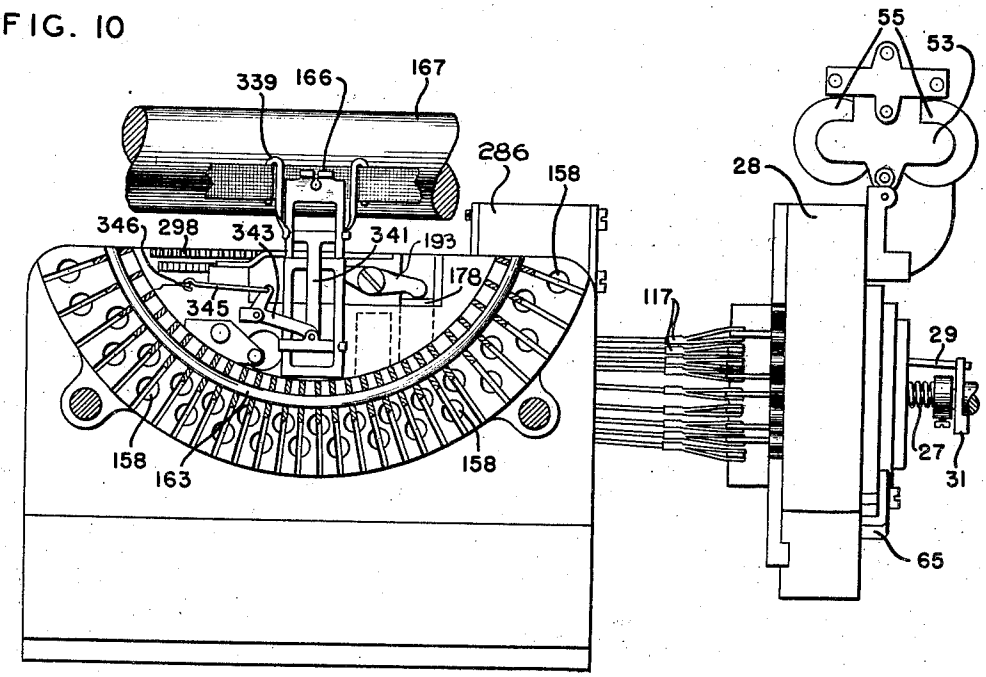
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FIG. 10



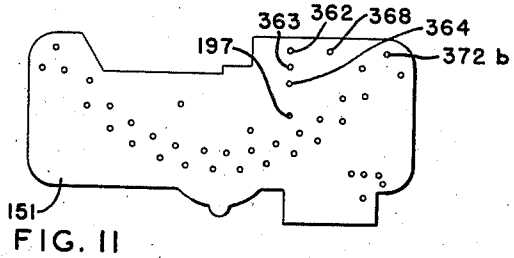


FIG. 11

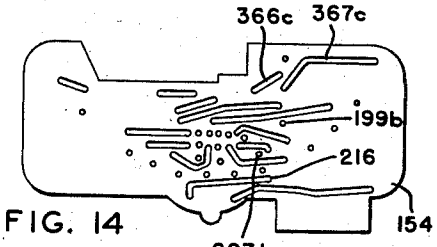


FIG. 14

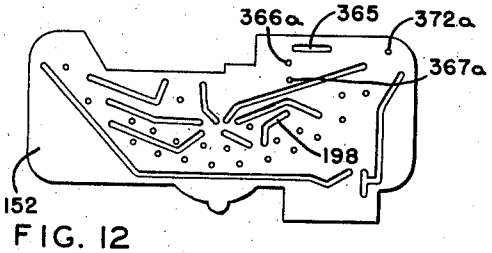


FIG. 12

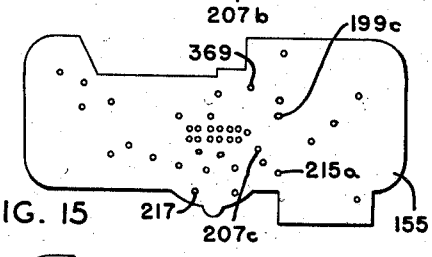


FIG. 15

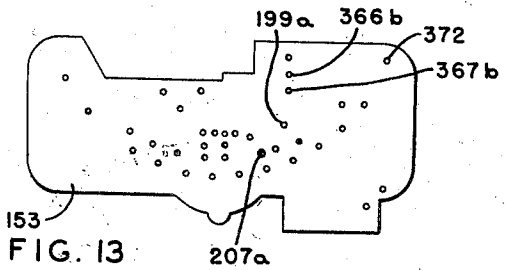


FIG. 13

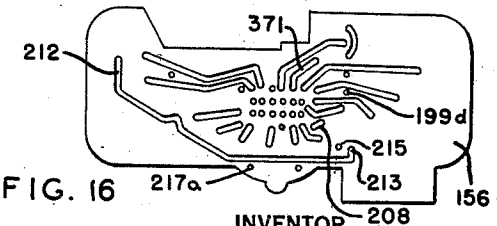


FIG. 16

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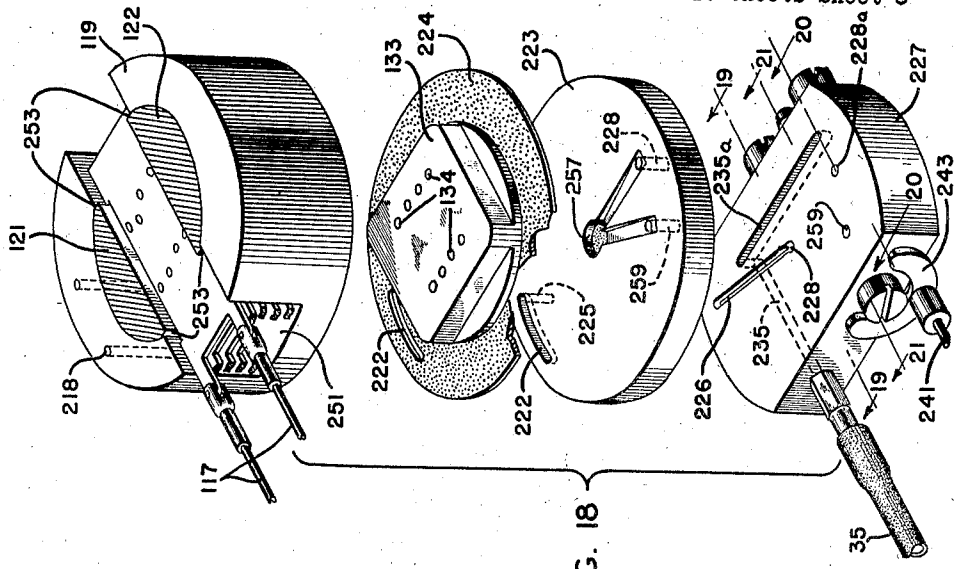


FIG. 18

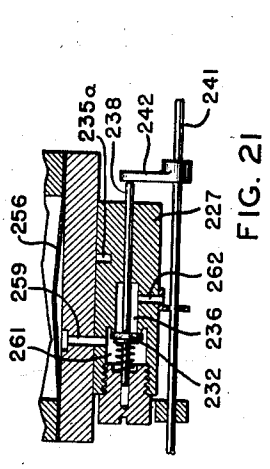


FIG. 21

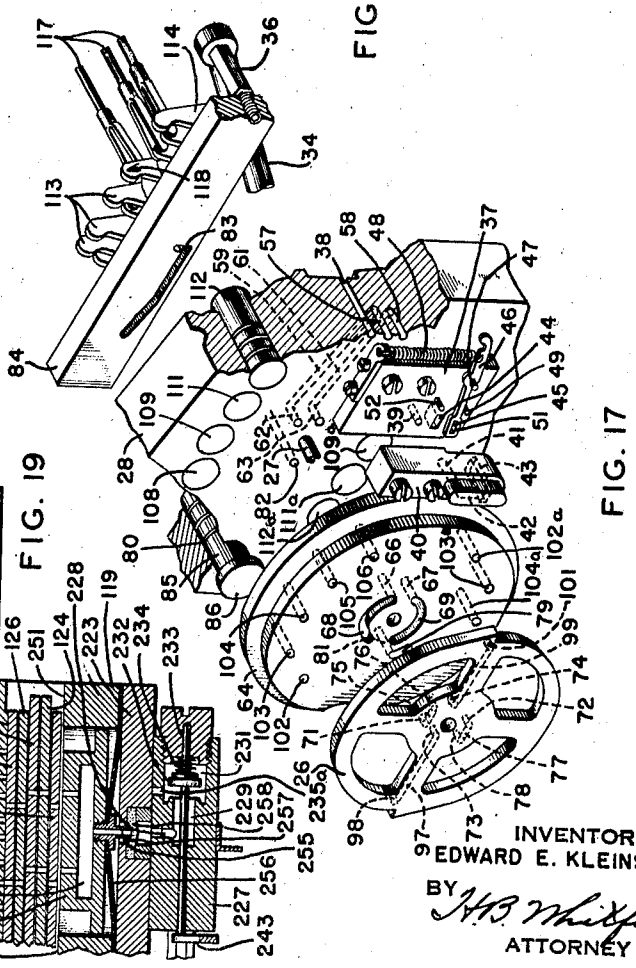


FIG. 17

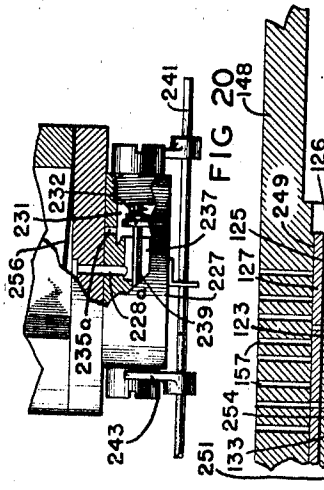


FIG. 20

FIG. 19

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FIG. 23A

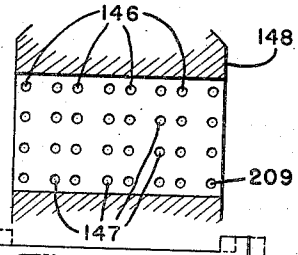


FIG. 23B

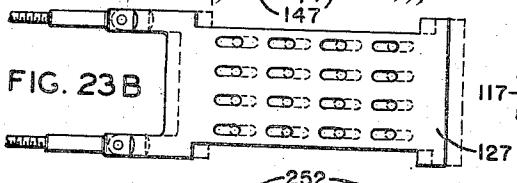


FIG. 23C

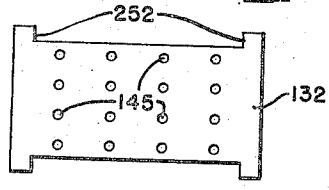


FIG. 23D

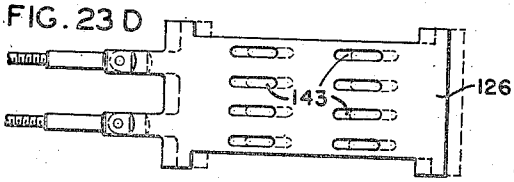


FIG. 23E

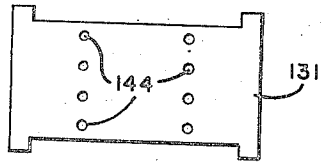


FIG. 23F

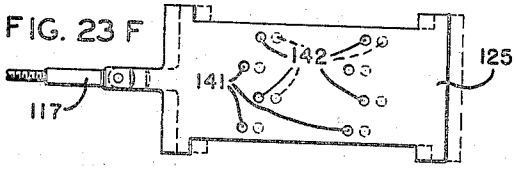


FIG. 23G

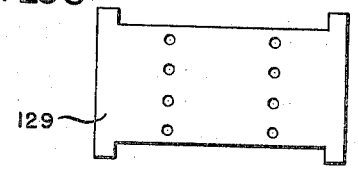


FIG. 23H

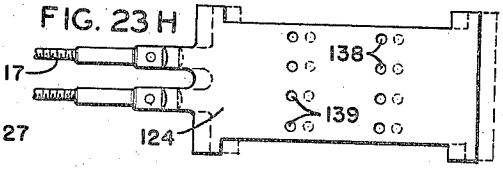


FIG. 23I

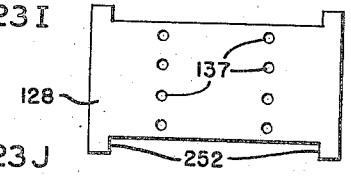


FIG. 23J

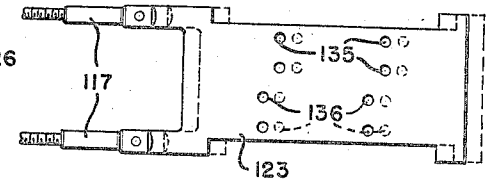
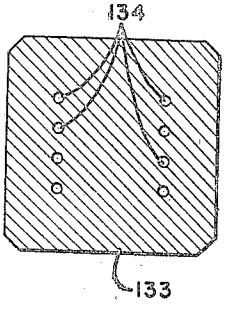


FIG. 23K



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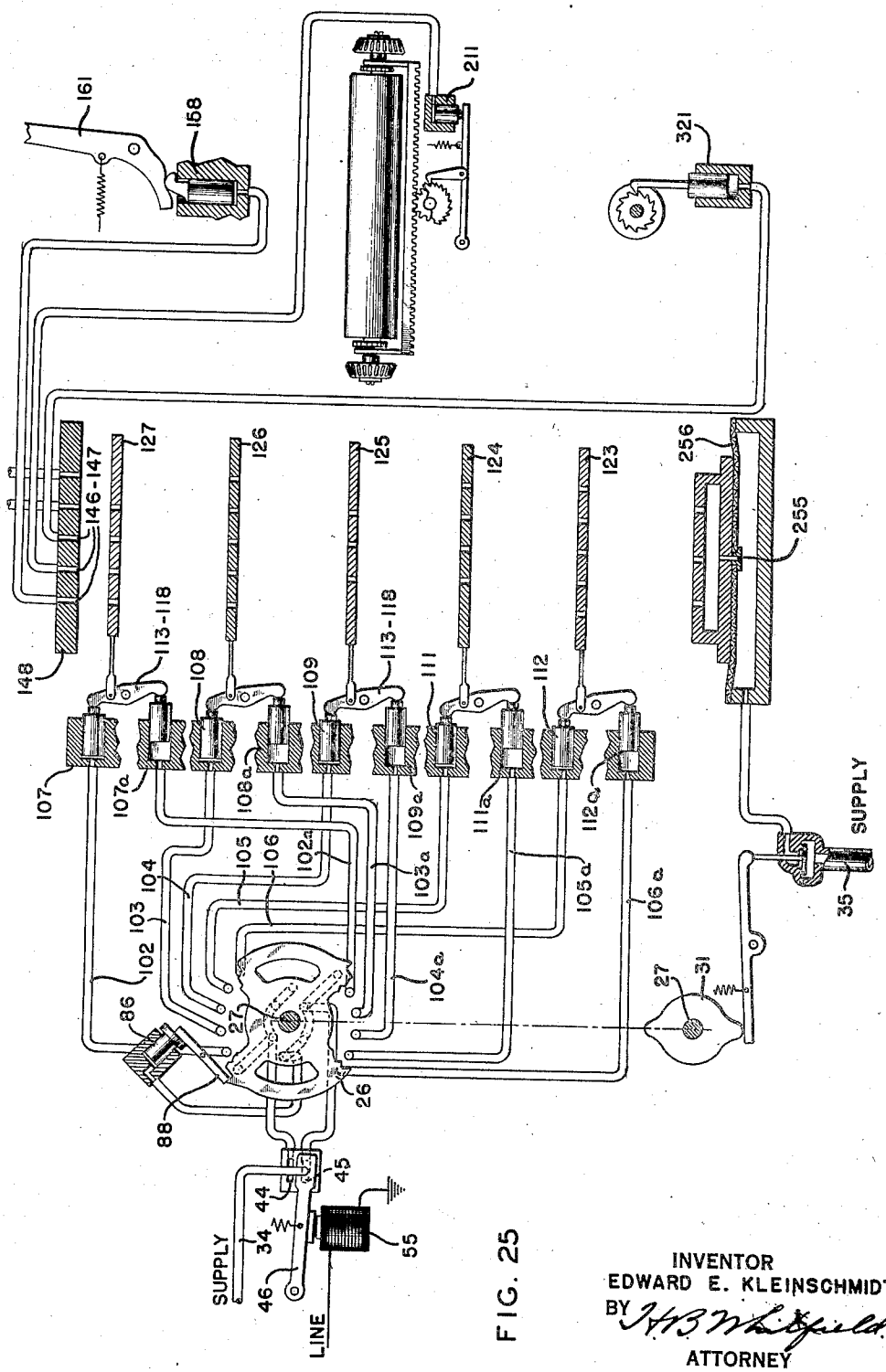


FIG. 25

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2,227,141

UNITED STATES PATENT OFFICE

2,227,141

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Edward E. Kleinschmidt, Highland Park, Ill., assignor to Teletype Corporation, Chicago, Ill., a corporation of Delaware

Application January 21, 1937, Serial No. 121,520

24 Claims. (Cl. 178—25)

The present invention relates to telegraph apparatus and more particularly to telegraphically controlled printing devices employing pneumatic actuating mechanism under the control of electrical signals.

An object of the present invention is to provide a printing telegraph apparatus in which pneumatic actuating and control mediums are employed to perform its several functions, and in which the distribution of fluid surges for performing the various control functions is supervised by a pneumatic distributing element under pneumatic impulses.

Another object of the invention is the provision of a receiving printer operated pneumatically, which is simple and reliable, and which includes a minimum of parts for the performance of its several functions.

In the attainment of these and other objects of the present invention there are contemplated several mechanical embodiments concerning carriage return and line feed mechanisms, pneumatic selector apparatus, and pneumatic distributing organs utilizing a single revolution for the performance of two complete cycles of supervision and operation. Fluid pressure is generated at a central distribution source whence it is led to the distributing organ and to a control valve which supervises a pneumatic selector mechanism.

The fluid passing through the distributing organ is released during rhythmically regulated surges through certain channels for effecting synchronism of a principal operating shaft through which the distributor mechanism is controlled. Through certain other channels, surges are admitted selectively for conditioning for operation one piston of a pair of sets of selector pistons whose ultimate function is the positioning of a corresponding set of plates. In accordance with the plate arrangement, each is provided with a certain distribution of openings or channels which cooperates with the openings of its adjacent plates to result in the establishment of a continuous path between a source of fluid supply originating with the aforementioned selector branch of fluid supply and an ultimate destination comprised of one of the type actuating pistons or one or another of the auxiliary function actuating pistons.

A salient feature of the present invention is the provision of pneumatically operative mechanism for executing all of the incidental functions to page printing, viz., line feed, carriage return, etc., which mechanism is capable of initiating said incidental functions during the same cycle in which the signal relating to such function is received by the printer receiving and distributing apparatus.

A more comprehensive understanding of the present invention may be obtained by referring to the accompanying drawings and to the following detailed description wherein like reference characters are employed to designate corresponding parts throughout and wherein

Fig. 1 is a plan view of a page printing mechanism having pneumatically actuated control organs which are supervised by means of conventional telegraph transmitting apparatus;

Fig. 2 is a transverse sectional view with portions broken away taken on an oblique angle indicated by the section line 2—2 on Fig. 5;

Fig. 3 is a detail elevation showing the central operating shaft of the distributing organ in section. The location of this figure is indicated by the section line 3—3 on Fig. 1;

Fig. 4 is a transverse sectional view through the distributing organ and printing mechanism taken on an oblique sectional line indicated 4—4 on Fig. 3;

Fig. 5 is a cross-sectional view taken approximately on line 5—5 of Fig. 1;

Fig. 6 is a detailed end elevation of the shiftable carriage mechanism viewed from a line in the proximity of line 6—6 illustrated in Fig. 1;

Fig. 7 is a plan sectional view with portions broken away of the printing unit base casting;

Fig. 8 is a fragmentary transverse sectional view taken approximately on line 8—8 of Fig. 2;

Fig. 9 is a detail elevational view of the distributor face plate;

Fig. 10 is a sectional plan view of the unit featuring the ribbon shift mechanism;

Figs. 11 to 16, inclusive, are plan details of distribution channel plates and partitioning shims for routing the selector ducts from the selector mechanism to their respective actuating bellows;

Fig. 17 is an exploded perspective view of certain elements of the pneumatic distributor featured in connection with the present disclosure;

Fig. 18 is an exploded perspective view of several elements comprising the pneumatic selector mechanism featured in connection with the present invention;

Fig. 19 is a transverse sectional view taken approximately on line 19—19 of Figs. 5 or 18;

Fig. 20 is a sectional detail view taken approximately on line 20—20 of Figs. 5 or 18;

Fig. 21 is a sectional detail view taken approximately on line 21—21 of Figs. 5 or 18;

Fig. 22 is an end elevation of the distributor block;

Fig. 23 is a view reverse to that of Fig. 22 featuring the rear of the distributor block;

Figs. 23A to 23K are a group of figures featuring the selector plates illustrated in the selector mechanism of Fig. 18;

Fig. 24 is a fragmentary plan detail view featuring the operating mechanism for the carriage shift and line feed;

Fig. 25 is a diagrammatic pneumatic circuit illustration in which the several elements are representatively illustrated by symbolic conventions;

Fig. 26 is a detail isometric view of certain of the mechanism revealed by cutting transversely the base and main castings; and

Fig. 27 is a fragmentary detail view of the line feed mechanism associated with the carriage platen.

Referring particularly to the accompanying drawings, the reference character 11 indicates a base or floor plate upon which the several units constituting the present apparatus are mounted. A motor 12 through worm wheel 13 drives a worm gear 14 which is secured upon a driven shaft 15 journaled in one of the frame standards 16. An end disc 17 is secured to shaft 15 and in opposition thereto, a companion disc 18 is urged by a spring 19, frictionally gripping therebetween a driving disc 21, on each side of which is a friction washer 22, as best indicated in Fig. 1. An L-shaped arm 23 is secured to the driven shaft 24 and its horizontally bent portion 25 extends into a notch located in the periphery of driving disc 21. Thus while shaft 15 is positively driven by the motor 12, shaft 24 may yield frictionally when the disc 21 is made to slip between the friction washers 22.

The object ultimately driven is a distributor plate 26 which is free to rotate upon a stub shaft 27 anchored in the distributor block 28. Motion is communicated from driven shaft 24 to plate 26 through the medium of a coupling bar or crank arm 29 which is integrally formed with a cam disc 31 secured to and rotatable with shaft 24. Since the distributor mechanism is designed to perform two complete operations for each rotation, its several moving organs are provided with symmetrically duplicated portions. Accordingly, cam 31 may be noted to have two side cam projections 32, see Fig. 3, which control the operation of a set of periodically operated pneumatic valves, while distributor plate 26 is provided with two stop lugs 33 for enabling the system to be arrested at the termination of either of its phases or cycles.

Distribution system

As may be noted from Figs. 9 and 17, the rotatable plate 26 and the distributor plate 64 are provided with several arteries for connecting a common source of fluid supply with each of a plurality of distributive ducts or channels. The central distribution point from which supply fluid is obtained is indicated in Fig. 2 by the reference character 34. From this source, one branch indicated 35 communicates with the selector unit. Fluid pressure issuing over this branch seeks out a selected alignment of openings, as will be indicated hereinafter, and ultimately operates a pneumatic piston for performing a printing function or a collateral operation.

Another branch indicated 36, see also Fig. 17, carries fluid supply from source 34 to the proximity of the adjunct distributor block 37, Fig. 17. Branch 36 continues through a hole 38 in block 28, thence through a transverse opening 39 in the adjunct block 37. From this point the passageway is doubled back through the ducts 41 and 42 and slot 43 of an end block 40 to reenter the block 37. The reentrant orifice of slot 43 is presented in alignment with a mid-point between a pair of opposite slots 44 and 45 of block 37. The passageway connecting said slots is controlled by a shuttle lever 46 pivoted at 47 and urged by a spring 48 into its counterclockwise extremity, as viewed in Figs. 3 and 17, which position is limited by a stop pin 49. When in this position, an opening 51 at one end of lever 46 aligns and connects the slot 43 with the lowermost slot 45 of the pair of slots 44 and 45, while at the same time isolating the upper slot 44.

During its alternative position, lever 46 is limited by a stop pin 52. The movement of lever 46 into this position is actuated by an armature 53 pivoted at 54 and influenced by a magnet 55. The foremost portion of armature 53 is provided with an adjustment screw 56 which engages one end of lever 46, urging the latter in opposition to its return spring 48. It may be noted, Figs. 3 and 17, that during the energized condition of magnet 55, common slot 43 is in communication with the upper slot 44, while during the deenergized condition of magnet 55, the common slot 43 is associated with the lower continuation slot 45. Beyond the adjunct distributor block 37, the continuation slots 44 and 45 align with a pair of ducts 57 and 58, whence the channelway proceeds a short distance inwardly and then leftwardly, see Figs. 17 and 23, over courses 59 and 61, doubling back and emerging through ducts 62 and 63.

A stationary face plate 64, Figs. 9 and 17, is securely held against the surface of block 28 by a pair of anchor clips 65, Fig. 3. Through the plate 64 there continue a pair of ducts 66 and 67 which align with the emergent ducts 62 and 63 of block 28. Upon the foremost surface of face plate 64 the passageways thus far traced develop into a pair of arcuate channels 68 and 69 of symmetrical formation, which register alternately with two sets of openings in the distributor plate 26, one set of which is indicated by the reference characters 71 and 72, and the other set by the reference characters 73 and 74.

Opening 71 doubles back through a U-shaped artery 75, exiting at 76, while opening 72 doubles back through a similar U-shaped artery 77, exiting at 78. The exit openings 76 and 78, during the rotation of distributor plate 26, successively encounter a short arcuate recess 79 in the face plate 64. Continuing from the recess 79, there is provided a channel 81 which registers with a continuation channel 82 in distributor block 28. After emerging from distributor block 28, the channel continues leftwardly across a ridge 83 formed in the surface of a pivot supporting bar 84. The ridge 83 terminates at a point in communication with a piston chamber 80 in block 28 within which the start-stop piston 85 resides. Thus it may be observed that the passageways just traced provide operating fluid for actuating the start-stop release piston 85, whose function is the release of distributor plate 26 in timed relationship with received telegraphic signals.

Piston 85 is provided with an enlarged piston head 86 which acts against a projecting pin 87, Fig. 3, located at the extremity of release pawl 88. The latter is pivoted upon a transversely extending shaft 89 supported in a pair of ears 91 integrally formed with a radially adjustable sector

block 92. As may be noted from the arcuate configuration of slots 93 and 94, sector block 92 is capable of being radially adjusted within the limits afforded by slots 93 and 94, and in accordance with the position thereof the stop tooth 95 of release pawl 88 may be varied angularly to afford a means of orientation or adjustment of the stop position of distributor plate 26. It is noted that stop lugs 33 are disposed to encounter stop tooth 95 during each half revolution which, in terms of the distributor mechanism, corresponds to a cycle of operation. Release pawl 88 is urged into its effective or stopping position by a spring 96 against whose influence the piston 85 operates in response to a cyclic fluid pulsation at the proper time interval for controlling the synchronism.

Referring again to the rotatable distributor plate 26, attention is directed to the openings 73 and 74, the former of which connects through a transverse duct 97 with a re-emergent opening 98, while the latter similarly connects through a transverse duct 99 with a re-emergent opening 101. Each of the openings 98 and 101 during its movement radially about shaft 27, encounters in successive sequence a pair of sets of five openings indicated 102, 103, 104, 105, and 106, which extend through the face plate 64. Each of the openings 102 to 106, of which there are two series disposed in diametrical opposition, registers in alignment with a piston chamber associated with a corresponding series of pistons indicated 107, 108, 109, 111, and 112 (Fig. 23).

Recalling again that flutter lever 46 determines the admission of operating fluid to one or the other of the arcuate recesses 68 and 69, it will be noted that the distribution of operating fluid is accordingly routed alternatively to one of the pistons 107 to 112 or to its diametrically opposite pistons, 107*a* to 112*a*. As a result of this arrangement, it will be noted hereinafter that the selection and movement of a selector plate 123 to 127, under the control of pistons 107 to 112 and 107*a* to 112*a*, is at all times effective positively by one of its diametrically opposite pair of pistons in contradistinction with a conventional or heretofore known practice or construction employing spring return means for the selector plates, or in contradistinction with a conventional practice employing a common cyclically actuated return means.

Selector apparatus

Having particular reference now to Figs. 2, 4, 19, and 23A to 23K, it will be observed that the selector pistons 109 and 109*a* (Fig. 4) being diametrically opposed about the axis 26, are connected to the disc terminals 113 of levers 114 pivoted at 115 upon a shaft which passes through the several spacing ears 116 which are integrally formed with the pivot supporting bar 84. The actuation of a lever 114 and hence the positioning of its corresponding selector plate is under the control of the pair of pistons 109 and 109*a*. Fig. 22 shows how the central single connecting lever 114 is associated with the pair of pistons 109 and 109*a* while half length levers, associated in pairs, jointly serve the other pairs of pistons 107—107*a*, 108—108*a*, etc.

One selector plate indicated in Fig. 23F is distinguishable by reason of its single connecting rod 117. Other selecting plates indicated in Figs. 23B, 23D, 23H, and 23J each are provided with a pair of connecting rods 117, and the pairs of levers 118 thereof, see Fig. 17, are provided with but single disc terminals 113 each. This mode of construction is convenient because the remaining selector plates, excepting the one indicated in Fig. 23F, are movable into each of their alternative positions by pistons 108, 111, 112, etc., not in transverse alignment but offset from the axial center 27, as best indicated in Figs. 22 and 23.

The course of fluid pulsations for actuating the selector pistons 108, 109, etc., will now be described. It will be recalled that the fluid supply obtained from source 34 is led over a branch 36, branch 38, etc., to the proximity of the shuttle valve 46 where, in response to a marking or current condition on a line, magnet 55 is energized and accordingly communication is established between slot 43 and opposite slot 44 for directing the fluid pressure over the aforedescribed channels to the recess 68. In response to spacing or no-current condition, on the other hand, with the magnet 55 deenergized, communication is established by shuttle valve 46 between common slot 43 and opposite slot 45, causing fluid pressure to be communicated through the several described avenues to the arcuate channel 69.

Each opening 73 and 74 is in communication, during successive cycles, with the channels 68 and 69 alternatively when, during the course of a cycle distributor plate 26 rotates 180°, the re-emergent openings 98 and 101 traversing and communicating with the chambers of the pistons 108, 109, etc., through the intermediate series of openings 102, 103, etc., and 102*a*, 103*a*, etc. Accordingly, during each radial position of distributor plate 26 when, for example, re-emergent opening 98 is in alignment with the upper face plate opening 102, then re-emergent opening 101 is in alignment with lower face plate opening 102*a*; when re-emergent opening 98 registers with upper opening 103, re-emergent opening 101 registers with lower opening 103*a*, etc.

As a result of this condition of alternative alignment, fluid supply distributed by shuttle lever 46 is communicable alternatively over the two aforedescribed courses so that either an upper or lower of a pair of pistons 108, 109, etc., is in each instance positively actuated by the introduction of a fluid surge. The opposite or non-energized piston of each pair is mechanically restored by its associated lever 114 or 118, and as this occurs the displaced fluid is forced back through an opening 102, 103, etc., and the other portion of the course including the various channels and openings 99, 62 or 63, 59 or 61 through the opposite slots 44 or 45 not in communication with the fluid supply source. Thus, as one of the alternative courses functions in the capacity of a pressure supply conduit, its alternative one functions in the capacity of a bleeder outlet.

The selector mechanism comprises essentially a cylindrical housing 119, Figs. 4, 5, 8, and 18, into which there protrudes a pair of cylindrical sectors 121 and 122. Between the sectors 121 and 122 there are arranged the stack of selector plates 123, 124, 125, 126, and 127, while intervening the aforedescribed selector plates are the foraminated spacer shims or partitioning elements 128, 129, 131, and 132. In surface engagement with the first selector plate 123 is the distributor block 133, Figs. 18 and 23K, which consists essentially of a rectangularly topped block having eight openings 134 arranged in two parallel alignments of four each. As the bottom selector plate 123 is shifted into its alternative positions as indicated in Fig. 23J, there may be brought into registration with

the corresponding openings 134 of block 133, the upper set of four openings 135 or the lower set of four openings 136, each set being registerable with its particular openings 134 to the exclusion of the other, and as each set is brought into registration, it is also made to register with the openings 137 of the spacer shim 128 which at all times are in alignment with the block openings 134.

Each set of openings 135 or 136 is divided into two columns of two openings each, and by means of the selector plate 124 which is positionable alternatively, the communication of the alignment of openings may be continued alternatively with the right or left-hand pair or column of openings 138 or 139. Thus the positioning of plate 124 selects two of the four openings 135 or 136 for continued communication thereafter through the partitioning shim 129.

On the other side of the partitioning shim 129 there is located the selector plate 125, Fig. 23F, whose two groups of openings are alternately staggered so as to present left side openings 141 and right side openings 142. Thus, in accordance with the positioning of plate 125, a further determination may be made for selecting between the remaining two classes of openings, determined by the preceding selector plate 124, thus restricting the passageway to but a single opening through the partitioning shim 131. Selector plates 126 and 127 differ from the previously described selector plates by reason of their having elongated openings 143 designed to register in the first instance, for example, with the openings 144 of partitioning shim 133 and openings 145 of the partitioning shim 132.

In one of the positions of plate 126, the openings 143 establish communication between the holes 144 and the holes 145 in the first and third vertical columns of shim 132, counting from the left of Fig. 23C, while during its alternative position, as indicated in dotted outline in Fig. 23D, the openings 143 establish communication between said holes 144 and the openings 145 of shim 132 of its second and fourth vertical columns. In the same manner that selector plate 126 enlarges the class of selective possibilities of the openings in shim 131, so also does selector plate 127 enlarge the class of selective possibiliites of shim 132, making them alternatively communicable with the rows of openings 146 or 147 of the base casting 148.

It will be noted that by means of the five selector plates 123 to 127 there may be selectively established thirty-two individually attainable routings which terminate at one of the openings 146 or 147 in the base casting 148, the operating fluid originating at the distributor block 133.

Routing scheme

Viewing now Figs. 4, 11 to 16, and 19, it will be observed that base casting 148 has a milled face conforming in outline to the lower surface of the main frame casting 149. Between base casting 148 and the frame casting 149 there may be noted a number of thicknesses of sheet metal indicated 151 to 156. Of these, the ones indicated 152, 154, and 156 are somewhat thicker than the others and are provided with variously extending canals which serve to distribute, route, or expand the thirty-two original emergent openings 157 of base casting 148 to connect them with divers outlying channels and openings in the frame casting 149 and also in other portions of the base casting 148, as will be indicated more particularly hereinafter.

The intervening elements 151, 153, and 155 constitute partitioning shims which define the aforementioned canals in the relatively thicker elements and which afford additional openings for connecting and promoting the distribution of the canals transversely to contiguous elements. This plate sandwich construction affords a mode of distributing and expanding a large number of minute conduits without having to perform complex drilling or other expensive machining operations.

The several elements are superimposed upon each other as best indicated in Fig. 4, and the continuation of each selective channelway may be traced by observing the relative location of the openings in the elements 151 to 156; the final distribution of the traversing channelways being manifest by the openings in the top shim 151 which is assembled contiguous to the under surface of frame casting 149. Here it will be noted that the major portion of the openings are aligned to form two arcuate groups. These coincide in position to the arrangement of the chambers which house the type bar actuating pistons 158, see especially Fig. 10.

Printing and case shifting

The pistons 158 each are disposed beneath a tail projection 159 of a type bar 161, Figs. 4 and 5, and by means of their flat vane heads 162, each is adapted to cam its type bar tail portion 159 about the arcuate pivot rod 163, causing the particular type bar to be rocked against the action of an individual return spring 164. As may be noted from Figs. 2 and 5, each type bar 161 carries at its extremity a type carrying block 165 customarily equipped with upper and lower case characters. The arrangement of type bars 161 is arched, as best indicated in Figs. 1 and 10, and upon being pivoted about the common pivot rod 163, the type block 165 of each type bar 161 may be brought into printing engagement at a focal point above the centering guide 166. In the normal or unshift position, the lower character of each type block 165 is adapted to come into printing engagement with the paper carried upon a printing platen 167, as indicated in dotted outline in Fig. 5, but by shifting the entire platen carrying carriage, as indicated in dotted outline in Fig. 6, a different printing engagement is effected, bringing the platen 167 into printing alignment with the upper character of each type block 165.

In shifting outwardly, the platen carriage is movable as a unit and is supported upon a bail 168 (Fig. 6), having the side arms 169 and 171 on each of which there is provided an elongated slot 172 through which there protrude movement limiting pins 173. Parallel movement is constrained by reason of the links 174, one of which is pivoted at the end of each arm 169 and 171 at the pivotal point indicated 175 and secured to the base casting 148 upon pivot screw 176. Being supported at an inclination, the carriage assembly, generally indicated by the reference character 177, tends to gravitate into the position featured in solid lines, Fig. 6, but definite control over this function is exercised by a pair of actuating pistons indicated 178 and 179, Figs. 2, 4, and 24.

Upon the introduction of operating fluid into the chamber of piston 179, it is urged outwardly, carrying with it the longitudinally shiftable stub shaft 181 and the latter's several appurtenances which include the line feed arm 182, the spacer

gear 183, and the pinion 184. As may be noted from Figs. 7 and 24, shaft 181 is longitudinally movable throughout a distance corresponding to the width of the transverse space 185 because within this space is confined the pin 186 which extends perpendicularly of shaft 181. In addition to being journaled at 187 within the main casting block, the shaft is also pivotally borne within a supporting sleeve 188 which protrudes inwardly of the collar 189 which is integral with the aforementioned pinion 184.

Also formed with collar 189 is a flange 191 against the face of which there rests the disc terminal 192 (Fig. 24) of a first-class lever 193 pivoted on a shoulder screw 194. Against the rear face of flange 191 there is adapted to urge the enlarged head 195 of piston 179, while against the end of lever 193 opposite disc 192 there urges the foremost portion of piston 178. It may be noted that upon the actuation of piston 178, lever 193 is rocked counterclockwise about pivot 194, Figs. 24 and 26, forcing the flange 191 as well as shaft 181 and its appurtenances rearwardly into the so-called unshift position whereat pin 186 occupies the rearmost portion of transverse space 185. Through piston 179 the assembly is moved forwardly by the engagement of enlarged head 195 of piston 179 with flange 191 shifting the carriage into its so-called shift or upper case printing position. The actuation of either piston 178 or 179 serves, through flange 191 and lever 193, to restore its alternative piston into its normal or non-actuating position.

During the procedure of the following description, the pneumatic circuits of certain ones of the functions will be traced from the source of fluid supply to their ultimate destinations and from these it may be understood how divers type actuating and collateral printing functions may be accomplished through the medium of the thirty-two primary selectable ducts which may be recognized in the rectangular grouping of openings in the partitioning element 156, Fig. 16, and in the base casting 148, Fig. 23A, which is contiguous to said partitioning element 156. For convenience in tracing the various routes, the descriptions in some instances will proceed in the reverse order beginning with the destination and coursing back through the selectable openings 146 or 147, their immediate source of origin.

Miscellaneous supervision

In Fig. 26, a duct 196 leads from the chamber of piston 178, through opening 197, Fig. 11, canal 198, Fig. 12, and openings 199*a*, 199*b*, 199*c*, and 199*d* of the partitioning elements 153, 154, 155, and 156, respectively, Figs. 13 to 16, to the opening 201, Fig. 26, which aligns with a groove between the contiguous pistons 202 and 203 of a series of contiguous pistons which also include the ones indicated 204, 205 and the ultimate valve piston 206. Taking up again at canal 198, the course is traceable to opening 207*a*, 207*b*, and 207*c* to a short canal 208 of partitioning element 156, Fig. 16, which aligns opposite the selectable opening indicated 209, Fig. 23A.

When a selective fluid surge is received through opening 209, therefore, fluid pressure is communicated on the one hand to the chamber of the unshift piston 178, and on the other hand to the space intervening the contiguous pistons 202 and 203. As has been said, the contiguous pistons 202 through 205 are arranged in tandem and the endmost one 202 abuts a valve 206. It is the function of valve 206 to control, by repressing, the issuance of an operating fluid surge which executes a space or character feed operation. In its normal position, piston valve 206 is disposed so that an annular groove 219 therein aligns with and therefore connects a pair of openings 214, one of which is indicated in Fig. 26 and the other of which is similar and parallel thereto and preferably equidistant but opposite the section line upon which Fig. 26 has been taken, and which traverses the valve chamber of pistons 202 to 206, permitting fluid to pass from one to the other as will be described later. At certain times, however, under the control of any one of the tandem pistons 202 to 205, the valve piston 206 is shifted against the influence of its return spring 221, displacing the annular groove 219 so that it is out of alignment with the pair of openings 214, cutting off the fluid path thereat and preventing operating fluid from continuing on to the space actuating piston 211, Fig. 4.

The circuit for accomplishing the spacing function may be traced from the chamber of piston 211, Figs. 2 and 4, through the canal 212, Fig. 16, which aligns at 213 opposite one of the pair of openings 214. The other of the pair of openings 214 aligns with an opening 215 in partitioning element 156, Fig. 16, 215*a* in partitioning shim 155, Fig. 15, and a channel 216 in partitioning element 154, Fig. 14. Channel 216 extends transversely and aligns with an opening 217 in partitioning shim 155 and an opening 217*a* in partitioning element 156. The opening 217*a* continues downwardly through the base casting 148 and may be seen again as the transverse opening 218, Fig. 18, which extends through the cylindrical housing 119, to a trough 222 formed in the distributor disc 223 and preferably also in the gasket 224.

From here the path is traceable through the transverse opening 225 of the distributor disc 223, groove 226 in a bottom plate 227, to the central opening 228. The central opening 228 communicates with a chamber 229, best seen in Fig. 19, which connects with the central compartment 231 when the valvular disc 232 on valve rod 233 is withdrawn, as indicated in Fig. 19, against the tendency of compression spring 234. The central compartment 231 is an enclosure into which operating fluid is continuously admitted over duct 235 and groove 235*a* from the aforedescribed supply branch 35, Figs. 18 and 19.

Bottom plate 227 is an element secured to the distributor disc 223 and its central compartment 231 is communicable with two chambers 229 aforedescribed and 237, Fig. 20, which resembles chamber 229. Chamber 236, Fig. 21, does not communicate with the pressure supply compartment 231 but instead with an aperture 261 connected over duct 259 with the space underlying the elastic diaphragm 256 discussed later. Each of the chambers 229 and 237 may be shut off from the central compartment 231 by its valvular disc 232 which is carried upon its valve rod 233, or 239, in the manner already described. The administration of operating fluid for certain purposes thus is supervised within the bottom plate 227 and moreover, the control is effected by means of a single control rod 241, see also Figs. 2, 3, and 4.

This control rod 241, Figs. 20 and 21, carries secured to it a single finger bracket 242 and a double finger bracket 243, the former extending

upwardly at the rear of bottom plate 227 and engaging the protruding end of a valve rod 238 and the latter extending upwardly in front of bottom plate 227, Fig. 18, and presenting each of its fingers to align with one of the rods 233 and 239. Accordingly, when control rod 241 is pushed forward, as is its condition in Figs. 19 and 20, valve rods 233 and 239 are shifted longitudinally against the action of their individual springs 234, opening communication between the central compartment 231 and their respective chambers 229 and 237 and closing the valve 232 of chamber 236, but when rod 241 is pulled back, valve rods 233 and 239 are permitted to seal while valve rod 238 is opened by single finger bracket 242. The opening of the valve in chamber 236, Fig. 21, affords an avenue of escape to fluid from beneath the diaphragm 256 over duct 259, compartment 261, chamber 236, and bleeder hole 262.

Probing fluid is introduced into the space, beneath diaphragm 256 and thereafter to the openings in plates 123 to 127, under the control of valve stem 239, Fig. 20. This element acting concurrently with the letter space controlling valve stem 233, Fig. 19, admits fluid under pressure to the space over the course which includes compartment 231, chamber 237, and duct 228a.

The longitudinal shifting of control rod 241 is executed by a follower lever 244, Figs. 1, 3, and 4, to which it is connected at 248, and which is pivoted at a stationary pivotal point 245, and whose follower projection 246 is urged by a spring 247 into engagement with the side cam projections 32 of cam disc 31. In this manner, the actuation of the valves in bottom plate 227 will be recognized as having cyclic performances under the supervision of the invariable and regular actuation of cam disc 31.

Recalling now that the aforetraced letter spacing function is periodically stimulated by the action of rod 241 through valve 233, it will be apparent that this control, as well as others to be explained hereinafter, are among those periodically initiated by the distributor mechanism, except for the intervention of the tandem controlled valve 206, Fig. 26, which represses the letter spacing function under certain predetermined circumstances.

Referring again to the details of the selector mechanism featured in Figs. 18 to 21, and 23A to 23K, it will be recalled that the set of selector plates 123 to 127 are supported between the cylindrical sectors 121 and 122 which are shown as being integrally formed with the base casting 148. In Fig. 18, these sectors are illustrated as extending into the cylindrical housing 119 and, for the sake of exposing the inner construction, as having been severed from the base casting 148. Between the sectors 121 and 122 are slidably housed the several selector plates 123 to 127 and their intervening foraminated shims 128 to 132. Sufficient space intervenes the bottom space 249 of base casting 148 and the top surfaces 251, Fig. 19, of cylindrical housing 119 to permit of an easy and unrestricted freedom to the several selector plates 123 to 127 so that they may be shifted without resistance between their positions, as indicated in solid and broken lines in Fig. 23B, 23D, 23F, 23H, and 23J. The shims 128 to 132 are not thus shiftable because their shoulders 252 define snugly the corner walls 253 of the cylindrical sectors 121 and 122. A selecting fluid is introduced through block 133 into the openings at the extreme surface of selector plate 123 which, probing its several possible avenues of communication, percolates through one alignment of openings 135, 136, 137, etc., until it reaches its ultimate destination, a type bar actuating piston or other function performing pneumatic device.

In the introduction of the selecting fluid, there is employed the already described floating distributor block 133, as indicated in Fig. 19, comprising an enclosure which chambers snugly within the cylindrical housing 119 and which has a central vault 254 with which communicates the already described openings 134 on the upper side of distributor block 133 and the valvular nozzle 255 on the bottom side. The chamber within which distributor block 133 is supported is of such depth as to permit of some vertical movement on the part of distributor block 133. An elastic diaphragm 256, whose periphery is secured air-tight between the distributor disc 223 and the cylindrical housing 119, is pierced by the valvular nozzle 255 sealed and secured to the latter and screw fitted into the bottom wall of distributor block 133. The foremost portion of nozzle 255 may be noted as extending downwardly into a recess 257, Figs. 18 and 19, of distributor disc 223 so that in the absence of buoyant fluid influences, distributor block 133 tends to precipitate to the bottom of the inner chamber of cylindrical housing 119, burying the nose of valvular nozzle 255 into an elastic disc 258 thereat which, under such conditions, seals its channel from the adjacent space.

In a manner to be described later, selecting fluid is introduced first into the area beneath elastic diaphragm 256. In rapid sequence, the pressure built up in this space raises distributor block 133, compressing the several selector plates 123 to 127 and binding them against fluid leakage and simultaneously valvular nozzle 255 is withdrawn sufficiently to permit its nose to clear the elastic disc 258. Thereupon the fluid under pressure enters through the central opening of valvular nozzle 255 and the central chamber 254 to probe the selecting openings 135, 136, 137, etc., and ultimately to operate a piston relating to a particular selection.

In the position illustrated in Fig. 3, the rotatable distributor plate 36 and its contemporaneously movable cam disc 31 are at rest. When the initial fluid impulse actuates release pawl 88, starting the assembly carried by shaft 27 into clockwise rotation, follower lever 244 rides off side cam projection 32 permitting its spring 247 to rock said lever 244 clockwise, as viewed in Fig. 4. This shifts control rod 241 leftwardly, withdrawing double finger bracket 243, which had been depressing its valve rods 233 and 239, and moving single finger bracket 242 into position to depress its valve rod 238. As a result of this change of position, the probing and operating fluid is cut off from entering into chambers 229 and 237 from the central compartment 231 while at the same time the previously accumulated fluid pressure, which is found in the space beneath the diaphragm 256 as well as in the central chamber 254, will be dissipated out into the atmosphere through the opening 259, Fig. 21, front chamber 261, inner chamber 236, and bleeder hole 262.

It follows, therefore, that during the interval represented by the angular distance between the side cam projections 32 of cam disc 31, the aforedescribed selecting fluid pressure is withheld from the selector plates 123 and 127 as well as from the space beneath elastic diaphragm 256. Accordingly, during this interval, the selector plates are not frictionally restrained and may be shifted in

accordance with a new setting following which the oncoming side cam projection **32**, acting through follower lever **244**, control rod **241**, and double finger bracket **243**, reestablishes the originally described condition at which time valve rods **233** and **239** are depressed, admitting fluid pressure from central compartment **231** into the selector operating chambers just described as well as to the spacing piston **211**. The latter route may be interrupted, however, on the contingency that piston valve **206** has been shifted by one of the contiguous pistons **202** to **205** as has been described above.

Letter spacing

Spacing piston **211** is provided at its foremost end with a node **263** which engages the hump **264** of a lever **265** pivoted at **266**. At **267** lever **265** pivotally carries the bell crank **268**, one arm of which terminates with a feed tooth **269** and another arm **271** of which is rounded at **272**. Also, pivoted upon the pivot screw **266** is a three-armed lever, one arm of which constitutes a retaining pawl **273**, one arm of which constitutes a piston follower **274**, while the third arm **275** is disposed beneath the rounded end **272** of pawl arm **271** and terminates with a shouldered extremity **276**.

A latch lever **277** is pivoted at **278** upon the downwardly extending projection integrally formed with the lever **265**. One arm of latch lever **277** is connected by means of a coil spring **279** with a spring post on arm **271** of bell crank **268**, while another arm **281** of latch lever **277** extends upwardly and is prepared to move into latch position behind the shoulder **276** of third arm **275** of said three-armed lever. In this, lever **277** is withheld when arm **275** of three-armed lever **273—274** maintains the position in which it is shown in Fig. 4. Another arm **282**, also integral with latch lever **277**, extends sidewardly and lies in the path encountered by a pin **283** secured in the downwardly and rightwardly extending terminus **284** of a dashpot plunger **285**, Figs. 2 and 4. The latter, pivotally secured to a check valve in the dashpot housing **286**, acts to cushion the final movement of the carriage return mechanism which will now be described. In this manner latch lever **277**, being placed into a carriage return initiating condition under the control of a signal and maintaining this condition until the carriage is in fact so returned, performs as a protracted stimulus for a function whose response is inherently dilatory.

Carriage return

The transverse shiftable carriage **177**, Figs. 2, 4, 5, and 8, comprises essentially a pair of rack bars **288** and **289** between which there is received the rack beam **291**. In the illustrated manner of construction, hardened strips **292** are inserted in both rack bars **288** and **289** as well as in rack beam **291**. Between opposing strips **292** there are freely carried the pinion rollers **293**, see especially Fig. 2. Each roller comprises an intermediate pinion which meshes with opposite ones of the strips **292**, adjacent flange sections which are beveled to conform with the recesses on both sides of the strips **292**, and stub shafts **294** which protrude between the space intervening each of the rack bars **288** and **289** and their intermediate rack beam **291**.

At each end of the lowermost transverse shiftable carriage **177** is a stop **295** for limiting the movement of the carriage in its respective direction, but the movement of the carriage in either direction is propelled by the aforedescribed spacer gear **183** which is freely journaled upon stub shaft **181**. Gear **183**, see especially Fig. 7, is constructed in the same manner as is each of the pinion rollers **293** having the side flanges **296**, the foremost one of which is provided with a relatively smaller opening, adapted to fit the reduced section **297** of shaft **181** and to confine thereby the assembly including pinion **184** and flange **191** against longitudinal displacement with respect to shaft **181**.

Meshing with the strips **292** of the upper rack bar **288**, gear **183** is instrumental in moving the carriage assembly rightwardly and leftwardly and in this capacity is actuated by the large driving gear **298** whose periphery is partially studded with teeth that mesh with the aforedescribed pinion **184**, see Figs. 2, 5, and 8. Pinion **184** is of considerable width in order that the teeth of large driving gear **298** may be maintained in mesh both during the shift and unshift positions of the carriage assembly **177** whose movement is coincident with that of shaft **181**, sleeve **189**, and therefore pinion **184**.

Large driving gear **298** is part of an assembly which includes a drum **287**, Fig. 2, for housing a carriage return spring **299**, see also Fig. 28. One end of spring **299** is secured as at **301**, Fig. 24, to the drum **287**, while its other end is secured to a sleeve **302** which is integrally formed with a ratchet wheel **303**. The latter is provided with an opening into which there fits the flat sided extremity **304** of a sleeve **305**, the foremost end of which protrudes as may be seen in Fig. 4, with a recessed head having in its face the screw driver notches **306**. Ratchet wheel **303** is prevented from rotating counterclockwise, in accordance with the urge of wound involute spring **299**, because of the intervention of a latch pawl **307** which is formed with a pair of ratchet teeth **308** and **309**. By rocking pawl **307** counterclockwise about its pivot, tooth **308** may be withdrawn from engagement with the ratchet wheel, but by the same movement tooth **309** is moved into position to encounter an oncoming ratchet wheel tooth in escapement manner. So too, during the clockwise movement of latch pawl **307**, when its tooth **309** is withdrawn from engagement with ratchet wheel **303**, the other tooth **308** thereof is concurrently moved into position to intercept an oncoming ratchet wheel tooth. The reciprocation pawl **307** alternately permits ratchet wheel **303** to pass one of its teeth by the latch teeth **308** and **309** and in this manner an overwound condition of spring **299** may be intermittently dissipated until a desired tension is attained.

A predetermined residual force is stored in spring **299**, but during the successive spacing operations of piston **211**, additional force is stored in the spring when bell crank **268** is reciprocated, engaging as it does so, consecutive teeth of a flange ratchet **309** integrally formed with drum **287**. When air is admitted to the chamber of piston **211**, the latter is forced downwardly, engaging with its node **263** the hump **264** of lever **265**, rocking the latter clockwise about its pivot **266** and against the tendency of its return spring **312**, Fig. 2. This carries bell crank **268** downwardly, ratcheting its tooth so as to engage another of the teeth of flange ratchet **311**. Thereafter when piston **211** is permitted to return, spring **312** rocks lever **265** counterclockwise causing bell crank **268** to rotate flange ratchet **311** and the carriage spring

assembly counterclockwise as viewed in Figs. 2 and 4. As this is done, the teeth of large drive gear 298 meshed with pinion 184 imparts a single space movement to the carriage which is driven by the rack gear 183, and at the same time there is stored additional kinetic force in spring 299.

As gear 298 is being moved counterclockwise, a hook 313, Fig. 2, formed on the periphery thereof is withdrawn from engaging a transverse pin 314 carried by the dashpot plunger 285. The latter is inclined to follow hook 313 for a predetermined distance under the influence of its restoration spring 315 which connects depending arm 316 with the spring binding post 317. After plunger 285 has been withdrawn from dashpot 286 its full extent, the continued rotation of large driving gear 298 causes hook 313 to recede, as indicated in Fig. 2, and thus continues to do in accordance with the width of line which is being printed or in terms of the carriage return mechanism, in accordance with the linear movement of the carriage 177.

When a carriage is released in a manner which will be described later, gear 298 is freed to rotate clockwise under impetus of spring 299. At a point in its travel, hook 313 encounters transverse pin 314 of dashpot plunger 285 and the momentum is instantly checked by the cushioning effect of the dashpot 286. When all of the fluid in dashpot 286 has escaped, its bar 285 will have receded into the position illustrated in Fig. 4, at which time hook 313 may assume a relative position, also as illustrated in this figure. Thus it will be understood that the dashpot 286 functions to check the final portion of travel of carriage return gear 298 so that its spring 299 may not cause a violent impact.

For initiating the carriage return function, there is provided a special piston indicated 318 having a node 319 which rests against the upturned end of piston follower 274. When this piston is actuated and accordingly moved downwardly, it causes three-armed lever 273—275 to be rotated counterclockwise about pivot 266 withdrawing retaining pawl 273 from the teeth of flange ratchet 311, and engaging with its arm 275 the rounded portion 272 of arm 271, in this manner withdrawing the feed teeth of bell crank 268 from engaging with flange ratchet 311. Accordingly, the actuation of piston 318, by withdrawing both the feed pawl and the holding pawls 268 and 273 from engaging with flange ratchet 311, permits the entire assembly including gear 298 to respond to the urge of the involute spring 299 and rotate in a clockwise direction until, as aforedescribed, its hook 313 encounters the dashpot plunger 285. The introduction of a fluid impulse into the chamber of piston 318 is supervised in accordance with one of the code combinations or settings of the selector plates 123—127.

While the time interval during which the carriage return signal is receivable, and manifest as a mechanical response, is in fact essentially brief and of such extent only as would suffice to effect one of the printing mechanism operations, means has been provided in the embodiment of the latch lever 277 for prolonging, as a stored impulse, the carriage return signal, permitting the more rapid and continuous distribution of received signals while yet giving to a slower responding instrumentality (the carriage return mechanism in the instant case) a controlling stimulus commensurate in duration to its peculiar requirements.

Another function, the details of which are illustrated in Fig. 4, is the line feed operation, and for this the piston 321 is actuated by being forced upwardly throughout a distance which may be regulated by an adjustable stop screw 322. In so doing, the engagement of piston 321 with pin 186 causes to be rocked counterclockwise, Fig. 4, the stub shaft 181 which at its foremost portion carries the aforedescribed line feed arm 182, Fig. 2. Observing now Figs. 2, 5, 26, and 27, it will be noted that upon the end of line feed arm 182 there is freely pivoted a follower roller 323 which rides within a channel bar 324 situated within the carriage unit 177. Channel 324 is carried upon end arms 325 which are pivoted at 326, Fig. 5, on side walls 327 of the carriage assembly. A feed pawl 328, Fig. 27, is pivotally secured at 329 to a supporting bracket 331 which is integral with the channel 324. As the channel 324 is rocked about the pivots 326, it forces pawl 328, during the counterclockwise movement, to engage a subsequent tooth in a ratchet wheel 332 associated integrally with the platen 167, and during its clockwise movement to advance printing platen 167 and its assembly one tooth distance which corresponds to a line feed distance on the periphery of said platen.

A detent roller 333 carried at one end of a jockey lever 334 is urged by spring 335 against the teeth of ratchet wheel 332, or if preferred, a star wheel having teeth which align longitudinally with the teeth of ratchet wheel 332 may be employed for this purpose which serves to maintain the platen in regular line feed adjustment.

The direct mechanical connection between line feed piston 321 and the feed pawl 328 operable in the same manner during both the shift and unshift conditions of the carriage as well as the relatively short action required on the part of shaft 181 and its associated parts accounts, it is believed, to a major extent for the relatively instantaneous response of the line feed apparatus as a result of which no momentary storage device such as lever 277 in the case of the carriage return, is required. Accordingly, this function too, is made to perform within the cyclic span of its initiating signal.

An ink ribbon is supported upon a pair of reels 336 and 337 which alternately serve as winding and unwinding reels in the manner of conventional ribbon advancing devices. The ink ribbon 338 traverses the proximity of the printing locus but is designed to normally assume a position aback the point at which the type bars strike the platen so as to afford visibility even to the most recently printed characters on the platen. For this purpose, the printing ribbon 338 is threaded through a pair of guides 339 which are carried by a vertically shiftable plate 341. Pivoted to the plate 341 at 342 is a bell crank lever 343 and at 344 a link 345 connects bell crank lever 343 with one arm of a secondary bell crank lever 346, see Figs. 1, 4, 7, and 10. The other arm of bell crank 346 is connected by means of a link 347 with an anchored pivot carried by lever 265.

It will be recalled that lever 265 is reciprocated during each printing operation or other function except in those instances which are controlled by valve 206. Accordingly, the reciprocation of lever 265 is utilized through the aforedescribed mechanical train to shift the ribbon guides 339 into and away from the printing locus. Thus,

there is provided a means for exposing at all times for observation that portion of the printing platen which carries the most recently printed subject matter. For the purpose of advancing the inking ribbon, it is well known to provide ribbon feed mechanism which is alternatively operable in opposite directions under the supervision of an apparatus which may be alternately changed by a taut condition of the ribbon after it has been completely unwound.

Attention is directed again to Fig. 26 which features the space feed mechanism control valve **206**. Here it will be noted that intervening contiguous ones of the pistons **202** and **205** is an annular space which is provided as a result of spacer nodes, one of which terminates each piston. An endmost plug **348** is threaded to the base casting **148** at **349** and affords a space between itself and the piston **205**.

Above, and by chance in parallel alignment with, the cylindrical opening which supports the series of pistons **202** to **206** is a smaller cylindrical opening within which there is housed a valve comprising a rear piston **351** and a fore piston **352** connected by a relatively thin link **353**. Three duct openings communicate with this chamber which are indicated **354**, **355** and **356**. The foremost portion of fore piston **352** is grooved and thereby is connected by a yoke **357** with a plunger **358**. The latter extends into a cylindrical opening which parallels the valvular opening just described and behind plunger **358** there resides a coil spring **361**, Fig. 7, which in urging plunger **358** forwardly communicates a similar tendency to the valvular assembly **351—352** by means of the yoke **357**.

Case shift

As may be noted from Fig. 7, which is shown with the carriage in shift position and rack beam **291** spaced away from the front face **359** of base casting **148**, spring **361** urges the assembly outwardly, to the extent indicated, only when the carriage is shifted. Coincident with this occurrence, the annular space surrounding thin link **353** is made to align with the openings **355** and **356**, Fig. 26, whereas at other times when the assembly is maintained inwardly, the annular space surrounding thin link **353** connects opening **355** with opening **354**. The three openings just mentioned coincide with the openings **362**, **363**, and **364** of partitioning shim **151**, Fig. 11. In partitioning element **152**, Fig. 12, opening **362** coincides with one end of a channel **365**, while openings **363** and **364** extend through openings **366***a* and **367***a*, Fig. 12, and **366***b*, and **367***b*, Fig. 13, and connect with the channels **366***c* and **367***c* of partitioning element **154**, Fig. 14.

Channel **365** connects with an opening **368** in partitioning shim **151** and thereafter the course leads to the chamber of an operating piston in the manner of the general class of operating pistons heretofore described, but as will be shown, this paticular operating piston has been designed to respond exclusively to an assigned signal only if preceded by a shift signal. There occur special functions which are usually operable only upon infrequent occasions, and where a system is limited in its total selective possibilities, it is herewith disclosed how in a pneumatic operating mechanism those certain functions may be assigned a selecting signal qualified or preceded by a shift signal, where the principal selecting signal unaccompanied by a shift signal has already been utilized for performing another and perhaps more convention function.

Thus, as has been said, in the unshift condition, Fig. 26, valve **351—352** connects opening **355** with opening **354**, whereas during the shift condition, the same valve connects opening **355** with opening **356**. Opening **355** has been traced above as far as partitioning element **153** where it is manifest as opening **366***b*. In partitioning element **154**, it connects with a channel **366***c* which in turn aligns with an opening **369** in partitioning shim **155**, and ultimately with a channel **371** in partitioning element **156**. It may be seen that channel **371** leads directly over to one of the openings **146** or **147** of base casting **148** which is one of the basic thirty-two selections. Opening **367***b* is traceable to channel **367***c* in partitioning element **154** which connects with the openings **372**, **372***a* and **372***b* of elements **153**, **152** and **151**, respectively, terminating eventually in the piston chamber of a type bar operating piston **158**.

When the apparatus is in its unshift position, valve **351—352** delegates a particular signal to the function of actuating said type bar piston, and accordingly to perform a printing operation, but when the apparatus is in its shift position, valve **351—352** delegates the particular impulse (fluid surge) to the function of performing some special utility. In this connection, it is to be observed that the indicated manner of utilizing case shift attributes for the performance of special functions may be enlarged in accordance with the principles herein disclosed to embrace any desired number of signals so that accordingly a permutation code having an inherently limited number of selective possibilities may in this manner be made subservient to a large number of selective possibilities.

Operation

For convenience in affording a concise and organized conception of the workings of the present invention, there has been portrayed in Fig. 25 a pneumatic circuit with conventional representations of each of the vital or major elements indicated concisely. While some of the symbols are not identical with the principle showing in the other of the figures, yet each is suggestive thereof for the purpose of representing its class of mechanism in order that a complete schematic illustration may be arranged in a single view.

Telegraphic signals received over a line are impressed upon the electromagnet **55** while an electric motor imparts frictional rotation to a single rotary driven shaft indicated **27**. All other operating organs are actuated by air under pressure, or more generally speaking, any suitable operating fluid which lends itself to the control and operation of pneumatic organs.

During each half revolution, a complete cycle of operation is consummated; that is to say, while the shaft **27** is undergoing 180° of rotation, five fluid pulsations are delivered from a source of supply **34** in accordance with a permutation code to the five pairs of pistons **107** to **112** and **107***a* to **112***a*. Also during the same span a probing fluid is admitted from a source **35** which seeks out and consummates a selective function printing, case shift, line feed, etc. Accordingly, upon the start of a second half revolution, i. e., another cycle, the selector plates are free to be immediately moved in accordance with the signal elements of an oncoming permutation code signal.

As the electromagnet **55** is energized and de-

energized in accordance with the alternative line conditions of conventional telegraphic systems, an armature 46 is made to fluctuate, registering a fluid supply source 34 alternatively with a pair of openings 44 or 45. The openings 44 and 45 communicate alternatively with a two-phased distributor plate 26 which functions to direct the fluid surges or pulsations to release the start controlling piston 86 as well as to distribute certain ones of the fluid surges selectively over predetermined paths indicated generally by the representative reference characters 102 to 106 and 102a to 106a.

The fluid conducting openings 102—106, etc., communicate with a series of pairs of selector operating pistons 107 to 112. Each pair of pistons, for example 107 and 107a, operates in a reciprocatory manner; that is to say, the actuation of one piston causes to be restored to unactuated condition its companion piston since each pair is mechanically linked together by means of a lever arrangement 113 or 118. The condition of each pair of pistons through the medium of a mechanical linkage is manifest upon an associated selector plate 123 to 127, while in accordance with each individual arrangement of the several of said selector plates, there is aligned a transverse series of openings affording an avenue through which a stream of operating fluid from the supply branch 35 is thereafter admitted to one of the selectable openings (thirty-two in a 5-unit system) indicated 146 and 147. The admission of the selecting fluid from source 35 is regulated by timing cam 31 mounted on shaft 27 which first admits the air into an antechamber acting upon elastic diaphragm 256 to compress the several plates 123 to 127 and thereafter the selecting fluid is permitted to flow through a valvular nozzle 255 for finding the aforementioned selective alignment of openings.

The selectable destination openings 146 and 147 lead to divers types of operating pistons the majority of which comprise a class indicated 158 which actuate type bar elements 161. Certain operating pistons are utilized in the execution of so-called "stunts." Toward this end, the piston 211, for example, performs the space feeding for advancing printing carriage either independently or in conjunction with each printing operation. Thus, the piston 211 is operable in response to an independent selection, or by means of a valve rod 239. This piston may be actuated as a cyclic performance conjointly with each printing operation. In Fig. 26 there is illustrated a method whereby a cyclically occurring function may be intercepted or prevented from operating under the control of certain several excepted conditions. In accordance with a series of control pistons 202 to 205 a by-pass valve 206 is regulated so as to cut off the fluid supply channel which cyclically actuates piston 211.

A piston 321 is controlled by an assigned selected opening 146 or 147 and functions to line feed the platen.

Also in Fig. 26 there is illustrated an adaptation of case shift valve 351—352 by means of which certain of the aforementioned thirty-two basic selective possibilities may, under the control of a case shift conditioning operation, be made to serve an additional function, thus increasing the total selective possibilities afforded by a mathematically limited code.

While the present invention has been explained and described in contemplation of a specific embodiment, it will be understood nevertheless that modifications and variations may be made without departing from the spirit or scope of the inventive concept. Accordingly, the invention is not to be limited to the specific details of the accompanying drawings nor to the language of the foregoing specification, except as indicated by the hereinafter appended claims.

What is claimed is:

1. In a selector mechanism, a set of alternatively positionable plates having perforations distributed in accordance with a permutative plan so that for each distributive arrangement, an individual alignment of perforations is established traversing said plates, a pair of pneumatic actuating means associated with each of said plates for moving it from each of its alternative positions to the other, and a rotary distributing organ having communication with said pneumatic actuating means cyclically.

2. In a pneumatic selecting mechanism, a series of permutably shiftable selector plates, a pair of pneumatic actuating elements associated with each plate for shifting it into alternative selecting positions, a rotary distributing mechanism having communication with each pair of said pneumatic operating elements concurrently and in accordance with a predetermined succession, and electrically controlled means for admitting operating fluid to one of said pair of elements during said communication and allowing the fluid to escape from the other of said pair of elements.

3. In a selector mechanism, a series of plates having perforations distributed in accordance with a permutative plan whereby for each arrangement of said plates an individual alignment of perforations is afforded traversing said series of plates, pneumatic actuating means associated with said plates, and a signal controlled fluid distributing element having cyclic communication with each of said pneumatic actuating means for operating them in accordance with a particular signal and for thereby causing to be moved said plates directly from a previous setting to accord with the signal elements of a succeeding setting.

4. In a pneumatic system, means for selectively establishing fluid communication from a source of supply to one of a plurality of fluid conduits comprising a series of plates intervening said source of supply and said conduits and having their perforations arranged to afford an individual transverse alignment for each permutative distribution of said plates, clamping means for sealing said plates by compressing them contiguously, a pair of fluid operated pistons associated with each plate for moving it into alternative positions, and a cyclically operating rotary member having communication during a portion of each cycle with each pair of said operating pistons and during another portion of each cycle with said clamping means.

5. In a pneumatic distributing organ, a rotary bi-cyclic member having at opposite points thereof a pair of intake ports and a pair of exhaust ports for conducting selective fluid surges, a pair of intake ports and a pair of exhaust ports for conducting fluid start pulsations, and a pair of projections to be encountered for arresting said rotary member, a body having fluid conductive openings arranged in diametric opposition to each other, and fluid supply openings arranged to communicate with said pair of selective fluid intake ports, and an arresting lever cooperating with said projections and pneumatically controlled by said fluid start pulsations.

6. In a pneumatic distribution system, a plu-

rality of pairs of selector operating pistons, a rotary distributor having concurrent communication with pairs of said pistons, and pneumatic synchronizing means for releasing said rotary distributor in timed relation with start-stop telegraph signals.

7. In a pneumatic system, a multiple phase distributor comprising a rotary member having a plurality of stop positions during each revolution, said distributor having bridging channels for connecting a source of fluid supply with a plurality of selector conduits during each cycle of said dstributor and additional bridging channels for connecting said source of fluid supply with other selector conduits, and a signal controlled means for determining, between one of said first mentioned channels and one of said additional channels, the channel to receive a fluid pulsation.

8. In a pneumatic distributor having multiple phase operation, the combination with a distributor block having oppositely arranged sets of fluid conducting ports and arcuate channels, a rotating member having wiping engagement with said ports, and bridging connections between said ports and arcuate channels, and an electrically controlled valve for directing a source of fluid supply selectively to said arcuate channels in accordance with electrical current signals.

9. The method of increasing arithmetically the basic selective possibilities in a pneumatic permutative system which comprises the steps of establishing a branch route over one of several branch channels by the use of basic ones of said selective possibilities, and selecting the main routes by the use of other of said basic selective possibilities.

10. In a pneumatic selector system, a set of plates having transverse perforations therein permutably arranged to afford an individual alignment for each distributive arrangement of said plates, and means for increasing the selective possibilities beyond the mathematical limits afforded by the principal permutation system including a valve having alternative branch communicating means associated with certain selective possibilities, and fluid operating means for switching said valve under the control of other ones of said selective possibilities.

11. In a pneumatic distribution system, the method of rendering a cyclic operation subservient to a limited class of operating signals of a total number of said signals which consists of assigning branch conduit courses to the selective fluid channels of said limited class, operating an element for governing said cyclic operation by means of each of said branch conduit courses, and restoring said element after each control operation by one of said limited class operating signals.

12. In a pneumatic selecting system, a series of plate selectors having openings distributed in accordance with a permutation code plan for affording an individual alignment for each permutative arrangement, a supervisory control valve, a tandem arrangement of pistons for operating said valve having fluid admission spaces intervening contiguous ones of said pistons, branch conduits for conveying selective operating fluid from certain of the openings of said selector plates to said spaces intervening contiguous pistons, and means for restoring said pistons cyclically following each operation.

13. In a pneumatic selecting system, a set of selecting plates, pairs of pneumatic actuating means for shifting said plates into alternative selecting positions, and a fluid distributor having selectively controlled relationship with alternate ones of said pairs of actuating means for shifting said plates into either of said alternative selecting positions exclusively under fluid actuation.

14. In a pneumatic selecting system, a set of selecting plates each shiftable into alternate selecting positions, said several plates having perforations therethrough distributed in accordance with a permutative selection plan, a pair of pistons associated with each plate, reciprocating lever means for communicating the movement of each one of a pair of pistons to its associated plate and for concurrently restoring the other of said pair to its non-actuated position, and a pneumatic distributor having alternative communication with each pair of pistons during each cycle of operation.

15. Apparatus for routing a set of selective fluid conductor openings including a first body having a predetermined arrangement of fluid conducting exit openings, a second body disposed in close proximity to said first body having a plurality of inlet openings diversified in arrangement from the arrangement of said exit openings in said first body, and means for connecting predeterminately associated exit openings of said first body with inlet openings in said second body, comprising a plurality of plates having slots therein, each with extreme terminals in alignment with certain of said body openings, and other slots having extreme terminals in alignment with other of said body openings, certain of said first mentioned and said second mentioned slots having mean terminals interconnecting with each other, intermediary slots for connecting the intermediate openings of certain of said first and second mentioned slots, and partitioning shims having holes for transversely connecting the intermediate and terminal openings of said slots with each other or with said body openings to effect a distributive routing scheme.

16. In an automatic page printing machine, a rotary signal distirbutor, means for regulating the rotation of said distributor by periodic stop and release control, the period intervening consecutive stops constituting a distributive cycle, printing means, line-feed means, carriage return means, and an actuating source for said printing, line-feed and carriage return means operative to execute the performance of any of said means upon its selection within its distributive cycle period.

17. In a page printing system, a plurality of function performing members, a set of selector plates for individually conditioning said members for operation, and a start-stop distributor including means operative during each cycle of rotation for positioning said plates in accordance with the permutation elements of a code and for operating a particular function performing member in accordance with the setting of said plates imparted during its selection cycle.

18. In a pneumatic system, the combination with a set of selector plates having perforations distributed in accordance with an individual selecting plan of a set of plate conditioning elements responsive during a distributive cycle to the signal components of a code for accordingly positioning said plates, and means operative during each distributive cycle for introducing a fluid to seek out and operate a function in accordance with the setting of said plate conditioning ele-

ments pursuant to the permutation signal of said cycle.

19. In a pneumatic system, a set of perforated selector plates, a rotary member having start-stop cyclic regulating means, a source of fluid supply, telegraphically controlled means operative in timed relation with said rotary member for releasing fluid surges from said supply source for setting said set of selector plates cyclically, and a valve controlled in timed relation with said member for releasing a fluid from said source of supply to seek out a selector plate selection during the same cycle in which a selector plate selection is set.

20. In a telegraphically controlled printing mechanism having start-stop cyclic operation, a shiftable platen carriage, a plurality of typing elements, and signal responsive selecting mechanism for shifting said carriage, and for actuating said typing elements within the time interval of start-stop cycles.

21. In a telegraphically controlled page printing mechanism, a printing platen carriage movable longitudinally, spring means for returning said carriage, signal controlled means for initiating the return of said carriage, and a latch for maintaining said signal responsive initiating means in effective position pending the consummate return of said carriage.

22. In a telegraphically controlled printing mechanism having start-stop signal operation, a plurality of typing members, a carriage, a carriage rotating mechanism for producing line feed operations, and permutation code controlled means for initiating said line feed operations within the start-stop interval of its selecting signal.

23. In a signal controlled printing mechanism, a receiving distributor having uniform intervals of cyclic operation, a line feed apparatus, a carriage return apparatus, and means operative during one cyclic interval for selecting and initiating either of said line feed or carriage return apparatuses.

24. In a printing telegraph apparatus, a start-stop signal distributing element for routing the impulses of a fixed unit permutation code, means for arresting said distributing element at the conclusion of each code signal, means for releasing said element in response to the initial impulse of each code signal, and mechanism associated with said distributing element for initiating the performance of a selective function during the start-stop interval in which its signal is distributed by said element.

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