June 21, 1966 F. BRETTI 3,256,969

HIGH SPEED SERIAL PRINTING DEVICE

Filed Dec. 13, 1963 3 Sheets-Sheet 1

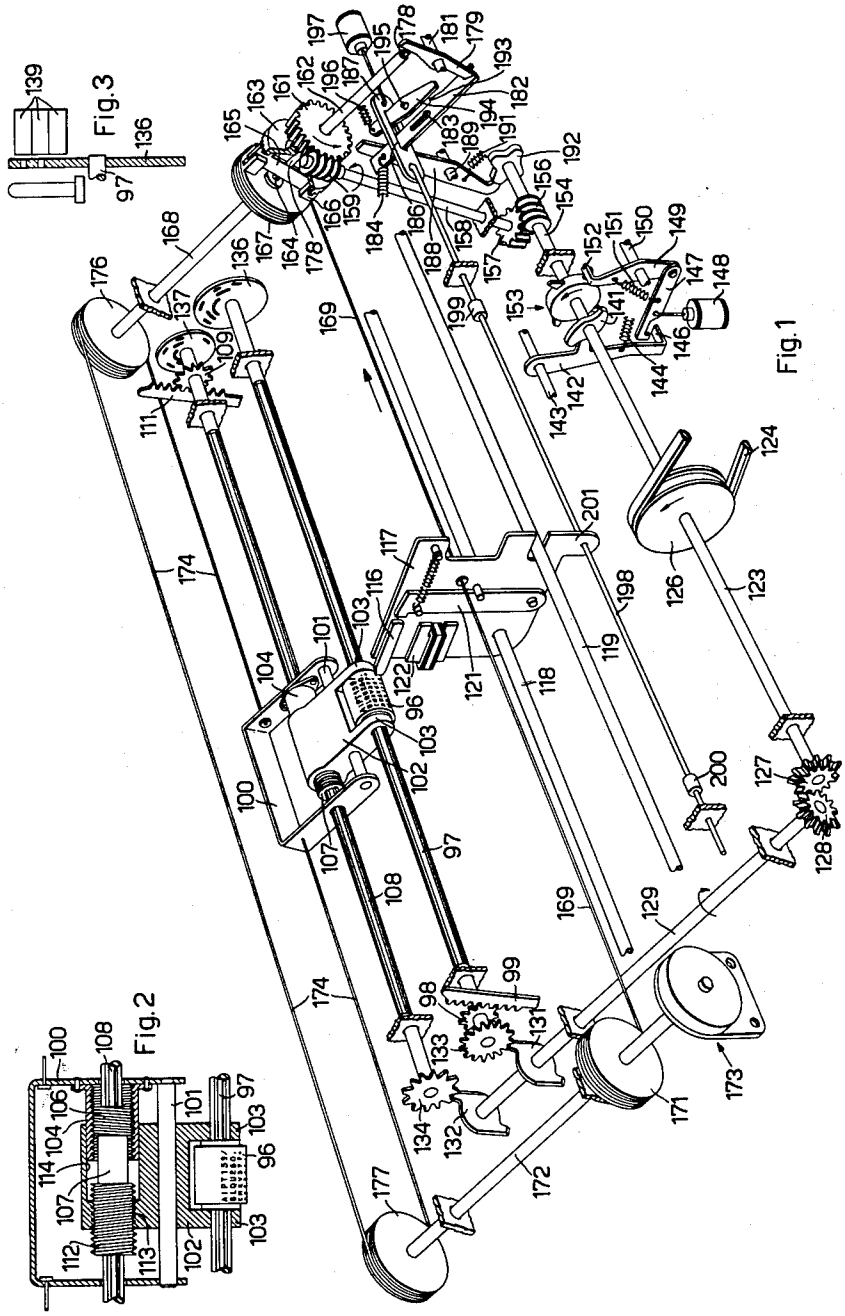

Fig. 1

Fig. 3

Fig. 2

HIGH SPEED SERIAL PRINTING DEVICE

Filed Dec. 13, 1963 3 Sheets-Sheet 2

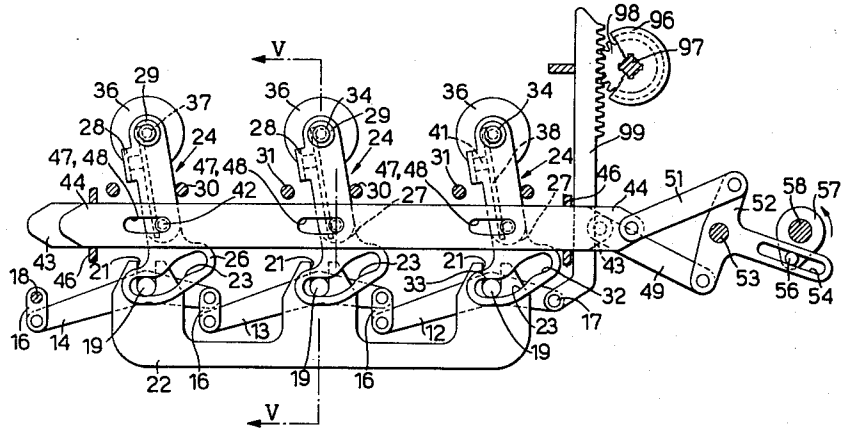

Fig. 4

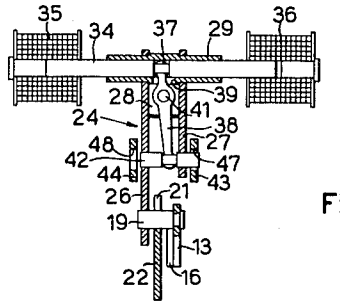

Fig. 5

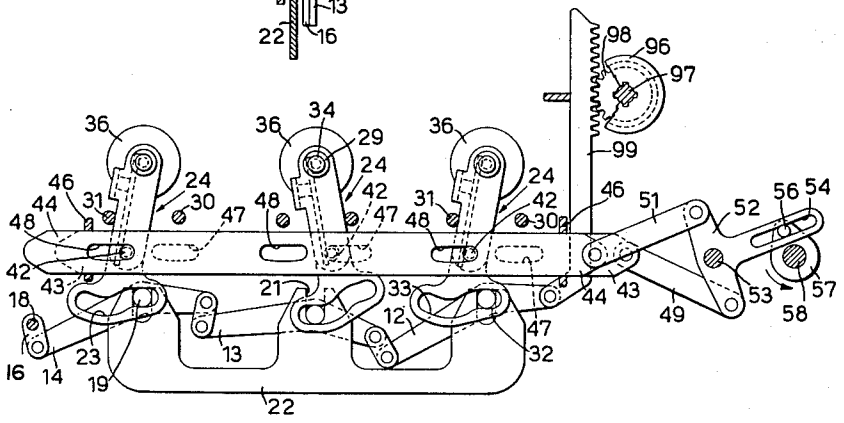

Fig. 6

HIGH SPEED SERIAL PRINTING DEVICE

Filed Dec. 13, 1963 3 Sheets-Sheet 3

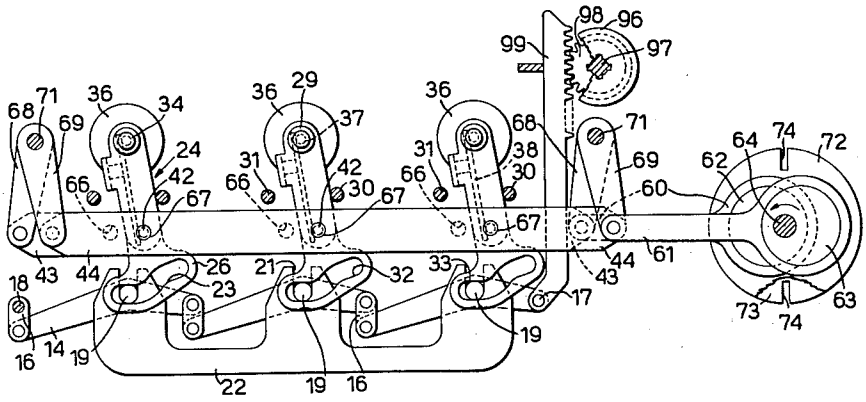

Fig. 7

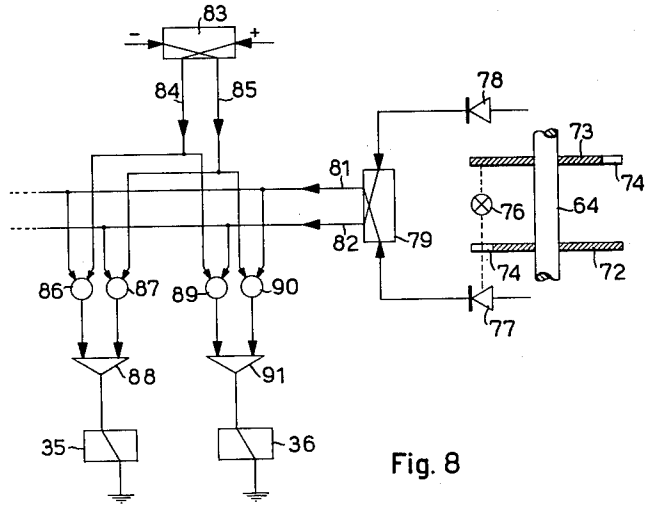

Fig. 8

United States Patent Office 3,256,969 Patented June 21, 1966

3,256,969

HIGH SPEED SERIAL PRINTING DEVICE

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Filed Dec. 13, 1963, Ser. No. 330,473
Claims priority, application Italy, Dec. 17, 1962, 25,368/62; Dec. 9, 1963, 25,583/63
17 Claims. (Cl. 197—49)

This invention relates to a high speed serial printing device for typewriters, teleprinters or data processing equipments, having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, and a cyclically operating mechanism. More particularly, this invention relates to a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units and comprising a set of selecting members each one associated with a corresponding unit of said code and adapted to be located in either one of a pair of opposite positions, means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements, and a pair of common actuators for said selecting members.

In a known printing device provided with a selecting device of the above type, each common actuator is moved by the operating mechanism at alternate cycles through an effective stroke in a predetermined constant direction, each actuator being returned idly while the other actuator effects its effective stroke. At each cycle, each selecting member under the control of the corresponding unit of code must be connected with the actuator which during this cycle will be moved through its effective stroke. Furthermore, the selecting members are moved by said actuators against the urge of a spring, whereby after being so moved they must be locked by suitable locking means. Finally, due to the action of said springs the selective operation for returning said selecting members is too heavy, while the return thereof causes undesired rebounds.

The primary object of the present invention is to provide a high speed serially printing device obviating all the above disadvantages.

Another object is to provide a printing device having a typecarrier adapted to remain in the reached position after each imprint.

Still another object is to provide a printing device having a typecarrier adapted to be selectively positioned angularly and longitudinally by two similar selecting devices.

A further object is to provide a printing device having a typecarrier adapted to be exactly and positively positioned both angularly and longitudinally.

Still a further object is to provide a printing device wherein the position reached by the typecarrier is automatically checked before each imprint.

With the above objects in view in a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, I now provide the combination comprising a set of selecting members each one associated with a corresponding unit of said code and adapted to be located in either one of a pair of opposite positions, means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements, a pair of common actuators for said selecting members, means operable by said mechanism for positively reciprocating said actuators in mutually opposite directions, connecting means for selectively connecting said selecting members to one of said actuators according to the corresponding code unit to cause said selecting members to be positively displaced, and means for rendering said connecting means ineffective when the corresponding selecting members are located in the position corresponding to the associated code unit.

Other objects, features and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof, made with reference to the enclosed drawings, wherein:

FIG. 1 is a perspective partial view of a high speed serial printing device according to the invention taken lookng at machne from the front and the left;

FIG. 2 is a horizontal sectional view of a detail of FIG. 1;

FIG. 3 is a transverse sectional view of another detail of FIG. 1;

FIG. 4 is a right hand longitudinal partial sectional view of the selecting device of the printing device of FIG. 1;

FIG. 5 is a sectional view taken on the line V—V of FIG. 4;

FIG. 6 is the longitudinal view of FIG. 4 in an operated position;

FIG. 7 is a longitudinal view of a modified form of the selecting device of FIG. 4;

FIG. 8 is a circuit diagram for controlling the device of FIG. 7.

With reference to FIG. 1, the numeral **96** indicates a cylindrical typecarrier provided with a plurality of types and selectively positionable according to the type to be printed. The types are arranged in six rows each one of eight types. The typecarrier **96** is axially slidable on a first transverse fluted shaft **97** and is bodily rotatable therewith. The shaft **97** is provided with two cylindrical ends rotatably mounted on the machine frame. A pinion **98** secured to the shaft **97** is engaged by a rack **99** adapted to be selectively moved according to the combinations of a predetermined code in a manner which will be disclosed later.

Means are provided for movably mounting the typecarrier **96** on a support or support member **100** which may be referred to as a first member and which is transversely movable step by step in a manner to be disclosed. Said means comprises a rod **101** secured to the support or support member **100**, also referred to as a first member, and a block or second member **102** which is slidable on the rod **101**. The block **102** is provided with two bored projections **103** slidable on the shaft **97** and adapted to displace the typecarrier **96** transversely.

Secured to the support or support member **100**, also called first member, is a first screwed hub **104** coaxial with a second transverse fluted shaft **108** provided with two cylindrical ends rotatable on the machine frame. A pinion **109** secured to the shaft **108** is engaged by a rack **111** adapted to be selectively moved according to the code combinations in a manner similar to the rack **99**. The screwed hub **104** (FIG. 2) cooperates with a first screwed portion **106** of an element **107** slidably mounted on the shaft **108** and bodily rotatable therewith. A second hub **113** provided on the block **102** is coaxial with the shaft **108** and is screwed in a direction opposite to the hub **104**. The screwed hub **113** cooperates with a second screwed portion **112** of the element **107**. A non-screwed hub portion **114** of the block **102** is adapted to telescopically cooperate with the outward surface of the hub **104**.

The printing device comprises also a hammer **116** schematically shown in FIG. 1, which is adapted to cooperate with the typecarrier **96**, but is normally held distanced therefrom by a spring not shown in the drawing. The hammer **116** is longitudinally slidable on a plate **117** in turn slidably mounted on two transverse shafts **118** and **119**. The plate **117** is transversely movable with the support **100** in a manner to be described. The hammer **116**

is operable by an armature 121 of an electromagnet 122 carried by the plate 117 and adapted to be energized in a known manner.

Between the typecarrier 96 and the hammer 116 the paper is vertically fed in a known manner. The conventional ink ribbon is horizontally fed by known means between the paper and the hammer 116 in order not to dirty the types of the typecarrier 96.

The printing device is operated by a cyclically operating mechanism comprising a main shaft 123 adapted to be rotated counterclockwise through 180 degrees for each machine cycle by means of a belt 124 and a pulley 126 secured thereto. A bevel gear 127 secured to the shaft 123 engages a similar gear 128 secured to a longitudinal shaft 129 having a pair of knife-members 131 and 132 adapted to engage the toothed wheels 133, and 134 respectively, at the instant of the operation of the hammer 116. It will be clear that the members 131 and 132 are rotatable each one in a plane perpendicular to the corresponding wheel 133, and 134 respectively.

Means are provided for indicating the position of the typecarrier 96, said means comprising a pair of disks 136, 137, secured to the right end of the shaft 97 and 108, respectively, and notched according to the code combinations corresponding to each circumferential position of the corresponding shaft. Each one of the two disks 136 and 137 is adapted to be sensed by a set of photodiodes 139 (FIG. 3), which through a known circuit, conditions the hammer 116 for operation when the notches sensed on the disks 136 and 137 correspond to the code combination which controlled the rotation of the shafts 97 and 108.

The transverse step by step movement of the first member or support 100 and the hammer bearing plate 117 is simultaneously effected under the control of a cam 141 of the main shaft 123. A lever 142 pivoted at 143 is normally urged by a spring 144 to contact the cam 141 and is provided with a bent lug 146 adapted to cooperate with a latch 147 linked to a lever 149 pivoted at 150 and connected to the latch 147 by a spring 151. The latch 147 is further connected to the armature of an electromagnet 148 normally adapted to be energized substantially simultaneously with the electromagnet 122 and also to be energized in a known manner under the control of the code combination corresponding to the letter space. A lug 152 of the lever 149 is adapted to control a clutch known per se and generically indicated by the numeral 153. The clutch 153 is adapted to connect a shaft 154 with the main shaft 123 for a cycle of 90 degrees.

Secured to the shaft 154 is a worm 156 engaging a gear 157 secured to a shaft 158. Another worm 159 secured to the shaft 158 engages a gear 161 rotatable on a bored shaft 162 and secured to a ratchet wheel 163. A tooth 165 pivoted on a projection 166 of a pulley 167 normally engages the ratchet wheel 163 under the action of a pin 164 housed in an axial bore of a shaft 168 and spring urged forwards. The support 100 and the hammer plate 117 are connected to a pair of cables 174 and 169 respectively, which are winding on a pair of similar pulleys 176 and 167 secured to the shaft 168, and are unwinding from a second pair of similar pulleys 177 and 171 secured to a shaft 172. This shaft is urged clockwise by a spiral spring, generically indicated by the numeral 173.

Slidable within the bored shaft 162 is a rod 178 rearwardly contacting the tooth 165. The rod 178 cooperates forwardly with a lever 179 pivoted at 181 and engaging a forked end of a slide 182 slidably mounted on a stationary pin 183 and into a slot 186 of a plate 187. The slide 182 is urged by a spring 184 to contact the left edge of the slot 186 and is provided with a shoulder 193 adapted to coopearte with a lever 194 pivoted at 195 and normally urged by a spring 196 to contact the right edge of the slot 186. A lever 188 pivoted at 189 is urged by a spring 191 to contact a cam 192 of the shaft 154 and is adapted to cooperate with the rear end of the slide 182.

The plate 187 is connected at right to the armature of an electromagnet 197 adapted to be energized under the control of a code combination for controlling the return to the left of the support 100 and the plate 117. The plate 187 is connected at left to a transverse rod 198 slidable on the machine frame and provided with a pair of margin control members 199 and 200. A projection 201 of the plate 117 is transversely slidable on the rod 198.

The printing device operates as follows.

Normally, since the spring 184 prevails on the spring 196, the plate 187 is held leftwards, whereby the rear end of the slide 182 is out of the path of the lever 188 and the lever 194 does not contact the slide 182. The main shaft 123 is cyclically rotated counterclockwise through 180 degrees and by means of the bevel gears 127 and 128 synchronously rotates the shaft 129 clockwise. Normally various machine cycles are conditioned by a suitable record controlled transmitter or by an electronic calculating apparatus, whereby the shafts 123 and 129 are rotated continuously through a series of cycles.

At the beginning of the machine cycle the shaft 129 disengages the knife-members 131 and 132 from the wheels 133 and 134, whereby the shafts 97 and 108 are released. Thereafter the racks 99 and 111 are selectively displaced under the control of the code combination corresponding to the type to be printed, in the manner which will be described later. The rack 99 through the pinion 98 selectively rotates the fluted shaft 97 together with the typecarrier 96, which locates the type to be printed on the printing line.

Simultaneously the rack 111 through the pinion 109 selectively rotates the fluted shaft 108 together with the element 107 (FIG. 2). On one hand the cooperation of the screwed portion 106 with the screwed hub 104 causes the element 107 to be axially displaced with respect to the stated first member or support 100, on the other hand the cooperation of the screwed portion 112 with the screwed hub 113 causes the stated second member or block 102 to be displaced with respect to the element 107. The typecarrier 96, which is axially displaced by the block 102, is thus displaced with respect to the support 100 through the sum of the axial displacement of the element 107 with respect to the hub 104 and of the displacement of the block 102 with respect to the element 107, whereby the rotation of the shaft 108 required for causing a predetermined axial displacement of the typecarrier 96 is reduced. The typecarrier 96 through its axial displacement locates the type to be printed on the printing point in front of the hammer 116 (FIG. 1).

During the selective movement of the typecarrier 96, the cam 141 of the main shaft 123 reciprocates the lever 142. Since in this first cycle the latch 147 is disengaged from the lug 146, it is not affected by the lever 142.

Near the end of the cycle, the knife-members 131 and 132 reengage the toothed wheels 133 and 134, thus exactly and positively adjusting the angular position of the shafts 97 and 108. Now the photodiodes 139 (FIG. 3) sense the disks 136 and 137 and through the known circuit effects the comparison of the code combination represented by the notches sensed by the photodiodes 139 and the code combination which controlled the rotation of the shafts 97 and 108 and have been stored in a suitable storing device. If the two code combinations are equal, that is if the two shafts have been correctly positioned, said circuit causes the electromagnet 122 to be energized. Then the armature 121 operates the hammer 116 which effects the imprint of the selected type on the paper.

The electromagnet 148 is energized substantially simultaneously with the electromagnet 122 and causes the latch 147 to engage the lug 146 of the lever 142. During the next following cycle of the shaft 123, the cam 141 through the lever 142 draws the latch 147 rearwards.

The lever 149 is thus rocked clockwise, whereby the lug 152 releases the clutch 153, which is engaged for one cycle of 90 degrees. The shaft 154 is now rotated counterclockwise and through the worm 156, gear 157, shaft 158 and worm 159, rotates the gear 161 counterclockwise.

The ratchet wheel 163, through the tooth 165 rotates the pulley 167 together with the shaft 168 and the pulley 176. The pulley 167 through the cable 169 moves the plate 117 rightwards, whereas the pulley 176 through the cable 174 moves the support 100 rightwards. The transmission ratio from the worm 156 to the pulleys 167 and 176 is such as the rotation of 90 degrees of the shaft 154 causes a rightward movement of the support 100 and the plate 117 of one step or letter spacing. This letter spacing is effected during the selective movement of the typecarrier 96 for the next type to be printed and will be finished before the hammer 116 is operated for said next type, whereby the imprint is effected when the typecarrier 96 and the support 100 are transversely standing.

At each letter spacing the cam 192 of the shaft 154 reciprocates the lever 188. Since the rear end of the slide 182 is normally out of the path of the lever 188, this slide is not affected by the lever 188. When the projection 201 of the plate 117 encounters the member 199, this latter is displaced rightwards together with the rod 198 and the plate 187 in the instant wherein the cam 192 causes the lever 188 to be rocked counterclockwise. The lever 194 is caused to contact the right edge of the slide 182, which in turn locates its rear end on the path of the lever 188.

Now the cam 192 returns clockwise the lever 188, which engages the rear end of the slide 182. This slide is thus moved forwards and is locked in the forward position by the lever 194 through the shoulder 193. In turn the slide 182 rocks counterclockwise the lever 179 which displaces rearward the rod 178 thus disengaging the tooth 165 from the wheel 163. Now the spring 173 rotates the shaft 172 clockwise, thus returning the support 100 and the plate 117 leftwards to the beginning of the printing line.

During this return movement, when the projection 201 encounters the member 200, this latter is displaced leftwards together with the rod 198 and the plate 187. Then the spring 184 returns the rear end of the slide 182 leftwards out of the path of the lever 188, whereas the lever 194 rotates counterclockwise thus releasing the slide 182. The pin 164 urged by its spring causes the tooth 165 to reengage the wheel 163, whereby the support 100 and the plate 117 are arrested against the action of the spring 173.

The leftward movement of the support 100 and the plate 117 may be effected when they are in any transverse position through a code combination adapted to cause the electromagnet 197 to be energized. Then the armature of electromagnet 197 displaces the plate 187 rightwards in a similar manner as in the above case. In any case the leftward movement of the support 100 and the plate 117 is stopped by the projection 201 encountering the member 200.

The selecting device for selectively rotating the shaft 97 is described hereinafter. Since the selecting device for selectively rotating the shaft 108 is quite similar to that for the shaft 97, it does not need to be described. The shafts 97 and 108 are each one selectively rotated by a corresponding selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units. Each selecting device comprises a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code.

More particularly, said code is formed of three binary units represented for instance of signals of two opposite polarities. Said set of selecting members is formed of three similar selecting levers, generically indicated by the numeral 24 (FIGS. 4 and 5), each one pivoted on a stationary hub 29 and adapted to assume either a right position defined by a stop member 30, or a left position defined by another stop member 31 (see the two lateral bails 24 on FIG. 6). Each lever 24 comprises a pair of arms 26 and 27 (FIG. 5) connected by a cross portion 28, the arm 26 being provided with a cam slot 23 having two end portions 32 and 33 concentric with the corresponding hub 29.

The selecting device comprises also means mutually connecting the selecting levers 24 (FIG. 4) and movable therewith for positioning the typecarrier 96 according to the sum of their movements. Said connecting means are formed of three similar shifting levers 12, 13 and 14, each one fulcrumed on the pivot 19 engaging the cam slot 23 of the corresponding selecting lever 24 and mounted for radial movement with respect to the hub 29 in a vertical notch 21 provided on a common stationary plate 22, whereby the pivots 19 when engaging the end portions 32 and 33 of the cam slot 23 cannot displace the corresponding levers 24. The levers 12, 13 and 14 are provided each one with two arms of different length and are connected as a chain with the short arm of each shifting lever connected through a link 16 to the long arm of the subsequent shifting lever. The extreme lever 14 is connected through another link 16 to a stationary pivot 18, while the extreme lever 12 is connected at 17 to the rack 99 and therefore, through the pinion 98 and the shaft 97 to the typecarrier 96.

Furthermore, the selecting device comprises a pair of common actuators or slides 43 and 44 slidably mounted in two stationary comb plates 46 and connected through a link 49, and 51 respectively, to a pair of opposite arms of a lever 52 fulcrumed at 53. The lever 52 is connected through a slot 54 to a pin 56 of a crank lever 57 secured to a shaft 58. This shaft is connected to the main shaft 123 (FIG. 1) of the machine in a known manner as to be rotated counterclockwise 360° for each cycle of the main shaft 123.

Slidably mounted within each hub 29 is a rod 34 (FIG. 5) forming the common armature of a pair of electromagnets 35 and 36 each one adapted to be energized by the code unit having a corresponding polarity. Each rod 34 is provided with the groove 37 engaged by one end of a lever 38, which through a notch 39 of the hub 29 is extended downwards. The lever 38 is fulcrumed on a pivot 41 secured to the cross portion 28 of the corresponding lever 24. Each slide 43 and 44 is provided with a set of trailing elements or slots 47, and 48 respectively, each one associated with one of the levers 24. Each slot 47 or 48 is adapted to be engaged by an engaging element or pin 42 transversely slidable on the two arms 26 and 27 and having a groove engaging the other end of the associated lever 38. The slots 47 and 48 are normally mutually facing and their length corresponds to the distance between the two positions of the lever 24. The lower edge of the slots 47 and 48 is slightly curved to allow the pin 42 to rock together with the corresponding levers 24 during the longitudinal movement of the slides 43 and 44 into the comb plates 46.

The selecting device of FIGS. 4, 5 and 6 operates as follows.

The signal of each binary code unit of a predetermined combination is sent in a known manner to the corresponding electromagnet 35 or 36 (FIG. 5) according to the polarity of said signal. The rods 34 attracted by the electromagnets 35 through the levers 38 cause the pins 42 to enter the corresponding slots 47 of the slide 43, while the rods 34 attracted by the electromagnets 36 cause the pins 42 to enter the corresponding slots 48 of the slide 44. Obviously, if the polarity of the code unit of a given combination is equal to that of the same unit of the next preceding combination, the corresponding pin 42 is not moved because it is already in the due position.

At each code combination, the shaft 58 is also rotated counterclockwise. At first the crank lever 57 through the pin 56 reciprocates the lever 52 counterclockwise, whereby the slide 43 is moved rightwards and the slide 44 is moved leftwards in the location of FIG. 6 through a forward stroke. During this forward stroke the slide 44 rocks clockwise the levers 24 located at right and whose pins 42 entered the slots 48 (in FIG. 6 the two extreme levers 24), while the slide 43 rocks counterclockwise the levers 24 located at left and whose pins 42 entered the slots 47 (in FIG. 6 the central lever 24). On the contrary, the levers 24 located at right and whose pins 42 entered the slots 47, as well as the levers 24 located at left and whose pins 42 entered the slots 48, are not affected by the slides 43 and 44.

It is thus clear that the actuators 43 and 44 are simultaneously positively reciprocated by the shaft 58 in mutual opposite directions through a forward stroke, which is the effective stroke for displacing the levers 24. Furthermore, it is clear that the pins 42 are adapted to selecitvely engage the corresponding selecting members 24 with one of the actuators according to the corresponding code unit to cause said selecting members to be positively displaced. Finally it is clear that the slots 47 and 48, due to their length, are adapted to render the engaging means 42 ineffective when the corresponding selecting member is located in each one of the two positions and the associated code unit presents the corresponding condition, that is when the lever 24 is not to be moved.

Each lever 24 moves the corresponding pivot 19 downwards if the lever has been rocked counterclockwise, or upwards if it has been rocked clockwise. In any case the rack 99 is moved by the chain of shifting levers 12, 13 and 14 according to the sum of the movements of the pivots 19. The rack 111 is simultaneously positioned in a similar manner, whereby the typecarrier 96 is angularly and axially positioned according to the type to be printed. Thereupon the hammer 116 (FIG. 1) is operated in the above described manner.

After the imprint, the shaft 58 terminates its counterclockwise revolution and returns the lever 52 clockwise from the position of FIG. 6 to the position of FIG. 4. The slides 43 and 44, are now caused by the lever 52 to effect the return stroke but, due to the slots 47 and 48, the selecting levers 24, the shifting levers 12, 13 and 14 and the typecarrier 96 remain in the reached position, whereby the return stroke of the slides 43 and 44 is ineffective. In the next following cycle the typecarrier 96 will be positioned departing from the position now reached.

It is clear that, due to the connection between the lever 52 and the crank lever 57, the ineffective stroke of the slides 43 and 44 is effected in a time shorter than the time required for the effective stroke.

According to a modified form of the selecting devices, the slides 43 and 44 (FIG. 7) are simultaneously positively reciprocated by the operating mechanism in mutual opposite directions between a first and a second location of a pair of locations associated with the two positions of the levers 24. More particularly, the slide 43 is moved from left to right and the slide 44 is moved from right to left during a predetermined cycle and oppositely during the next following cycle. Each slide 43 and 44 is thus adapted to displace the levers 24 to the one or the other of the two positions at alternate cycles.

Particularly, each slide 43, 44 is connected to a corresponding link 60, 61 operable by corresponding eccentrics 62, 63. The two eccentrics 62 and 63 are secured in a mutually opposite angular relationship to a main shaft 64 adapted to be rotated through 180 degrees during each cycle of the shaft 123 (FIG. 1). Each slide 43 and 44 (FIG. 7) is linked on two levers 68, and 69 respectively, which are fulcrumed on two stationary pivots 71 and are as long as the distance of each pin 42 from the fulcrum of the corresponding lever 24.

Each slide 43 and 44 is provided with a set of trailing elements formed of circular holes 66, and 67 respectively, each one associated with one of the levers 24. Each hole 66 or 67 is adapted to be engaged by the pin 42 of the associated lever 24.

Shifting means are provided for inverting at each cycle the action of each code unit on the connecting means 42 by inverting the polarities of the electromagnets 35 and 36. To this end said shifting means comprises a pair of disks 72 and 73 secured to the shaft 64 and provided with a notch 74 located in a mutual opposite angular relationship, a lamp 76 (FIG. 8) being located between the two disks normally in front of one of the two notches 74 (in FIG. 8 in front of the notch 74 of the disk 72). A pair of photodiodes 77 and 78 are adapted to sense the notch 74 of the corresponding disks 72 and 73 and to send alternately a signal to a flip-flop 79 provided with two outputs 81 and 82.

Each flip-flop 83 is provided with two outputs 84 and 85. Connected to each flip-flop 83 are a pair of AND gates 86 and 87 connected through an OR gate 88 to the electromagnet 35, and a pair of AND gates 89 and 90 connected through another OR gate 91 to the electromagnet 36. The AND gates 86 and 89 are energized by the signal of the output 84 of the flip-flop 83, and by the signal of the output 81, and 82 respectively, of the flip-flop 79. The AND gates 87 and 90 are energized by the signal of the output 85 of the flip-flop 83 and by the signal of the output 82, and 81 respectively, of the flip-flop 79.

The selecting device of FIGS. 7 and 8 operates as follows.

It is assumed that the right position of the levers 24 corresponds to a positive code unit and the left position corresponds to the negative code unit, and that initially the selecting device is in the position of FIG. 7. At the beginning of the cycle of the shaft 64, the photodiode 77 senses the notch 74 of the disk 72 and causes the output 81 of the flip-flop 79 to be energized. Consequently a positive code unit is sent by the flip-flop 83 through the output 84, the gate 86 and the gate 88 to the electromagnet 35. On the contrary, a negative code unit is sent through the output 85, the gate 90 and the gate 91 to the electromagnet 36. The rods 34 (FIG. 5) attracted by the corresponding electromagnets 35, through the levers 38, move the corresponding pins 42 toward the slide 43, but since in FIG. 7 the levers 24 are in the right position said pins 42 cannot engage the holes 66 and merely contact the slide 43. On the contrary, the rods 34 (FIG. 5) attracted by the electromagnets 36 cause the corresponding pins 42 to enter the holes 67 of the slide 44 (FIG. 7).

Now the eccentric 62 of the main shaft 64, through the link 60 moves the slide 43 rightwards, while the eccentric 63, through the link 61 moves the slide 44 leftwards. The slide 44 thus rocks clockwise the levers 24 whose pins 42 entered the holes 67, while the slide 43 rocks counterclockwise the levers 24 whose pins 42 entered the holes 66. The levers 24, whose pins 42 merely contact the slides 43 or 44 without entering the corresponding holes, remain standing. Due to the friction of these pins 42 with the slides 43 and 44, the movement of the slides 43 and 44 contributes to maintain the standing levers 24 in their positions.

At the beginning of the next following cycle, the photodiode 78 senses the notch 74 of the disk 73 and causes the output 82 of the flip-flop 79 to be energized. Consequently a positive code unit is now sent by the flip-flop 83 through the output 84 and the gates 89 and 91 to the electromagnet 36, whereas a negative code unit is sent through the output 85 and the gates 87 and 88 to the electromagnet 35. Thus the polarity of the two electromagnets 35 and 36 is inverted, while the slides 43 and 44 are moved oppositely with respect to the preceding cycle toward the position of FIG. 7. The levers 24 are now moved counterclockwise by the slide 44 and the clock-

wise by the slide **43**, in a manner similar to that above described.

Obviously, if a predetermined code unit is repeated, the corresponding electromagnets **35** and **36** are alternately energized and the pin **42** is alternately moved to contact the slides **43** and **44** without entering the holes **66** and **67**, whereby the corresponding lever **24** is not rocked. It is thus clear that the positions of slides **43** and **44** contacted by each pin **42** are adapted to render ineffective the engagement of the pin **42** when one of the selecting members **24** is located in each one of the two positions and the associated code unit presents the corresponding polarity.

In any case the hammer **116** is now operated substantially at the end of each cycle when the slides **43** and **44** reach their extreme locations.

It is thus clear that at each machine cycle the slides **43** and **44** are positively operated by the main shaft through a single stroke, which is the effective stroke for positively moving the levers **24**, whereby the speed of the machine may be increased.

It is intended that improvements, modifications and additions of parts may be made on the described printing device without departing from the scope of the invention.

What I claim is:

1. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members,

(d) means operable by said mechanism for simultaneously positively reciprocating said actuators in mutually opposite directions,

(e) engaging means for selectively engaging said selecting members with one of said actuators according to one of said conditions and with the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(f) and means comprised in said actuators for rendering said engaging means ineffective.

2. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movably therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members slidably mounted at the opposite side thereof,

(d) means operable by said mechanism for simultaneously positively reciprocating said actuators in mutually opposite directions,

(e) a set of trailing elements provided on each one of said actuators, each trailing element being associated with one of said selecting members,

(f) a set of engaging elements each one connected to one of said selecting members and adapted to engage the corresponding trailing element of one of said actuators according to one of said conditions and the corresponding trailing element of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions.

(g) and means comprised in said actuators for rendering said engaging means ineffective.

3. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members slidably mountde at the opposite side thereof,

(d) means operable by said mechanism for sultaneously positively reciprocating said actuators in mutually opposite directions,

(e) a set of holes provided on each one of said actuators, each hole being associated with one of said selecting members,

(f) a set of pins each one transversely slidable on one of said selecting members,

(g) and a pair of electromagnets associated with each one of said pins and each one adapted to be selectively energized by the corresponding code unit for engaging same with the corresponding hole of one of said actuators according to one of said conditions and with the corresponding hole of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(h) said holes being elongated to render the engagement of said pins ineffective.

4. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of similar selecting levers each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) a cam slot on each one of said levers, said cam slot having two end portions concentric with the fulcrum of the associated lever,

(c) a set of movable elements each one engaging one of said cam slots, each one of said movable elements being mounted for a radial movement with respect to said fulcrum, whereby said movable elements when engaging said end portions cannot displace said levers,

(d) means mutually connecting said movable elements and movable therewith for positioning said typecarrier according to the sum of their movements,

(e) a pair of common actuators for said selecting members slidably mounted at the opposite side thereof,

(f) means operable by said mechanism for simultaneously positively reciprocating said actuators in mutually opposite directions,

(g) a set of holes provided on each one of said actuators, each hole being associated with one of said selecting members,

(h) a set of pins each one transversely slidable on one of said selecting members,

(i) and a pair of electromagnets associated with each one of said pins and each one adapted to be selectively energized by the corresponding code unit for engaging same with the corresponding hole of one of said actuators according to one of said conditions and with the corresponding hole of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(1) said holes being elongated to render the engagement of said pins ineffective.

5. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of similar selecting levers each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) a cam slot on each one of said levers, said cam slot having two end portions concentric with the fulcrum of the associated lever,

(c) a set of pivots, each one engaging one of said cam slots, each one of said pivots being mounted for a radial movement with respect to said fulcrum, whereby said pivots when engaging said end portions cannot displace said levers,

(d) a set of similar shifting levers each one fulcrumed on one of said pivots and provided with two arms of different lengths, said shifting levers being connected as a chain with the short arm of each shifting lever connected to the long arm of the subsequent shifting lever, one of the two extreme shifting levers of the chain being connected to a stationary member, the other extreme shifting lever being connected to said typecarrier for positioning same according to the sum of the movements of said pivots,

(e) a pair of common actuators for said selecting members slidably mounted at the opposite side thereof,

(f) means operable by said mechanism for simultaneously positively reciprocating said actuators in mutually opposite directions,

(g) a set of holes provided on each one of said actuators, each hole being associated with one of said selecting members,

(h) a set of pins each one slidable on one of said selecting members,

(i) and a pair of electromagnets associated with each one of said pins and each one adapted to be selectively energized by the corresponding code unit for engaging same with the corresponding hole of one of said actuators according to one of said conditions and with the corresponding hole of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(1) said holes being elongated to render the engagement of said pins ineffective.

6. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members slidably mounted at the opposite side thereof,

(d) means operated by said mechanism for simultaneously positively reciprocating said actuators through an effective forward stroke and an ineffective return stroke in mutually opposite directions,

(e) a set of slots provided on each one of said actuators, each slot being associated with one of said selecting members, the length of each one of said slots corresponding to the distance between said one pair of positions, the slots of one actuator normally facing the slots of the other actuator,

(f) and a set of pins each one transversely slidable on one of said selecting members and adapted to engage the corresponding slot of one of said actuators according to one of said conditions and the corresponding slot of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions, the engagement of the pins of the selecting members located in the position corresponding to the conditions of the associated code unit resulting ineffective due to said length of said slots.

7. In a printing device according to claim 6,

(g) an operating shaft comprised in said opening mechanism,

(h) a crank lever on said main shaft,

(i) an operating lever pin-and-slot connected with said crank lever,

(l) and a pair of members connecting a pair of opposite arms of said operating lever to said pair of actuators.

8. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising,

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members positively reciprocable between a first and a second of a pair of opposite locations associated with said pair of positions,

(d) means operable by said mechanism for simultaneously reciprocating one of said actuators from said first to said second location and the other actuator from said second to said first location during a predetermined machine cycle and oppositely during the next following cycle,

(e) engaging means for selectively engaging said selecting members with one of said actuators according to one of said conditions and with the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(f) shifting means adapted to invert at each cycle the action of each code unit on said connecting means,

(g) and means comprised in said actuators for rendering said engaging means ineffective.

9. In a high speed serial printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a character selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members positively reciprocable between a first and a second of a pair of opposite locations associated with said pair of positions,

(d) means operable by said mechanism for simultaneously reciprocating one of said actuators from said first to said second location and the other actuator from said second to said first location during a predetermined cycle and oppositely during the next following cycle,

(e) a set of circular holes provided on each one of said actuators, each hole being associated with one of said selecting members,

(f) a set of pins each one transversely slidable on one of said selecting members for engaging the corresponding hole of one of said actuators,

(g) a pair of electromagnets associated with each one of said pins and each one adapted to be selectively energized by the corresponding code unit for engaging same with the corresponding hole of one of said actuators according to one of said conditions and with the corresponding hole of the other of said actuators according to the other of said conditions to cause said selecting members to be positively displaced into either one of said positions,

(h) and shifting means controlled by said mechanism for inverting the polarities of said electromagnets at the beginning of each cycle,

(i) said holes being elongated to render the engagement of said pins ineffective.

10. In a high speed printing device having a typecarrier provided with a plurality of types and selectively positionable according to the type to be printed, a cyclically operating mechanism, and a selecting device adapted to be controlled by the combinations of a predetermined code formed of a set of binary code units, the combination comprising:

(a) a set of selecting members each one associated with a corresponding unit of said binary code and adapted to assume either one of a pair of opposite positions corresponding to the two conditions of each unit of said code,

(b) means mutually connecting said selecting members and movable therewith for positioning said typecarrier according to the sum of their movements,

(c) a pair of common actuators for said selecting members positively reciprocable between a first and a second of a pair of locations associated with said pair of positions,

(d) means operable by said mechanism for simultaneously reciprocating one of said actuators from said first to said second location and the other actuator from said second to said first location during a predetermined machine cycle and oppositely during the next following cycle,

(e) a set of circular holes provided on each one of said actuators, each hole being assocaited with one of said selecting members,

(f) a set of pins each one transversely slidable on one of said selecting members for engaging the corresponding hole of one of said actuators,

(g) each hole of each one of said actuators being normally placed in front of the pin of the corresponding selecting member if this latter is located in the position associated with the location of said actuator, said holes being elongated to render the engagement of said pins ineffective,

(h) a pair of electromagnets associated with each one of said pins and each one adapted to be selectively energized by the corresponding unit code for engaging same with the corresponding hole of one of said actuators,

(i) and shifting means controlled by said mechanism for inverting the polarities of said electromagnets at the beginning of each cycle.

11. In a printing device according to claim **10**,

(h) an operating shaft comprised in said operating mechanism and adapted to be rotated through 180 degrees for each cycle,

(i) and a pair of eccentrics secured to said main shaft in a mutual opposite angular relationship and each one connected to one of said actuators.

12. In a printing device according to claim **11**,

(l) a pair of disks secured to said shaft, said disks being each one provided with a notch located in a mutual opposite angular relationship,

(m) and a pair of photodiodes for sensing said disks and accordingly controlling said shifting means.

13. In a high speed printing device comprising a cylindrical typecarrier provided wtih types arranged in rows and columns and being axially movable along a printing line, a first member adapted to be moved step by step parallel to said printing line, a hammer concertedly stepped with said first member and operable for printing by cooperating with said types on said typecarrier, and selecting means for rotatively and axially positioning said typecarrier according to the particular required type to be positioned at the hammer, the combination therewith comprising,

(a) a first fluted shaft extending parallel to the printing line and adapted to be rotatively positioned by said selecting means, said typecarrier being axially movable on said shaft and rotatable therewith,

(b) a second fluted shaft, parallel to said first fluted shaft, and adapted to be rotatively positioned by said selecting means,

(c) a second member related to said first member, movable relatively thereto parallel to said fluted shafts and having an association with said typecarrier for moving it on said first fluted shaft,

(d) a screw element concentrically and slidably carried on said second fluted shaft and adapted to receive rotative positioning movements therefrom

(e) and means shiftably connecting said second member to said first member through said screw element and including on at least one of said members a threaded association with said screw element.

14. In a high speed printing device comprising a cylindrical typecarrier provided with types arranged in rows and columns, a support for said typecarrier adapted to be moved transversely step by step, a hammer transversely movable with said support and operable for cooperating with said typecarrier, and a selecting device for angularly and axially positioning said typecarrier ac-

cording to the type to be printed, the combination comprising:

(a) a first transverse fluted shaft adapted to be selectively rotated by said selecting device, said typecarrier being axially slidable thereon and bodily rotatable therewith,

(b) a second transverse fluted shaft adapted to be selectively rotated by said selecting device,

(c) a first screwed hub secured to said support coaxial with said second fluted shaft,

(d) a second hub screwed in a direction opposite to said first hub, said second hub being coaxial with said second fluted shaft and transversely movable with said typecarrier,

(e) an element slidably mounted on said second fluted shaft and bodily rotatable therewith,

(f) a first screwed portion on said element adapted to cooperate with said first screwed hub,

(g) and a second screwed portion on said element adapted to cooperate with said second screwed hub, whereby a predetermined rotation of said second fluted shaft causes said typecarrier to be axially displaced with respect to said support through the sum of the displacement of said element with respect to said first hub and of the displacement of said second hub with respect to said element.

15. In a high speed printing device comprising a cylindrical typecarrier provided with types arranged in rows and columns, a support for said typecarrier adapted to be moved transversely step by step, a hammer transversely movable with said support and operable for cooperating with said typecarrier, and a selecting device for angularly and axially positioning said typecarrier according to the type to be printed, the combination comprising:

(a) a first transverse fluted shaft adapted to be selectively rotated by said selecting device, said typecarrier being axially slidable thereon and bodily rotatable therewith,

(b) a second transverse fluted shaft adapted to be selectively rotated by said selecting device,

(c) means for connecting said typecarrier to said support,

(d) an element comprised in said connecting means and slidably mounted on said second fluted shaft and bodily rotatable therewith, said element being adapted to displace said typecarrier axially with respect to said support according to the rotation of said second shaft,

(e) a pair of toothed wheels each one secured to one of said fluted shafts,

(f) and a pair of knife-members for angularly adjusting said wheels, said pair of knife-members being rotatable in a plane perpendicular to said wheels and adapted to engage same at the instant of the operation of said hammer.

16. In a high speed printing device comprising a cylindrical typecarrier provided with types arranged in rows and columns, a support for said typecarrier adapted to be moved transversely step by step, a hammer transversely movable with said support and operable for cooperating with said typecarrier, and a selecting device for angularly and axially positioning said typecarrier according to the type to be printed, the combination comprising:

(a) a first transverse fluted shaft adapted to be selectively rotated by said selecting device, said typecarrier being axially slidable thereon and bodily rotatable therewith,

(b) a second transverse fluted shaft adapted to be selectively rotated by said selecting device,

(c) means for connecting said typecarrier to said support,

(d) an element comprised in said connecting means and slidably mounted on said second fluted shaft and bodily rotatable therewith, said element being adapted to displace said typecarrier axially with respect to said support according to the rotation of said second shaft,

(e) a pair of cables connected to said support and said hammer,

(f) a first pair of bodily rotatable pulleys for winding said pair of cables,

(g) means for step by step rotating said first pair of pulleys,

(h) and a second pair of bodily rotatable pulleys for unwinding said pair of cables against the action of a restraining power means.

17. In a high speed printing device comprising a cylindrical typecarrier provided with types arranged in rows and columns, a support member adapted to be moved transversely step by step, a hammer transversely movable with said member and operable for cooperating printingly with said typecarrier, and a selecting device for angularly and axially positioning said typecarrier in reference to said member according to the type to be printed, the combination comprising:

(a) a first transverse fluted shaft adapted to be selectively rotated by said selecting device, said typecarrier being axially slidable thereon and rotatively movable therewith,

(b) a second transverse fluted shaft adapted to be selectively rotated by said selecting device,

(c) a screwed portion on said member,

(d) and a screwed element slidably mounted on said second fluted shaft and rotatively movable therewith, said screwed element threadedly engaging said screwed portion,

(e) and means associated with said typecarrier and controlled by the extents of the rotative movements imparted to said screwed element, to move said typecarrier on said first fluted shaft axially in reference to any prevalent step position of said support member.

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