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Salto et al.

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[54] **CHARACTER SELECTING DEVICE FOR A PRINTING MECHANISM**

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March 24, 1970 Italy.....68007 A/70

[52] **U.S. Cl.** **197/18,** 178/34, 197/16, 197/52, 197/55

[51] **Int. Cl.** **B41j 1/60**

[58] **Field of Search** 178/34; 197/16, 18, 48, 49, 197/52, 55

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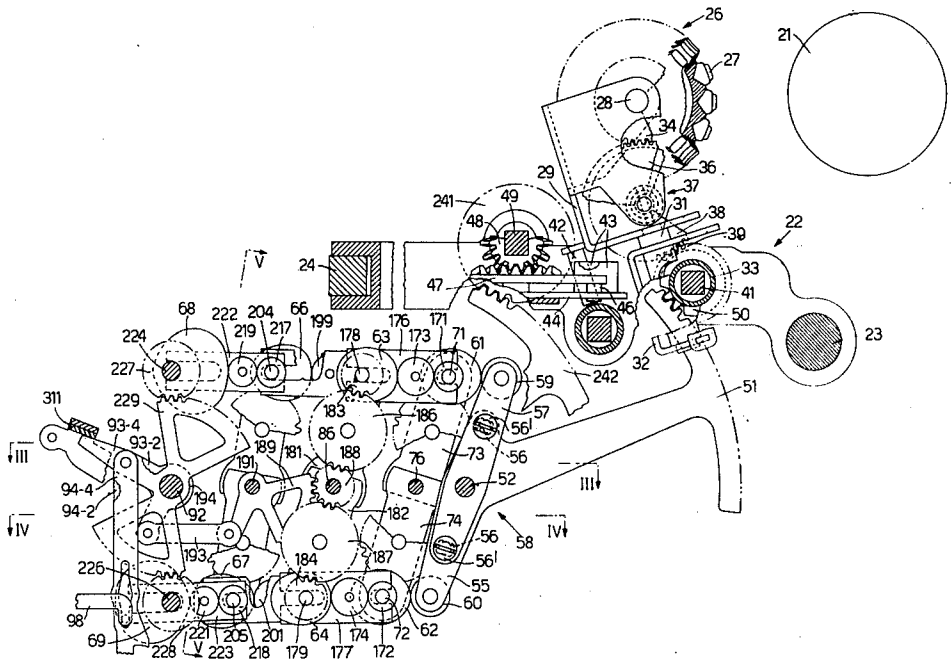
[57] **ABSTRACT**

A character selecting device for a printing mechanism comprising a type-bearing element having a set of characters selected in accordance with the combination of a plurality of binary code units. Each code unit is associated with a selector cam rotatable between a first position and a second position. Each selector cam is in turn carried by a shaft, and at least one of the selector cams is so interconnected with at least one of the other shafts to cause the other shaft to shift perpendicularly to its axis when the one cam rotates from the first to the second position. Output means are engaged by the cam carried by the other shaft to move the type-bearing element to select the character to be printed.

24 Claims, 10 Drawing Figures



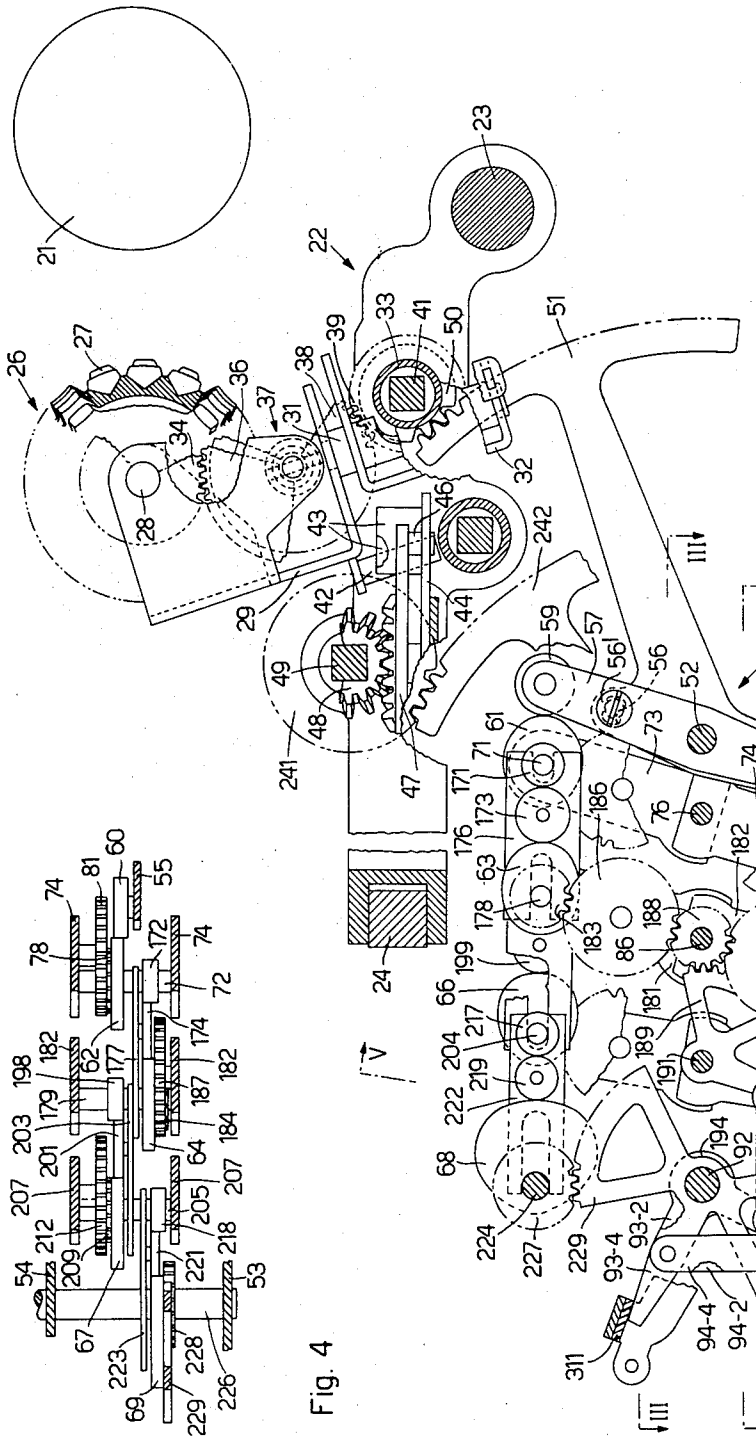


Fig. 1

Fig. 4

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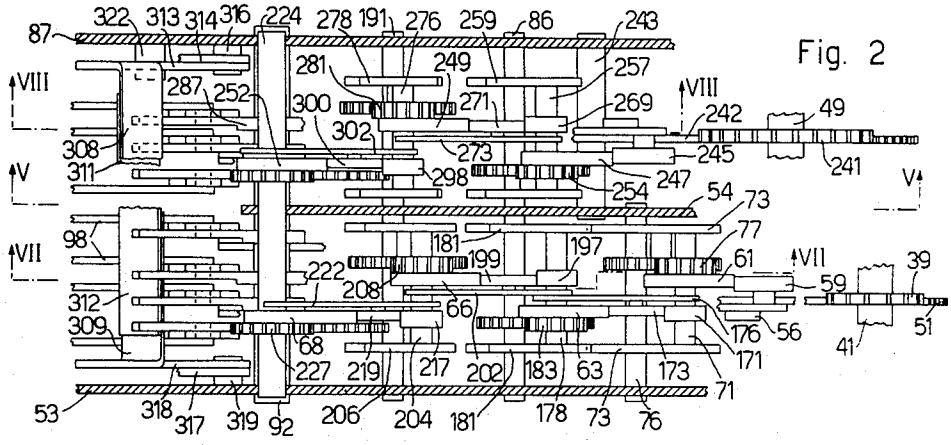

Fig. 2

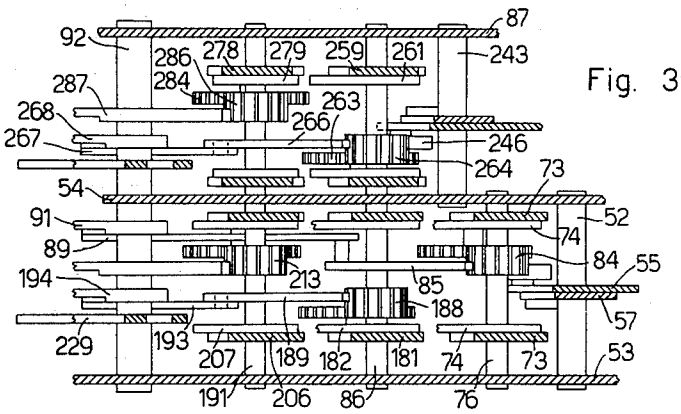

Fig. 3

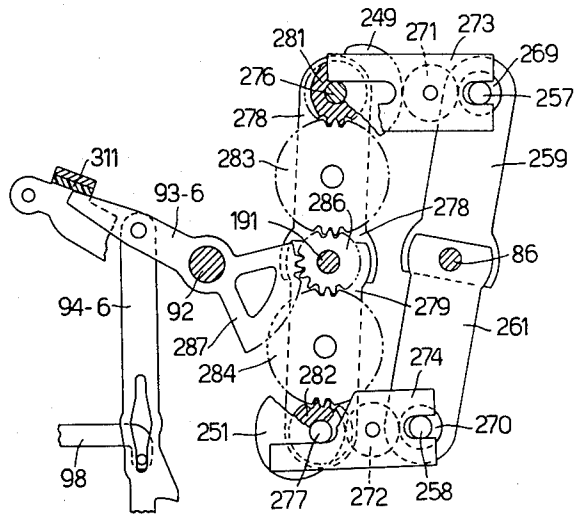

Fig. 8

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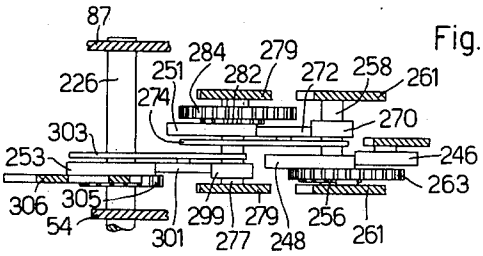

Fig. 6

Fig. 5

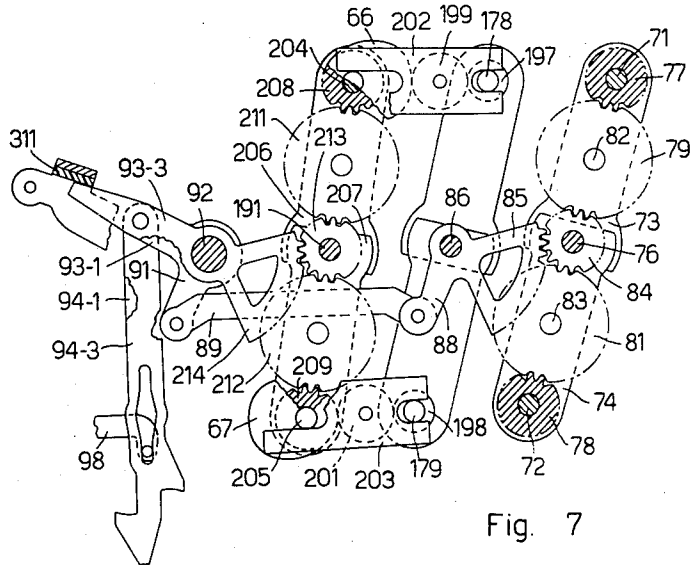

Fig. 7

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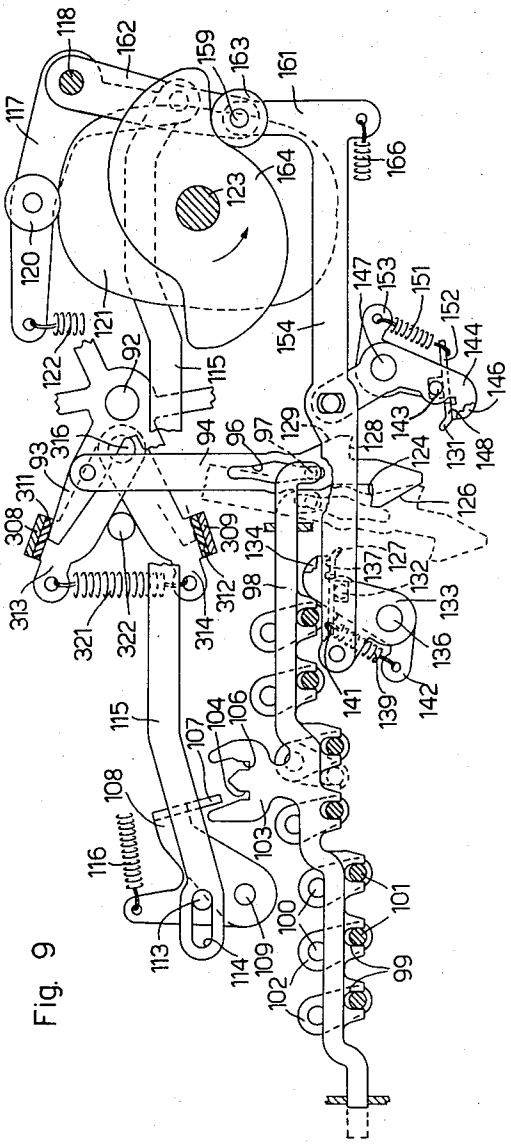

Fig. 9

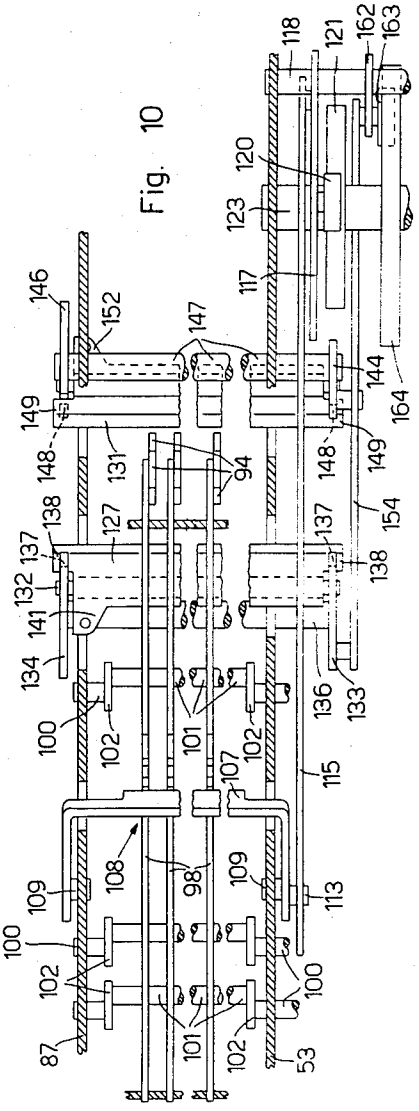

Fig. 10

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CHARACTER SELECTING DEVICE FOR A PRINTING MECHANISM

BACKGROUND OF THE INVENTION

The present invention relates to a character selecting device for a printing mechanism such as may be used in typewriters, teleprinters and accounting machines, in which a type-bearing element is provided with a set of characters selectable in accordance with a code combination having a plurality of binary units.

Many character selecting devices are known which convert code combinations having a plurality of binary units into movements of elements adapted to select the characters of a type-bearing element for printing. In one of these devices, the positioning of the type characters is effected by a series of frontal cams with predetermined lifts associated with the various binary units. The cams are disposed on a common shaft and are rotated selectively in response to the various input codes by means of gears. As a result of its rotation, each cam shifts the remaining cams along the supporting shaft. The sum of the movements or shifts corresponding to the individual cams is then transmitted to the type-bearing element. In this selecting device, the gears associated with each cam must be very long to be able to permit the axial shifting of the cams simultaneously with their selective rotation. Moreover, during the rotation of the cams, they are subjected to sliding friction between the cams and the common shaft and between the gears associated with the cams and the driving gears. The selecting device is therefore bulky and of limited mechanical efficiency.

SUMMARY OF THE INVENTION

The object of this invention is to provide a character selecting device which is of limited dimensions and is not subject to excessive friction.

According to the present invention, there is provided a character selecting device for a printing mechanism, in which a type-bearing element is provided with a set of characters selectable in accordance with a code combination having a plurality of binary units. A plurality of selector cams associated with the code units are rotated selectively between two positions, each cam of the plurality being carried by a corresponding shaft. At least one cam is adapted to cause at least one other shaft of the plurality of shafts to shift perpendicularly to its own axis when the cam rotates from the first to the second position. Output means are engaged by the cam of the other shaft to move the type-bearing element to select the character to be printed.

BRIEF DESCRIPTION OF THE DRAWINGS:

A preferred embodiment of the invention is presented by way of example in the following description and shown in the accompanying drawings, in which:

FIG. 1 is a side view from the right, partly in section, of part of a typewriter with a character selecting device embodying the invention;

FIG. 2 is a partial plan view of the selecting device of FIG. 1;

FIG. 3 is a partial section on the line III—III of FIG. 1;

FIG. 4 is a partial section on the line IV—IV of FIG. 1;

FIG. 5 is a partial section on the line V—V of FIG. 2;

FIG. 6 is a partial section on the line VI—VI of FIG. 5;

FIG. 7 is a partial section on the line VII—VII of FIG. 2;

FIG. 8 is a partial section on the line VIII—VIII of FIG. 2;

FIG. 9 is a side view from the right, partly in section, of a detail of the device;

FIG. 10 is a partial plan view of the detail of FIG. 9.

DESCRIPTION OF PREFERRED EMBODIMENTS:

The character selecting device of the invention can be used as a decoding device in typewriters controlled directly from their keyboard, in teleprinters controlled through transmitting and receiving equipment and in any printing or typing mechanism or printers for accounting machines and data processors in general.

The device is applied here by way of example to a typewriter with a transversely fixed platen or cylinder **21** (FIG. 1) and a type carriage **22** movable transversely on two guides **23** and **24** parallel to the platen **21**. On the carriage **22** there is mounted a barrel-shaped typing head **26** from which there projects a set of types **27** arranged in six rings, or files, around the head, each of which contains sixteen types. The types are also lined up in sixteen rows extending lengthwise of the barrel-shaped head.

The head **26** is rotatable on a substantially horizontal shaft **28** in a fork **29** to bring the row in which the character to be typed is located in front of the platen **21**. The fork **29** can turn by means of an approximately vertical shaft **31** in a bail **32** to orient the head **26** in front of the platen **21** and select the file in which the character to be typed is located. The printing of the selected character is effected by rotation of the bail **32** on a hollow shaft **33**, rotatable in turn in the carriage **22**, until the head **26** is caused to strike against the platen **21**.

For selection of the character row, the head **26** is rotated by a toothed wheel **34** in mesh with a toothed wheel **36**. The latter toothed wheel is connected in turn through a universal joint **37** to a toothed wheel **38** meshing with a toothed wheel **39** fixed on the hollow shaft **33**. This shaft is angularly fixed and axially slidable on a square shaft **41**, which is rotatable in turn by means of two cylindrical ends in the fixed frame of the machine.

For selection of the file in which the character is located, the fork **29** is swivelled through the medium of a pin **42** by a pair of lugs **43** of a slider **44** slidable transversely of the carriage **22**. The slider **44** is shifted by a stud **46** on a toothed sector **47** meshing with a pinion **48** rotatable on the carriage **22**. The pinion **48** is angularly fixed and axially slidable on another square shaft **49** rotatable in turn by means of two cylindrical ends in the fixed frame of the machine.

On the shaft **41** there is fixed a toothed wheel **50** in mesh with a toothed sector **51**. Toothed sector **51**, in turn, is keyed on a shaft **52** rotatable between two side pieces **53** and **54** (FIG. 3) of the device. Fixed adjustably on an arm **55** (FIG. 1) of the toothed sector **51** by means of two slots **56** and two screws **56'** is another arm **57** which constitutes together with the arm **55** a rocking lever indicated generally by the reference **58** At the ends of the arm **57** and the arm **55** there are

rotatable two rollers 59 and 60, respectively, which co-operate with a pair of selector cams 61 and 62 which are alike and have profiles symmetrical with respect to a diametral plane.

The cams 61 and 62 from part of a kinematic train for the selection of the row of characters on the head 26 comprising another three pairs of selector cams having symmetrical profiles and alike two by two, these being the cams 63 and 64, 66 and 67, and 68 and 69, respectively. The two cams of each pair are turned through 180° with respect to one another and are moreover adapted to assume one or the other of two diametrically opposite positions. The lift of the various pairs of cams increases in accordance with the power of two. Therefore, the lift of the pair of cams 63 and 64 is double that of the cams 61 and 62, the lift of the cams 66 and 67 is four times and that of the cams 68 and 69 is eight times that of the cams 61 and 62.

The cams 61 and 62 are rotatable on two respective shafts 71 and 72 which are each fixed to a pair of arms 73 and 74, respectively, together with which they constitute two bails 71, 73 and 72, 74. The arms 73 and 74 can pivot in turn on a shaft 76 fixed to the side pieces 53 and 54 (FIG. 3). The cams 61 and 62 (FIG. 1) are respectively integral with two like pinions 77 and 78 (FIG. 7) meshing with two toothed transmission wheels 79 and 81 rotatable on two pins 82 and 83 fixed to two corresponding arms 73 and 74. The two wheels 79 and 81 mesh with a toothed wheel 84 similar to the pinions 77 and 78, rotatable on the shaft 76 and meshing in turn with a toothed sector 85. This toothed sector can turn on a shaft 86 coplanar with the shafts 76 and 52 (FIG. 1) and fixed to the side pieces 53, 54 (FIG. 3) and to another side piece 87 of the device. The toothed sector 85 is provided with an arm 88 (FIG. 7) connected through a connecting rod or link 89 to one arm of a right-angled lever 91. This lever can turn on a shaft 92 which is also fixed and coplanar with the shafts 86 and 76.

On the other arm of the lever 91 indicated by the reference 93–1 there is pivoted a connecting rod 94–1. As will be seen hereinafter, there is provided a series of seven like connecting rods 94 pivoted on an equal number of arms 93 which constitute as many operating elements for the various cams.

Two rollers 171 and 172 can rotate on the shafts 71 and 72 (FIG. 1) and co-operate with two transmission rollers 173 and 174 rotatable on two sliders 176 and 177. The sliders 176 and 177 have slotted ends which respectively engage the shafts 71 and 72 on the one hand and a pair of shafts 178 and 179 on the other hand. Each of the shafts 178 and 179 is fixed to two arms 181 (FIG. 3) and 182 (FIG. 4) which can turn on the shaft 86 (FIG. 1) and form two bails 178, 181 and 179, 182. The rollers 173 and 174 cooperate in turn with the cams 63 and 64, which are respectively rotatable on the shafts 178 and 179. The cams 63 and 64 are integral with two like pinions 183 and 184, which mesh with two toothed wheels 186 and 187 rotatable on one of the arms 181 and 182, respectively, and in mesh with a toothed wheel 188 similar to the two pinions 183 and 184 and rotatable on the shaft 86. The toothed wheel 188 is in mesh in turn with a toothed section 189 which can turn on a fixed shaft 191 coplanar with the shafts 92 and 86. The sector 189 is connected by means of a connecting rod or link 193 to a right-angled lever 194 which can turn on the shaft 92 and is provided with an arm 93–2 on which there is pivoted a second connecting rod 94–2 of the series of connecting rods 94.

On the shafts 178 and 179 there can also rotate two rollers 197 and 198 (FIG. 7) cooperating with a pair of rollers 199 and 201 rotatable on another two sliders 202 and 203. The ends of the sliders 202 and 203 are also slotted and slidable on the shafts 178 and 179 on the one hand and, on the other hand, on a pair of shafts 204 and 205 on which the cams 66 and 67 are rotatable. The shafts 204 and 205 are fixed to two pairs of arms 206 and 207 with which they form two bails 204, 206 and 205, 207. The rollers 199 and 201 cooperate in turn with the cams 66 and 67, which are integral with two like pinions 208 and 209. These pinions are in mesh with two toothed wheels 211 and 212 which are respectively rotatable on one of the arms 206 and 207 and mesh in turn with a toothed wheel similar to the pinions 208 and 209 and rotatable on the shaft 191. The toothed wheel 213 is in mesh with a toothed sector 214 which can turn on the shaft 92 and is provided with an arm 93–3 similar to the other arms 93 and on which there is pivoted a third connecting rod 94–3 of the series of connecting rods 94.

Finally, two rollers 217 and 218 are rotatable on the shafts 204 and 205 (FIG. 1) and cooperate with two rollers 219 and 221 rotatable on two sliders 222 and 223. The ends of the sliders 222 and 223 are also slotted and are slidable on the one hand on the shafts 204 and 205 and on the other hand on two fixed shafts 224 and 226. The rollers 219 and 221 cooperate in turn with the cams 68 and 69 which are rotatable on the shafts 224 and 226 and are integral with two like pinions 227 and 228. These pinions are in mesh in turn with a double toothed sector 229 which can turn on the shaft 92 and has an arm 93-4 similar to the other arms 93 and on which there is pivoted a fourth connecting rod 94–4 of the series of connecting rods 94.

The selector cams and the rollers cooperating with them are kept in contact by the rocking lever 58, the arms 55 and 57 of which can be adjusted so as to take up any play due to machining tolerances and any possible play due to wear. Moreover, the profiles of the cams of each pair are such as to maintain contact between the elements of the kinematic train hereinbefore described even in the course of the rotary movements of the cams from one working position to the other diametrically opposite working position.

On the square shaft 49 there is fixed a toothed wheel 241 meshing with a toothed sector 242. This sector is keyed on a shaft 243 (FIG. 5) which can turn between the side pieces 54 and 87 (FIG. 2) and is coplanar with the shafts 86 and 191. The sector 242 is connected to a rocking lever 244 (FIG. 5) similar to the rocking lever 58 (FIG. 1) and at the ends of which two rollers 245 and 246 (FIG. 5) can rotate. The rollers 245 and 246 cooperate with a pair of like selector cams 247 and 248 having symmetrical profiles and turned through 180° with respect to one another.

The cams 247 and 248 form part of a second kinematic train for the selection of the file or vertical line of characters on the head 26, which kinematic train is similar to that already described for the selection of the character row and comprises another two pairs of

selector cams also having symmetrical profiles and alike two by two, these being the cams **249** and **251**, and **252** and **253**, respectively. The two cams of each pair are turned through **180°** with respect to one another and are adapted to assume one or the other of two diametrically opposite positions. The first two pairs of cams **247** and **248**, **249** and **251** have the same lift, which is twice that of the third pair of cams **252** and **253**.

More particularly, the cams **247** and **248**, which are integral with two like pinions **254** and **256**, are rotatable on two shafts **257** and **258** fixed to two pairs of arms **259** and **261** which can pivot in turn on the shaft **86** and form with said two shafts a pair of bails. The pinions **254** and **256** mesh with two toothed wheels **262** and **263** each rotatable on one of the arms **259** and **261** and in mesh with a toothed wheel **264**. This toothed wheel is similar to the pinions **254** and **256** and rotatable on the shaft **86** and meshes with a toothed sector **266** which can turn on the shaft **191**. The sector **266** is connected through the medium of a connecting rod or link **267** to one arm of a right-angled lever **268** which can turn on the shaft **92** and provided in turn with an arm **93—5** similar to the other arms **93** and on which there is pivoted a fifth connecting rod **94–5** of the series of connecting rods **94**.

On the 8) **257** and **258** (FIG. *) there can rotate two rollers **269** and **270** cooperating with two rollers **271** and **272** rotatable on two sliders **273** and **274**. The ends of the sliders **273** and **274** are slotted and slidable on the one hand on the shafts **257** and **258** and on the other hand on two shafts **276** and **277**. The latter shafts are fixed to two pairs of arms **278** and **279** which can pivot on the shaft **191** and form with said two shafts another pair of bails. The rollers **271** and **272** cooperate in turn with the cams **249** and **251**, which are rotatable on the shafts **276** and **277**. The cams **249** and **251**, which are integral with two like pinions **281** and **282**, are adapted to be rotated through a pair of transmission gears **283** and **284** by a toothed wheel **286** similar to the pinions **281** and **282** and rotatable on the shaft **191**. The toothed wheel **286** meshes in turn with a toothed sector **287** which can turn on the shaft **92** and is provided with an arm **93–6** similar to the other arms **93** and on which there is pivoted a sixth connecting rod **94–6** of the series of connecting rods **94**.

On the shafts **276** and **277** there can moreover rotate two rollers **298** and **299** (FIG. 5) cooperating with two rollers **300** and **301** rotatable on two sliders **302** and **303**. The ends of the sliders **302** and **303** are slotted and slidable on the one hand on the shafts **276** and **277** and on the other hand on the shafts **224** and **226**. The rollers **300** and **301** cooperate in turn with the cams **252** and **253**, which are rotatable on the shafts **224** and **226** and integral with two respective like pinions **304** and **305**. These pinions mesh with a double sector **306** which can turn on the shaft **92** and is also provided with an arm **93–7** similar to the other arms **93** and on which there is pivoted a seventh connecting rod **94–7** of the series of connecting rods **94**.

As in the case of the kinematic elements described for the selection of the character in a file or vertical line, the selector cam and the rollers concerned with the selection of the file are also kept in constant contact by the rollers **245** and **246** of the rocking lever **244**, the arms of which are adjustable for taking up the play due to machining tolerances and to wear.

The connecting rods **94** (FIG. **1**) are adapted to assume one or the other of two positions shown in FIG. **9** in solid lines and broken lines, respectively. Each connecting rod **94** has a longitudinal slot **96** in which there is engaged a pin **97** fixed to the end of a corresponding slider **98** slidable in the frame of the machine. Each of the sliders **98** has a slot **99** in which there is engaged a corresponding bar of a set of seven code bars **101** fixed to seven pairs of cranks **102**. The cranks **102** can turn by means of an equal number of pins or pivots **100** in the side pieces **53** and **87** (FIG. **10**) of the device and are orientable selectively in known manner to the right or left under the control of a keyboard, for example in the manner described in the Applicants Italian Pat. No. 724,207.

Each slider **98** (FIG. **9**) is provided with a projection **103** which has a pair of notches **104** and **106** adapted to be engaged by a crosspiece **107** of a bail **108**. The bail **108** is pivoted on two pins **109** and is provided with a pin **113** normally bearing against the right end of a slot **114** in a connecting rod **115** through the action of a spring **116**. The connecting rod **115** is pivoted in turn on an arm of a rocking lever **117** which can pivot on a fixed shaft **118**. A roller **120** can rotate on the rocking lever **117** and cooperates with a cam **121** through the action of a spring **122**. The cam **121** is keyed on a shaft **123** which is rotatable in the frame of the machine and is rotated cyclically anticlockwise through 180° **in known manner during the positioning of the bars** 101.

Each connecting rod **94** has two opposed shoulders **124** and **128** adapted to cooperate alternately with two lug plates **127** and **131**. The lug plate **127** is fixed on a transverse shaft **132** pivoted between two arms **133** and **134**. These arms are fixed to a transverse shaft **136** which can turn in the side pieces **53** and **87** (FIG. **10**). The arms **133** and **134** are provided with two shoulders **137** against which two extensions **138** of the lug plate **127** normally bear through the action of a spring **139** (FIG. **9**) stretched between a projection **141** of the lug plate **127** and a projection **142** of the arm **134**. The lug plate **131** is fixed on a transverse shaft **143** pivoted between two arms **144** and **146** fixed in turn to a transverse shaft **147** which can turn between the side pieces **53** and **87** (FIG. **10**). The arms **144** and **146** are provided with two shoulders **148** against which two extensions **149** of the lug plate **131** normally bear through the action of a spring **151** (FIG. **9**) stretched between a projection **152** of the lug plate **131** and a projection **153** of the arm **146**.

The two arms **133** and **144** are connected by a connecting rod **154** which has an arm **161** connected by means of a pin **159** to a lever **162** pivoting on the shaft **118**. A roller **163** co-operating through the action of a spring **166** with a cam **164** fixed on the shaft **123** is rotatable on the pin **159**.

The seven arms **93** can cooperate with two stop crosspieces **308** and **309**. To these crosspieces there are fixed two strips **311** and **312** of soft material, for example sponge rubber, adapted to deaden the impacts of the arms **93**. The crosspieces **308** and **309** are integral on one side with two arms **313** and **314** (FIG. **2**) which can turn about a pin **316** fixed to the side piece **87** and are integral on the other side with two arms **317** and

318 which can turn on a pin 319 on the side piece 53. Between the arms 313 and 314 (FIG. 9) is stretched a spring 321 which retains the arms 313 and 314 against a fixed pin 322.

The selecting device operates in the following manner.

The seven code bars 101 (FIG. 9) are disposed in the position corresponding to the character to be typed or printed in known manner, for example on the depression of the key corresponding to the character in the manner described in said U.S. Pat. No. 724,207. Some bars remain stationary in the previous position, while others are shifted into the other position. The corresponding connecting rods 92 may therefore remain in their old position, or be turned clockwise or anticlockwise through the respective sliders 98.

Simultaneously with the setting of the code bars 101, the main shaft 123 is set in rotation together with the two cams 121 and 164. At the beginning of the cycle, the cam 121 presents its profile of greater radius to the roller 120. Immediately after the positioning of the bars 101, the cam 121 causes the rocking lever 117 to turn anticlockwise, shifting the connecting rod 115 to the right. Owing to the action of the spring 116, the bail 108 then turns clockwise and brings the crosspiece 107 between the notches 104 or between the notches 106, thus locking the bars 101 in the position reached.

At the beginning of the cycle, the cam 164 presents its profile of smaller radius to the roller 163. Thereafter, the cam 164 causes the connecting rod 154 to shift to the right and causes the lug plates 127 and 131 to turn clockwise. The connecting rods 94 not shifted by the corresponding code bars 101 are not affected by the pivoting of the two lug plates, since the shoulders 124 and 128 remain beyond the paths of the lug plates 127 and 131.

In the case of shifting to the left of a bar 101 previously located to the right, the corresponding connecting rod 94 is turned clockwise about the pivot connecting it to the respective arm 93. The connecting rod 94, the starting position of which is that indicated in continuous lines, then brings the shoulder 124 below the lug plate 127. This lug plate, during its clockwise turning movement, pushes the connecting rod 94 downwardly until the arm 93 is caused to be arrested on the crosspiece 309. Owing to the effect of the turning action due to the slider 98 and by the effect of the lowering due to the lug plate 127, the connecting rod 94 shifts from the position indicated in solid lines to the position indicated in broken lines.

In the case of shifting to the right of a bar 101 previously located to the left, for example the bar 101 indicated by a broken line in FIG. 9, the corresponding slider 98 causes the corresponding connecting rod 94 to turn anticlockwise about the pivot on the arm 93. The connecting rod 94, which is also shown in broken lines, brings the shoulder 128 above the lug plate 131. This lug plate, during its clockwise turning movement, then pushes the connecting rod 94 upwardly, bringing it into the position indicated in continuous lines until the arm 93 is arrested against the crosspiece 308.

After the extreme right-hand position corresponding to the profile of maximum radius of the cam 164 has been reached, the cam allows the spring 166 by means of its sharply declining profile to shift the connecting rod 154 negatively to the left. The lug plates 127 and 131 then turn anticlockwise to be brought back into their respective starting positions, leaving the shoulders 124 and 128, while the connecting rods 94 remain in the positions reached, as will be seen hereinafter. In turn, during the turning and shifting movements of the connecting rods 94, the profiles of smaller radius of the cam 121 holds the crosspiece 107 substantially stationary. The sliders 98 are thus held in position by the crosspiece 107, which prevents the stresses originating from the connecting rods 94 being transmitted to the bars 101.

On the return of the lug plates 127 and 131 to the starting position, a fresh cycle can take place in the manner already described. If, by accident, a positioning of the bars 101 occurs before the two lug plates have completed their return travel, the paths of the connecting rods 94 interfere with those of the lug plates 127 and 131. The connecting rods 94 then strike against the lug plate 127 or against the lug plate 131 with an inclined edge 126 or 129, respectively, causing a clockwise turning movement of the lug plates about the respective shafts 132 and 143 and tensioning the spring 139 or 151. Towards the end of the return cycle of the lug plates, since the interference between the paths ceases, the lug plates 127 and 131 are disengaged from the projections 126 and 129 and are brought back into their inoperative position through the action of the springs 139 and 151.

Referring to the selection of the row of the character, let us assume that the connecting rods 94 were previously in the high position shown in the drawing. The lower cams 62, 64, 67 and 69 (FIG. 1) then present their profile of smaller radius to the respective rollers 60, 174, 201 and 221, while the upper cams 61, 63, 66 and 68 present their profile of greater radius to the rollers 59, 173, 199 and 219. A downward movement of the connecting rod 94–1 (FIG. 7) causes through the arm 93–1 an anticlockwise rotation of the lever 91, which is transmitted by means of the connecting rod 89 and the arm 88 to the toothed sector 85. The sector 85 then causes the toothed wheel 84 to turn clockwise and, through the transmission wheels 79 and 81, said toothed wheel causes a clockwise rotation of the pinions 77 and 78 and the associated cams 61 and 62 (FIG. 1) through 180°.

To this rotation there corresponds a shifting of the roller 59 to the left and a shifting of the roller 60 to the right for the same travel. The rocking lever 58 is then turned anticlockwise positively through an angle proportional to the lift of the cams 61 and 62, which angle is transmitted through the sector 51 and the toothed wheel 50 to the selector shaft 41. Through the medium of the hollow shaft 33, the toothed wheels 39 and 38, the articulation 37 and the other pair of toothed wheels 36 and 34, the rotation of the shaft 41 causes the head 26 to rotate anticlockwise through an angular step, selecting a row adjacent that previously selected.

A downward movement of the connecting rod 94–2 produces an anticlockwise rotation of the arm 93–2 of the lever 194. This lever, acting through the connecting rod 193, causes the toothed sector 189 to turn and, through the toothed wheel 188 and the two transmission wheels 186 and 187, this toothed sector, in turn, causes the two pinions 183 and 184, and therefore the

cams 63 and 64, to rotate clockwise through 180°. The rotation of these cams produces a shifting of the roller 173 to the left and an equal shifting of the roller 174 to the right. These movements are transmitted through the rollers 171 and 172 to the shafts 71 and 72 and produce an anticlockwise turning action of the arms 73 and 74 about the shaft 76. The cams 61 and 62, being carried by the arms 73 and 74, turn anticlockwise together with these two members through the same angle. The transmission wheels 79 and 81 (FIG. 7), then rolling on the wheel 84, rotate anticlockwise with respect to the pins 82 and 83 through an angle equal to the turning movement of the arms 73 and 74 owing to the transmission ratio between the wheel 84 and the wheels 79 and 81. The rotation of the wheels 79 and 81 is transmitted in the opposite sense to the respective pinions 77 and 78. Since the pinions 77 and 78 are similar to the wheel 84, the rotation of these pinions produced by the transmission wheels 79 and 81 is equal and opposite to the rotation due to the arms 73 and 74, as a result of which the cams 61 and 62 (FIG. 1) do not change their orientation with respect to the rollers 59 and 60. The distance between the rollers 173 and 59 and that between the rollers 174 and 60 thus remain unchanged and the interposed cams 61 and 62 confine themselves to transmitting the movement of the rollers 173 and 174 to the rollers 59 and 60. The rocking lever 58 and the shaft 41 then turn through an angle proportional to the lift of the cams 63 and 64 and therefore double with respect to the rotation produced by the cams 61 and 62. The head 26 then rotates anticlockwise for two angular steps, selecting in front of the platen 21 a row which is two rows distant with respect to that previously selected.

A downward movement of the connecting rod 94–3 (FIG. 7) produces an anticlockwise rotation of the toothed sector 214, which causes the cams 66 and 67 to rotate clockwise through 180° through the medium of the toothed wheel 213, the two transmission wheels 211 and 212 and the two pinions 208 and 209. To the rotation of the cam 66 there corresponds a shifting of the roller 199 to the left, which is transmitted through the roller 197, the shaft 178, the cam 63 (FIG. 1), the rollers 173 and 171, the shaft 71 and the cam 61 to the roller 59. Similarly, owing to the rotation of the cam 67, the roller 60 is shifted to the right together with the rollers 201, 198 (FIG. 7) the shaft 179, the cam 64 (FIG. 1), the rollers 174 and 172, the shaft 72 and the cam 62.

Since the orientation of the various selector cams is not changed during the movements for the reasons already stated in connection with the cams 61 and 62, the movements of the rollers 199 and 201 are transmitted unchanged to the rollers 59 and 60. This produces an anticlockwise rotation of the rocking lever 58 and the shaft, 41 through angles proportional to the lift of the cams 66 and 67 and therefore equal to four times the rotation produced by the cams 61 and 62. The head 26, in turn, rotates anticlockwise through four angular steps, selecting a row four rows distant with respect to the preceding one.

A downward movement of the connecting rod 94–4 produces an anticlockwise rotation of the double toothed sector 229, which cause clockwise rotation of the pinions 227 and 228, and therefore of the two cams 68 and 69, through 180°. The rotation of the cam 68 causes a shifting of the rollers 59 to the left through the rollers 219 and 217, the shaft 204, the cam 66 and the kinematic train described for the rotation of the cam 66. Similarly, the rotation of the cam 69 causes a shifting of the roller 60 to the right through the rollers 221 and 218, the shaft 205, the cam 67 and the kinematic train described for the rotation of the cam 67. The movements of the two rollers 59 and 60 in opposite directions are now proportional to the lifts of the cams 68 and 69 and produce a rotation of the rocking lever 58 and the shaft 41 equal to eight times the rotation produced by the two cams 61 and 62. The head 26, in turn, rotates anticlockwise for eight angular steps and positions a row eight rows distant with respect to the preceding one.

In the event of a connecting rod 94 (FIG. 9) being disposed in the position indicated in dash lines, the corresponding pair of cams presents to the respective rollers the profile of larger radius in the lower cam and the profile of smaller radius in the upper cam. A shifting of the corresponding bar 101 to the right through the respective slider 98 causes an anticlockwise turning action of the connecting rod 94, which is thereafter brought upward by the lug plate 131 until it arrives in the position indicated in solid lines. This movement of the connecting rod 94 gives rise in the manner already described to an anticlockwise rotation of the corresponding cams through 180°, which is followed by a clockwise rotation of the rocking lever 58 (FIG. 1), which in turn gives rise to an anticlockwise rotation of the selector shaft 41 and to a clockwise rotation of the head 26.

Since the shifting of a connecting rod 94 causes the rotation of the pair of corresponding cams only and does not change the orientation of the other cams, a combination of lowering and/or raising movements of the various connecting rods 94 gives rise to a rotation of the shaft 41 which is the algebraic sum of the rotations due to the individual cams. Starting from the position shown in the drawing, there are therefore sixteen possible angular positions of the shaft 41 and of the typing head connected thereto, — which are distant from one another by equal angles —, for a total rotation of the sector 51 of about 40°. It is to be noted that the coupling of each selector cam with the roller shifted by it is irreversible, for which reason each connecting rod 94 remains from time to time in the position reached.

As in the case of the selection of the row, let it also be assumed in the case of the selection of the file or vertical line of the character that the connecting rods 94–5 . . . 94–7 (FIG. 5) are disposed at the top. The lower cams 248, 251 and 253 therefore present their profiles of smaller radius to the respective rollers 246, 272 and 301, while the upper cams 247, 249 and 252 present their profiles of larger radius to the rollers 245, 271 and 300. To this arrangement of the connecting rods 94 there corresponds the selection of an extreme or end file of the head 26, the representation of which in FIG. 1 has, on the other hand, been referred to a centered position for reasons of graphic clarity.

Starting from an arbitrary position of the connecting rods 94 (FIG. 5), there correspond to a lowering or raising of the connecting rods 94–5, ... 94–7 by the two operating lug plates 127 and 131 clockwise or an-

ticlockwise rotations, respectively, through 180° of the cams 247 and 248, 249 and 251, 252 and 253. To these rotations there correspond rotations of the rocking lever 244 in the same sense and rotations of the selector shaft 49.

More particularly, the lowering of the connecting rod 94–5 causes a clockwise rotation through 180° of the cams 247 and 248 through the lever 268, the connecting rod 267, the toothed sector 266, and toothed wheel 264, the transmission wheels 262 and 263 and the pinions 254 and 256. The rotation of the cams 247 and 248 causes a shifting of the roller 245 to the left and a shifting of the roller 246 to the right, with a consequent anticlockwise orientation of the rocking lever 244 and a clockwise orientation of the shaft 49. The rotation of the shaft 49 (FIG. 1) causes a shifting of the slider 44 transversely of the carriage 22 by means of the pinion 48, the sector 47 and the pin 46. The slider 44, in turn, acting through the lugs 43 and the pin 42, causes the fork 29 to swivel with the shaft 31 in the bail 32, orienting the head 26 in such manner as to position in front of the platen 21 a file of characters two files distant with respect to that previously selected.

The lowering of the connecting rod 94–6 (FIG. 8) produces a clockwise rotation of the pair of cams 249 and 251 through 180° by means of the sector 287, the toothed wheel 286, the transmission wheels 284 and the two pinions 281 and 282. The rotation of these cams causes a shifting of the rollers 271 and 272 which is transmitted, through the rollers 269 and 270 and the cams 247 and 248 (FIG. 5), to the rollers 245 and 246, in a similar manner to that described in the preceding cases. Since the cams 249 and 251 are like the cams 247 and 248, the rotation of the rocking lever 244, and therefore of the shaft 49, is equal to that defined by the cams 247 and 248. The consequent rotation of the fork 29 (FIG. 1) causes the head 26 to be oriented in such manner as to select a file of characters another two files distant with respect to that previously selected.

Finally, the lowering of the connecting rod 94–7 (FIG. 5) produces an anticlockwise rotation of the double toothed sector 306 and a clockwise rotation of the pinions 304 and 305 and of the two cams 252 and 253 through 180°. The rotation of these two cams causes a shifting of the rollers 300 and 301 which is transmitted to the rollers 245 and 246 through the rollers 298 and 299 and the kinematic train already described for the cams 249 and 251. Since the lift of the cams 252 and 253 is one half of that of the cams 249 and 251, the corresponding rotation of the rocking lever 244 is one half of that corresponding to the other two cams, for which reason a file adjacent that previously selected is selected in front of the platen 21 (FIG. 1).

Since the cams not rotated by the respective connecting rods 94 (FIG. 5) do not modify the movements of the rollers 245 and 246, the rotations of the rocking lever 244 and, therefore, of the fork 29 (FIG. 1) are of a value equal to that due to the rotation of the individual pairs of cams. By means of a combination of lowering and raising movements of the connecting rods 94–5, ... 94–7 (FIG. 5), there can be obtained six different angular positions of the rocking lever 244 which are distant by constant amounts, for a total rotation of about 40°. To these positions there correspond an equal number of positions of the shaft 49 and of the fork 29 (FIG. 1) which permit the selection of the six files of characters on the head 26.

It is understood that, without departing from the scope of the invention, many variants of the device described are possible. For example, the positioning of the rocking levers 58 and 244 may be effected by a single set of selector cams instead of by a series of pairs of cams. In this case, the contact between the cams and the other connecting elements may be ensured by return springs. The pairs of cams or the single cams may moreover be guided in a rectilinear manner instead of by the respective pivoted arms. The transmission of the rotation to the various selector cams could be effected in this case by means of bevel gears integral with the individual cams. These gears mesh in turn with corresponding bevel gears fixed angularly and axially slidable on splined shafts parallel to the direction of movement of the cams, and which are rotated selectively under the control of the various binary units.

Moreover, the cams may be rotated individually by means of clutches controlled by the various binary units. The rotation of the cams may moreover be effected by means of toothed belts instead of by means of gears. Finally, the connecting rods operating the various selector cams may be controlled and/or actuated by electromagnets associated with each code unit, instead of being preset by the individual code bars and actuated by the lug plates 127 and 131.

What we claim is:

1. A character selecting device for a printing mechanism comprising a type-bearing element provided with a set of characters selectable in accordance with a code combination established by a plurality of binary code units, each said code unit having associated therewith a selector cam rotatable selectively between a first position and a second position, each said selector cam being carried by a corresponding shaft, at least one said selector cam being interconnected with at least one other said shaft of at least one other said selector cam to cause said other shaft to shift perpendicularly to said other shaft axis when said one selector cam rotates from said first position to the said second position, and output means engaged by said other selector cam to move said type-bearing element to select the character to be printed.

2. A device according to claim 1, wherein said one selector cam causes the said other shaft to be shifted by means of a first roller rotatable on an intermediate support and engaged between said one selector cam and a second roller rotatably mounted on said other shaft.

3. A device according to claim 2, wherein the engagement of said selector cams and said rollers is irreversible, whereby the type-bearing element remains in the position reached.

4. A device according to claim 2, wherein said intermediate support is a slider slidable on said shaft of said one selector cam and on said other shaft.

5. A device according to claim 1, wherein said shaft of one of said selector cams is fixed and said shafts of said other selector cams are each carried by a corresponding movable element.

6. A device according to claim 5, wherein each said movable element comprises an arm pivotable on a corresponding pivot, the plurality of said pivots being coplanar.

7. A device according to claim 6, wherein each said selector cam carried by said movable element is rotated by a train of gears comprising two like pinions, one of said pinions being integral with the corresponding said selector cam, while the other said pinion is rotatable on the corresponding said pivot, means being provided for maintaining the orientation of the corresponding one of said selector cams unchanged during the movement of the said corresponding movable element.

8. A device according to claim 7, wherein the said means for maintaining the orientation comprises a toothed wheel pivoted on the said corresponding movable element and in mesh with the said two pinions.

9. A device according to claim 7, wherein each said pinion rotatable on a corresponding said pivot is rotated by a toothed sector, all but one of said toothed sectors turning respectively on the said pivot of the adjacent said movable element, whereas the said one toothed sector turns on an additional fixed pivot.

10. A device according to claim 9, wherein the said selector cam with the said fixed shaft is integral with a pinion which is rotated by a second toothed sector which also turns on the said additional fixed pivot.

11. A device according to claim 1, wherein said selector cams are rotated by gear means comprising corresponding toothed sectors being rotatable by corresponding latches shiftable from one to the other of two positions by the action of at least one universal member, means representing the said binary units being provided for causing said latches to be actuated selectively by the said universal member, and cyclic actuation means being adapted to operate the universal member in correspondence with the presentation of a code combination.

12. A device according to claim 11, wherein said latches are carried by a series of pivoted arms individually connected to said toothed sectors, said latches being provided with two opposed shoulders adapted to cooperate selectively with one or the other of two lug plates connected to said universal member in such manner as to be moved selectively in opposite directions thereby.

13. A device according to claim 12, wherein the binary units are represented by a set of sliders movable into one of two positions by means of corresponding code bars.

14. A device according to claim 13, wherein each of said sliders is locked in the position into which said universal member has caused it to shift by positioning means comprising a common crosspiece controlled by said cyclic actuation means.

15. A device according to claim 12, wherein said two lug plates are connected to said universal member by means of two flexible couplings to allow the shifting of said latches also during the movement of said lug plates.

16. A device according to claim 1, wherein with each said code unit there is associated a pair of said selector cams having complementary profiles which are off-set from one another, said selector cams of each pair being connected such that when one said selector cam of said pair rotates from said first position to said second position the other said selector cam of said pair rotates from said second position to said first position, said pairs of selector cams forming a sequence such that each said pair of selector cams other than the last pair shifts the corresponding said shafts of the next said pair of said selector cams by the same amount and in opposite directions and the last said pair of selector cams positions said output means positively.

17. A device according to claim 16 wherein each of said shafts of said selector cams of each said pair is carried by a corresponding one of two supports which are turnable about a fixed common pivot, the said selector cams of each said pair being rotated by a single pinion rotatable on said fixed common pivot.

18. A device according to claim 16 wherein said output means comprise a rocking lever engaged simultaneously by said last pair of selector cams, said rocking lever being engaged with a toothed sector in engagement with a toothed wheel that positions said type-bearing element correspondingly.

19. A device according to claim 16 wherein said type-bearing element is shiftable in accordance with at least two coordinates, the shifting in accordance with each said coordinate being controlled by a corresponding group of the said selector cams.

20. A device according to claim 19, wherein the said type-bearing element is carried by a transversely movable carriage and is shifted in accordance with two coordinates by means of two prismatic shafts operatively connected to said type-bearing element, said two prismatic shafts being parallel to the direction of movement of the carriage and rotatable in the frame of the machine, each of said two prismatic shafts being rotatable by a corresponding one of a pair of rocking levers, one of said rocking levers being operated by a first said group of said selector cams and the other of said rocking levers being operated by a second said group of selector cams.

21. A device according to claim 20 wherein said selector cams of at least one of said groups have a lift varying in accordance with powers of two.

22. A device according to claim 21, wherein said first group of said selector cams comprises a kinematic train of four said pairs of said selector cams with a lift varying in accordance with powers of two, in which said pair with the greatest lift is rotatable on fixed shafts and the other three said pairs are rotatable on three corresponding pairs of supports, and in which said pair with the smallest lift cooperates with said one rocking lever, said second group of selector cams comprising a kinematic train of three pairs of said selector cams in which one said pair of selector cams of said second group is rotatable about fixed shafts and the other two said pairs of said selector cams of said second group have a lift which is double that of said first pair of selector cams of said second group and are rotatable on corresponding movable shafts of two pairs of supports, one pair of said two pairs of said selector cams of said second group cooperating with said second rocking lever.

23. A device according to claim 19 wherein said type-bearing element is of spheroidal form, said set of characters being distributed in a plurality of rows selectable by rotation of said type-bearing element about one axis by means of a first group of said selector cams, said set of characters being distributed in a plurality of rings round said type-bearing element and selectable by rotation of said type-bearing element

about a second axis by means of a second group of said selector cams.

24. A device according to claim 20, wherein one of said prismatic shafts is connected to said type-bearing element by means of gears and a universal joint borne by the carriage.

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