April 16, 1963 W. G. PAIGE 3,085,670

PRINTING MACHINE

Filed Oct. 10, 1961 2 Sheets-Sheet 1

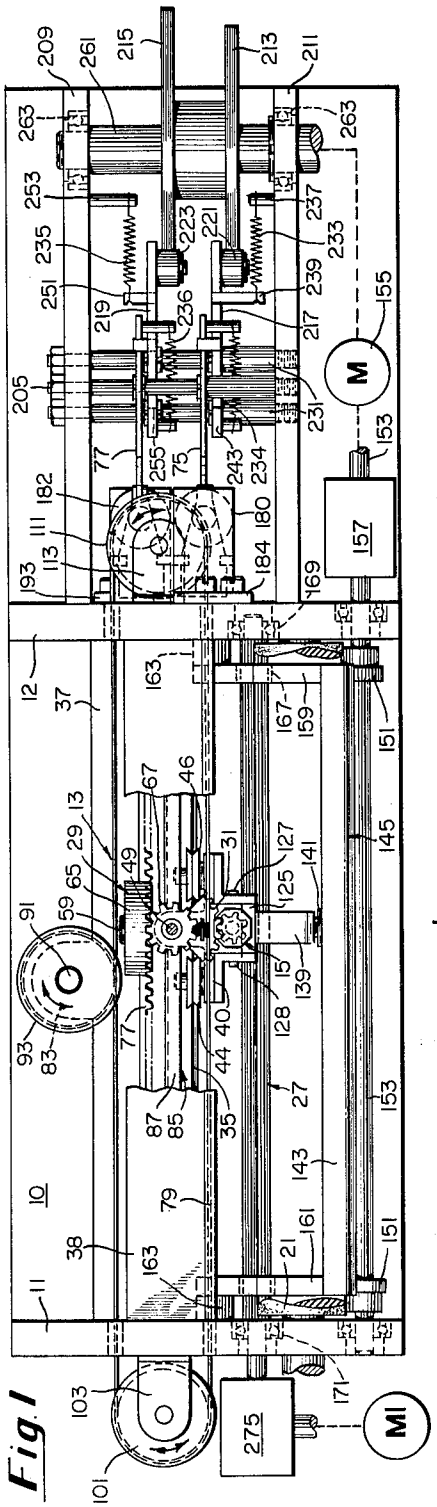


Fig. 1

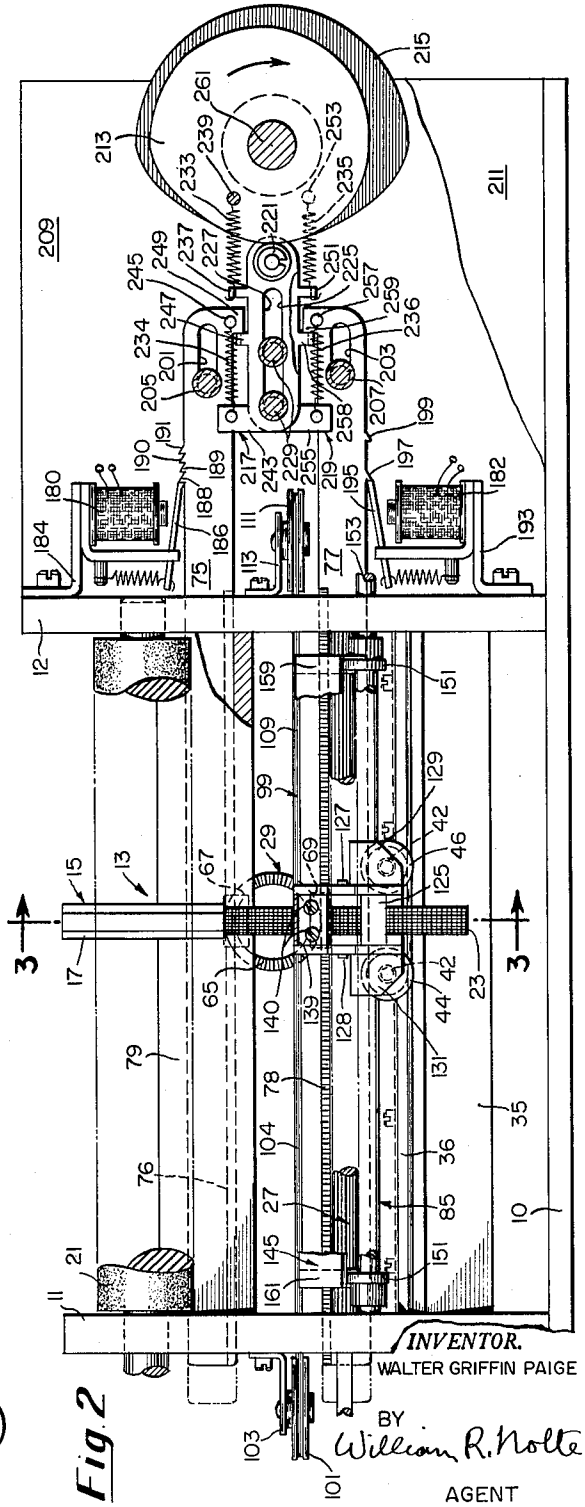


Fig. 2

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PRINTING MACHINE

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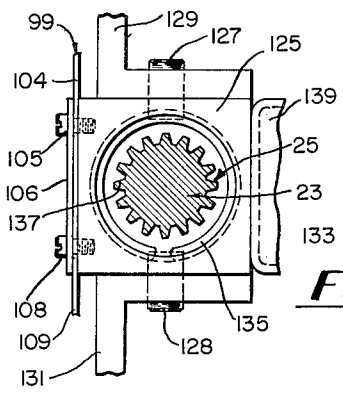


Fig. 5

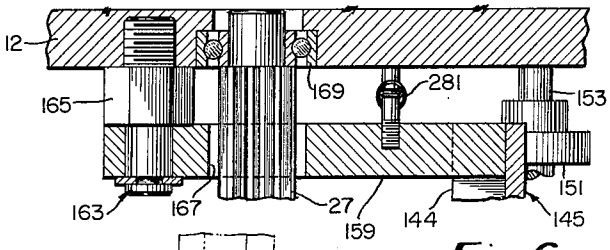


Fig. 6

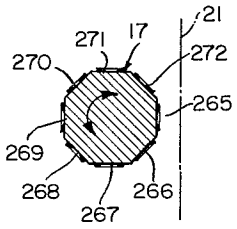


Fig. 4

Fig. 3

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3,085,670

PRINTING MACHINE

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Filed Oct. 10, 1961, Ser. No. 144,136
14 Claims. (Cl. 197—16)

This invention relates to a printing machine, and more particularly to a machine of the above mentioned class employing a typeshaft with novel driving means for the same.

One type of printer which has previously been used for printing purposes employs a type shaft in the printing unit. The axis of the typeshaft is disposed in a substantially vertical position and has a number of circumferential rows of type elements thereon. The typeshaft moves back and forth relative to the recording paper to effect character spacing and return thereof to print out a new line of type. At each print position the typeshaft is moved axially to place any one of the rows of type elements thereon in printing position and in addition the typeshaft is rotated about its vertical axis to select a predetermined element in that row for printing. The present invention relates to the combined translational, rotary and axial movement of a typeshaft whereby a given character contained in one of the plurality of circumferential rows is positioned in a printing position opposite the recording platen.

In view of the above, it is one of the primary objects of the present invention to provide a typeshaft translating, rotating, and axially shifting apparatus of improved design employing fewer parts, requiring less service and maintenance, and capable of relatively high speed of operation.

An additional object of the invention is to provide a typeshaft having a multiplicity of teeth disposed thereon in a manner which enable the shaft to be rotated about and moved along its axis in a single operation, such motion not being in steps.

A still further object of the invention is to provide a novel carriage mechanism which permits the typeshaft to be moved laterally after each print cycle and enables the typeshaft to be rotated and moved along its axis for selection of a type character during such lateral movement.

The invention contemplates a printing machine employing a typeshaft having circumferential rows of teeth projecting therefrom with a pinion drivingly connected with the teeth row-wise to move the typeshaft about its axis, a rack member engaging adjacent rows of teeth to move the typeshaft axially, differential gear means for selectively imparting rotational movement to said pinion, means for imparting movement to said rack coincidentally with the movement of said pinion to move said typeshaft axially, and means for bodily moving the typeshaft laterally concomitantly during said rotational and axial movement thereof.

The foregoing and other objects and advantages of the invention will appear more clearly from a consideration of the specification and drawings wherein one embodiment of the invention is described and shown in detail for illustration purposes only.

In the drawings:

FIG. 1 is a top plane view of the printing machine of the instant invention;

FIG. 2 is a front elevation view of the printing machine;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2 showing certain parts of the machine of the section;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 3;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 3 showing the lever mechanism for impelling the typeshaft of the platen of the machine.

Referring now to the various figures of the drawings for a detailed description of the illustrated embodiment of the invention, and first to FIGS. 1, and 2, it will be seen that the machine includes a base plate 10, upstanding side walls 11 and 12, between which is mounted type carrier 13. A typeshaft 15 supported on the carrier includes an upper prismatic portion 17 having raised type characters 19 on each face thereof. The carrier moves back and forth between the side plates 11 and 12 and the typeshaft may be tilted relative to the carrier to strike platen 21 at each columnar position therealong. The lower portion 23 of typeshaft 15 includes circumferential rows of teeth 25, FIG. 3 extending axially of the shaft which are engageable by a power actuator in the form of a transverse shaft 27 to move the shaft vertically along its axis. A differential gear mechanism 29, also supported for transverse movement by said carrier, drives a pinion or gear sector 31 which is engageable with said rows of teeth to rotate the typeshaft about its axis in time coincidence with the movement of the typeshaft along its axis and in a manner to be described in detail hereinafter.

Neglecting for a moment the operation of the differential gear mechanism 29, and first considering the typeshaft in great detail it is noted that the latter is normally in a mean position relative to platen 21 such that the centrally located character 19 on each of its faces is on a level with the center line of the platen. Thus the maximum vertical movement which must be imparted to the typeshaft is limited to three vertical spaces.

To facilitate such rotation, each tooth 25 includes involute side faces 32 which are generally parallel to the axis of the shaft and are engageable by the teeth of gear sector 31 to rotate the typeshaft about its axis. In a similar manner the top and bottom faces 33 of each tooth, generally transverse to the axis of the typeshaft, are engageable by the teeth 34 of transverse shaft 27 to raise or lower the typeshaft axially to present a selected character in its printing position. Teeth 34 extend over the whole length of shaft 27 between side frames 11 and 12.

The type carrier 13 with reference to FIGS. 1, 2, and 3 is mounted upon rails 35, 36, 37, and 38, which extend across the width of the machine as seen in FIGS. 1 and 2 between the aforementioned side plates 11 and 12. As better seen in FIG. 3 the carriage 13 includes a right-angled flanged member 40 which carries a pair of studs 42 upon which rollers 44 and 46 are journalled for rotation. The rollers include peripheral V grooves which ride on the upper right-angled edge of rail 35.

The horizontal flange of member 40, bearing reference carrier 45, supports the differential gear assembly 29 which is effective to rotate the typeshaft to present one of its faces opposite the platen. The differential gear assembly includes a spindle 49 which is retained at its lower end in horizontal flange 45 of member 40 by means of snap ring 51. The upper end of the spindle is restrained by roller bearing 53 which is received in groove 55 of rail 38. The bearing 53 restrains the spindle 49 against fore and aft movement in a direction toward the platen 21 while ballbearing 57, secured to the top of the spindle, serves to limit movement of the carrier in an axial direction of the spindle. Frame 59, in the form of a stud, extends at right angles to the spindle to carry intermediate gear 65 for free rotation thereon, and to mesh with the two input pinions 67 and 69. Stud 59, spring-loaded by spring 71 and secured to the spindle by snap washer 73 serves to reduce backlash in intermediate gear 65. The arrangement is such that the intermediate gear is mounted for bodily movement with spindle 49, and in addition rotates about the axis of stud 59. Pinions 67 and 69 are mounted for free rotation about the axis of spindle 49 and may be moved independently of each other or in unison with each other about that axis. As previously mentioned the gear sector 31 meshing with the rows of teeth 25 on typeshaft 15 is affixed beneath the lower input pinion 69 as by pin 73. Thus any rotation imparted to spindle 49 will through gear sector 29 impart input rotation to typeshaft 15.

An upper rack member 75 faces adjacent rail 38 which extends across the width of the machine, and includes a row of teeth 76 which engage the upper input pinion 67 to rotate the same about the axis of spindle 49. In a similar manner a lower rack 77 is provided in face contact with lower rail 37. The rack includes a comb-like row of teeth 78 which engages the lower input pinion 69. Linear movement of the rack 77 through teeth 78 induces rotation of input pinion 69 about the axis of spindle 49. Cover plates 79 and 81 are suitably grooved to embrace racks 75 and 77 respectively, and each include face portions thereof which are secured to the upper and lower guide rails 37 and 38. Guide rails 35, 36, and 37 are secured in rigid unitary relationship one to another by means of bolts 83. The intermediate guide rail 36 carries member 85, which includes an upper flange portion 87, to restrain the pivot studs 42 against vertical movement.

Guide rail 37 includes a flanged portion 89 in which pulley shaft 91 is journalled for rotation by bearings 93 and 95. The lower portion of the shaft 91 may be driven by a suitable carriage position servo designated schematically by the reference character "S" to move the typeshaft carriage one step laterally after each print cycle. The pulley 93 is affixed to the upper end of shaft 91 as by screw 97. A cable or tape 99 encircles pulley 93 and as seen in FIG. 1 has one end thereof passed about pulley 101 supported upon plate 11 by bracket 103. The free end 104 of the cable is then affixed to carrier 13 at an attachment point 105 see also FIG. 5 by means of clamping plate 106. In similar manner the other end of the cable designated by reference carrier 109 passes around pulley 111 which is affixed to side plate 12 by means of bracket 113. The free end of cable 109 is thereafter terminated to the opposite end of carrier 13 as at terminal point 108.

It can be observed that rotation of pulley 93 in one direction will impart movement to carrier 13 from left to right along the platen 21. Correspondingly rotation of the pulley 93 in the opposite direction will be effective through the tape encircling the same to return the type carrier to its original starting position to thereby print out a new line of type.

With reference to FIGS. 3 and 5, the typeshaft 15 is shown supported for pivotal movement by means of typeshaft holder or block 125. Pins 127 and 128 extending from the holder 125 are received in brackets 129 and 131 respectively. The latter brackets are suitably secured to the right angle frame member 40 upon which the previously mentioned rollers 44 and 46 are mounted. The pivots 127 and 128 permit rocking or tilting motion of the typeshaft 15 toward and away from the platen 21 as seen in FIG. 3. A bushing 133 is retained in holder 125 by means of snap ring 135, which retains the bushing 133 within the holder 125, but permits rotation of the bushing relative to the holder. The bushing includes spline grooves 137 which extends vertically and in a direction parallel to the axis of typeshaft 15 to receive and guide the teeth 25 extending from the lower portion of the typeshaft.

In order to rock the typeshaft 15 toward the platen 21 as shown in the phantom line position as indicated in FIG. 3, there is provided a spring-like arm member 139 affixed to the top portion of holder 125 as by screws 140. The arm member carries a roller bearing 141 which is received between the upper and lower flanges 143, 144 of channel member 145. The lower flange 144 of member 145 coacts with cams 151 which as seen in FIG. 6, is rotated by shaft 153. Referring to FIG. 1, each cam 151 is rotated by motor designed by reference character 155, which through a suitable one revolution clutch 157, imparts cyclic rotation to shaft 153 to rotate cams 151. Levers 159 and 161 support the opposite ends of aforementioned channel member 145. With reference to FIG. 6 it is observed that the lever 159 is secured to upright plate 12 by means of pivot 163 and spacer element 165. The lever 159 is apertured as at 167 to provide clearance when the lever 159 is rotated about pivot 163 relative to splined shaft 27. It is observed that the latter shaft is journalled for rotation in side plate 12 by means of bearings 169 and in side plate 11, FIG. 1 by bearings 171. At the proper time in the machine cycle, channel member 145 drops off the high point of the cams 151 to tilt the typeshaft 15 through 139, and block 125, to strike the platen 21.

The lateral movement of the previously mentioned rack members 75 and 77, as seen in FIGS. 1 and 2, is controlled by electro-magnetic control devices 180 and 182 respectivey. Electro-magnet 180 is supported to the upper portion of side plate 12 by means of bracket 184 and includes a clapper 186 which is engageable with teeth 188, 189, 190, and 191 of rack member 75 during linear movement of the latter. In a similar manner electromagnet 182 is affixed to the lower portion of side plate 12 by means of bracket 193, FIG. 2 and it includes clapper 195 which is engageable with teeth 197, 199 of the lower input rack 77. Depending upon which of the aforementioned teeth of the racks 75, 77 are arrested by magnets 180, 182, determines the amount of rotation which may be imparted to pinions 67, 69 to rotate the upright spindle 49, gear sector 29 and hence impart rotation to typeshaft 15.

The right hand end portion of rack 75, FIG. 2 is shown as including an elongated slot 201 while the lower rack 77 includes elongated slot 203. Pins 205 and 207 supported between upstanding side plates 209 and 211 limit the lateral linear travel of rack members 75 and 77 respectively. Racks 75 and 77 are driven by cams 213 and 215, through yield links 217 and 219, respectively. Cam follower rollers 221 and 223 affixed to each end of yield links 217 and 219, respectively, engage the peripheral surfaces of cams 213 and 215, to receive driving impetus therefrom. Yield links 217, 219 include elongated slots 225, 227 respectively, through which extend a pair of guide pins 229. A plurality of spacer elements 231 sleeved upon pins 229, provide bearing surfaces to control the movement of the yield links in a straight line pattern. The opposite ends of pins 229 are supported between the upstanding plates 209 and 211.

Motion may be transmitted from the cams 213, 215 through the yield links 217, 219 and thence to drive

racks 75 and 77 through springs 233, 234, 235, 236. Spring 233 is shown connected at one of its ends to lug 237 integral with link 217, while its other end is secured to post 239 extending inwardly from upright plate 211, FIG. 1. One end of spring 234 is shown affixed to the upstanding tab portion 243 of link 217, while the other end of the spring is affixed to pin 245 projecting from rack member 75. When yield link 217 is moved to the left as seen in FIG. 2 to the phantom line position shown, spring 234 will be stressed in tension to urge rack member 75 in a like direction. If the clapper 186 of electromagnet 180 is rotated out of the path of movement of teeth 188 and 191 inclusive, leftward motion may thus be transmitted through spring 234 to the rack member 75.

Intermediate the length of yield link 217 there is shown an upward extending abutment 247, which coacts during the return movement of link 217, with a shoulder portion 249, integral with rack 75, to restore the latter to its initial position. Upon rotation of cam 213 such that its low surface thereof is opposite the yield link, the latter will through the urging of spring 233 move to the right as seen in FIG. 2 and thereby causes the abutment 247 to engage shoulder 249 of rack 75 to likewise move the latter rightwardly to its home position.

Cam 215 drives lower rack 77 through yield link 251 and springs 235 and 236. One end of spring 235 is connected to downwardly depending lug of yield link 251 and is secured to post 253 which extends inwardly from upstanding plate 209. The spring forces cam follower roller 223 into bearing engagement with outer periphery of cam 215. Spring 236 is secured to the forward end of link 219, being connected at one of its ends thereof to the downwardly extending tab 255. The opposite end of the spring 236 is secured to post affixed to rack 77. As cam 215 is rotated so that its high side coacts with the cam follower roller 223, the latter is urged in a leftward direction as seen in FIG. 2. This leftward motion through link 219, stresses spring 236 in tension. When solenoid 182 is pulsed so that its clapper 195 is pivoted downwardly out of the path of tooth 197 of rack 77, such tension in spring 236 will move rack 77 in a leftward direction to impart rotation to input pinion 69 of the differential gear mechanism 29 to rotate typeshaft 15 about its longitudinal axis in a manner as will be described in detail hereinafter. Upon conclusion of a print cycle and upon rotation of cam 215 so that low side of the cam is opposite the cam follower roller, yield link 219 is urged in a rightward direction by means of spring 235. During this rightward motion, downwardly depending lug 258 of link 219 coacts with upwardly extending shoulder 259 of rack 77 to thereby apply a force to restore the rack member to its home position in which pin 207 in slot 203 restrains the rack member 77 against further rightward travel.

With reference to FIG. 1 it is observed that cams 213 and 215 are suitably secured upon cam shaft 261 which is journalled for rotation by bearings 263 in the aforementioned upright supporting plates 209 and 211. During operation of the machine, shaft 261 is continuously rotated and for this purpose, receives its rotative power from a source indicated as in M. In a similar manner the transverse splined shaft 27 may be rotated clockwise or counter-clockwise by means of a suitable bi-directional clutch 275 also receiving its driving power from motive source M.

If rack 75 is moved so as to rotate upper pinion 67 in the direction as shown by the arrow on the pinion in FIG. 3, while the lower pinion 69 is held stationary by rack member 77, then the intermediate gear 65 will revolve on stud 59 and rotate spindle 49 in the same direction as pinion 67. Correspondingly, if the lower rack 77 is moved to rotate lower input pinion 69 in the direction shown by the arrow thereon in FIG. 3, while the upper pinion 67 is secured against rotation by rack 75, then the intermediate gear 65 will turn about its own axis and bodily move about the axis of spindle 49 to rotate the latter in the same direction as pinion 69. The spindle 49 of the differential gear assembly 29 will record addition or subtraction of inputs according to the direction of rotation of the pinions 67, 69 as effected by the movement of racks 75 and 77.

In the relationship wherein the typeshaft carrier 13 is moved parallel to platen 21 and wherein both racks 75 and 77 are held stationary, it is observed that no net motion is imparted to the typeshaft 15 through the differential gear mechanism. Assuming that the carrier is moved from left to right as seen in FIGS. 1 and 2, the direction of rotation of pinions 67 and 69 will be in directions to that indicated by the arrows on the pinions as seen in FIG. 3. The rotation of both pinions will be in a mutual direction as to permit intermediate pinion 65 to turn or idle about its own axis and without bodily movement of the same about the axis of spindle 49. It thus follows that a desired character selection may be made during the time that the typeshaft is moved from one columnar position to another along the platen to the next without upsetting such selection during such movement.

As previously described pulley 93 affixed to shaft 91 is rotated after each print cycle to step the carrier 12 to the next columnar position along the platen 21. Rotation of pulley 93 will move the ends of cable 99, FIG. 1, between which the carrier is fastened, the carrier being supported by rollers 44 and 46 to move relative to the rails 35 by means of the tension exerted in said cable.

Referring now to FIGS. 3 and 4 it is observed that the prismatic typeshaft 15 includes seven characters 19 on each face thereof, and that the characters 19 are moreover arranged in circumferential rows about the periphery of the typeshaft. With reference to FIG. 4 the typeshaft is shown as being octagonal in cross section with the normal or home position of the typeshaft disposed so that face designated by reference character 265 is opposite and in confronting relationship to platen 21. The remaining faces considered in a clockwise direction are indicated by reference characters 266 to 272 inclusive.

When rack 75 is moved from right to left as seen in FIG. 2, so that tooth 189 is in engagement with clapper 186 of solenoid 180, and lower rack 77 is held stationary in its home position, the upper pinion 67 will be rotated in the direction of the arrow shown thereon in FIG. 3. Intermediate gear 65 will be rotated about its own axis and will rotate spindle 49 and gear sector 31 in a direction to rotate typeshaft 15 in a counter-clockwise direction as seen in FIG. 4. The rotation is of an amount to present face 266 of the typeshaft opposite the platen 21. With rack 77 remaining stationary and upon movement of rack 75 further in the same direction so that teeth 190 and 191 are successively in engagement with clapper 186 of solenoid 180, the typeshaft 15 will then be rotated in a counter-clockwise direction FIG. 4, so that faces 267 and 268, respectively, are presented opposite the platen 21. Movement of the rack between any two adjacent teeth is effective to rotate the typeshaft between adjacent type faces corresponding to 45° of rotation.

If rack 75 is in its normal, or home, position such that clapper 186, of solenoid 180 is in engagement with tooth 188 on the rack and the lower rack 77 is moved so that tooth 199 instead of tooth 197 is in engagement with clapper 195 of solenoid 182 the typeshaft is then rotated in a clockwise direction through 180° of rotation as seen in FIG. 4, so that face 269 is presented opposite platen 21.

Print faces 270, 271, and 272 are positioned opposite platen 21 by means of combinational tooth settings of both racks 75 and 77. For example in order to position face 270 in its printing position rack 75 is arrested by tooth 189 while rack 77 is arrested by tooth 199. These settings are individually effective to produce a counter-clockwise rotation of 45 degrees plus a clockwise direction of 180 degrees of rotation of typeshaft 15 to thereby

produce a net rotation to position type face 270 opposite the platen. In a similar manner type face 271 is positioned for printing by stopping rack 75 at tooth 190 and rack 77 at tooth 199, while type face 272 is disposed opposite the printing platen by arresting rack 75 by means of its tooth 191 and rack 77 by its tooth 199.

In considering the operation of the various elements of the mechanism just described to select a given character, it will be seen that it employs the principle of supplying simultaneously rotation to one of two input pinions of a differential gear assembly such that a third gear thereof furnishes an output rotation to a typeshaft about its axis and whereby the latter may be bodily moved along its axis in time coincidence with such rotation. The mechanism differs from conventional printing devices in that it supplies forces to rotate the typeshaft about its longitudinal axis during the same time that transverse forces are supplied which move the typeshaft along its longitudinal axis. This may be clearly understood by considering the operation of the printing device under specific operation conditions.

Assume that it is desired to print the character "A," FIG. 3, the top most character on the face 267 of the typeshaft. Under this condition it is necessary that the typeshaft be moved downwardly three vertical character spaces, and in addition, that the typeshaft be rotated such that face 267 lies opposite platen 21, FIG. 4. This combined rotational and axial movement is accomplished in the following manner. Rack 77 remains stationary and solenoid 182 is not pulsed. Its clapper 195 remains in blocking engagement with tooth 197. Rack 75 on the other hand is permitted to move the distance between teeth 188 and 190. Thereafter solenoid 180 is pulsed so that its clapper is moved out of engagement with tooth 188 of rack 75. As cams 213, 215 are rotated, rack 75 is permitted to move in a leftward direction as seen in FIG. 2. Thereafter solenoid 180 is de-energized so that its clapper arrests tooth 190. This rack motion as above described imparts rotation to typeshaft 15 through gear 31 to present type face 267 opposite the platen. Simultaneously with the movement of rack 75 splined shaft 27 is rotated in a counter-clockwise direction as seen in FIG. 3, so as to engage successive rows of gear teeth 25 on the lower portion shaft 15 to cause the latter to be moved downwardly the three vertical spaces between upper circumferential rows of type characters 19. At this elevation of the typeshaft the A on face 271 will be at an elevation opposite the center line of platen 21, and in a position be tilted to strike platen 21. It will be noted in FIG. 1 that transverse splined shaft may be rotated clockwise or counter-clockwise by means of a suitable bi-directional clutch 275, receiving its power from a motive source designated by the referenced character M–1.

At the appropriate time in the printing cycle the typeshaft holder 125 is tilted when the low side of cam 151 is presented in coacting relationship with channel member 145. Spring 281 affixed to arm 159 will thus urge the channel member in a downward direction. Correspondingly arm 139 affixed to typeshaft block 125 is effective by such downward movement to tilt the latter typeshaft block about pivots 127 and 128, to thereby strike the platen 21. No paper or other material is shown interposed between the typeshaft and the platen, since the paper handling apparatus forms no part of this invention.

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

What is claimed is:

1. In a printing machine the combination comprising, an elongated multifaced type member having a plurality of type characters disposed upon each face thereof,
(*a*) said member including a portion having a multiplicity of teeth projecting from an external surface thereof and disposed in rows encircling said portion transverse to its major axis,
(*b*) drive means engaging said teeth to rotate said member about said axis to present a given type face in its printing position,
(*c*) rack means engageable with teeth in adjacent rows thereof to move said member along said axis,
(*d*) means for moving said drive means,
(*e*) and means for moving said rack means in timed relation with the movement of said drive means, whereby said type member is simultaneously rotated about and bodily moved along its axis.

2. In a printing machine the combination comprising, an elongated member having a plurality of type characters disposed about the periphery of one portion thereof,
(*a*) a plurality of teeth projecting from another portion of said member and disposed in rows transverse to its axis,
(*b*) gear means engageable with said rows of teeth to rotate said member about said axis,
(*c*) rack means engageable with teeth in adjacent rows thereof to move said member along said axis,
(*d*) means for driving said gear means,
(*e*) and means for moving said rack means in timed relation with said driving means to simultaneously rotate and bodily move the typeshaft along its axis.

3. In a printing machine, the combination comprising
(*a*) an elongated type member having type characters disposed about the periphery thereof,
(*b*) said member including a portion having circumferential rows of teeth extending from an external surface thereof and transverse to the major axis of the member,
(*c*) each tooth having a first pair of faces generally parallel to said axis and a second pair of faces generally transverse to said axis,
(*d*) pinion means engageable with the first pair of faces of each tooth thereof to rotate the member about its axis,
(*e*) rack means engageable with the second pair of faces of each tooth thereof to move the type member along its axis,
(*f*) means for rotating the pinion means, and
(*g*) means for moving the rack means in timed relation with the pinion rotating means so that the type member is simultaneously rotated about and moved along its axis and wherein first pairs of faces of said teeth slide in a direction parallel to said axis relative to said pinion and second pairs of faces of said teeth slide in a direction normal to said axis and relative to said rack means.

4. In a printing mechanism having a platen, the combination comprising
(*a*) a carrier,
(*b*) means for moving said carrier laterally along said platen,
(*c*) a holder mounted on said carrier for tilting movement in a direction toward said platen,
(*d*) a typeshaft mounted on said holder,
(*e*) integral means on said typeshaft for rotational movement about and simultaneous bodily movement along the axis of said typeshaft,
(*f*) characters arranged about the periphery of said typeshaft,
(*g*) first means carried by said carrier for engaging said integral means of said typeshaft to rotate the same about its axis to present each character opposite the platen,

(*h*) input means external of said carrier for selectively driving said first means during lateral movement of said carrier,

(*i*) second means external of said carrier for engaging said integral means of said typeshaft for moving the latter along its axis,

(*j*) means for actuating said second means simultaneously with said input means whereby said typeshaft is rotated and bodily moved along its axis while the same is carried laterally along said platen by said carrier,

(*k*) and means for tilting said holder to cause said typeshaft to strike the platen.

5. In a printing mechanism having a platen, the combination comprising

(*a*) a carrier,

(*b*) means for moving said carrier laterally along said platen,

(*c*) a holder mounted on said carrier for tilting movement toward and away from said platen,

(*d*) bushing means having elongated grooves therein and mounted for rotating in said holder to turn in a direction transverse to the grooves therein.

(*e*) a typeshaft having rows of characters arranged about one portion thereof and including rows of teeth encircling a second portion of the shaft, said typeshaft being supported in said bushing so that the teeth thereon slide in the longitudinal grooves of the latter,

(*f*) means carried by said carrier for rotating the typeshaft about its axis,

(*g*) means for actuating said rotating means,

(*h*) means external of the carrier and engaging the teeth of the typeshaft for moving the latter along its axis,

(*i*) and means for actuating said external means simultaneously with said actuating means whereby the typeshaft and the bushing rotate in unison in the holder and the typeshaft is moved along its axis relative to the bushing while the carrier is moved laterally of the platen.

6. In a printing machine, the combination comprising

(*a*) an elongated type member having rows of type characters disposed about the periphery thereof,

(*b*) said member including a portion having circumferential rows of teeth projecting therefrom,

(*c*) said rows of teeth being disposed transverse to the axis of said member,

(*d*) means for engaging said teeth to rotate the member about said axis,

(*e*) means disposed transverse to said member and engaging the teeth thereof to move the member along its axis,

(*f*) means associated with said member for tilting the same about the axis of said transverse means,

(*g*) and means for moving said tilting means whereby said teeth on said member slide relative to said rotating means in a direction parallel to the axis of rotation of the latter.

7. In a printing machine as set forth in claim 6 wherein said transverse means comprises a rotatably mounted cylindrically shaped member having teeth elongated in a direction parallel to its axis of rotation, and wherein the teeth on the type rack member slide relative to said elongated teeth during rotation of said type member.

8. In a printing mechanism having a platen, the combination comprising

(*a*) a carrier,

(*b*) means for moving said carrier laterally along said platen,

(*c*) a holder mounted on said carrier for tilting movement relative to said platen,

(*d*) a typeshaft having rows of characters arranged about the periphery of one portion thereof and having rows of teeth extending encircling a second portion of said shaft,

(*e*) bushing means having elongated grooves therein and mounted for rotation in said holder to turn in a direction transverse to said elongated grooves, said typeshaft being received in said bushing means so that the teeth thereon slide in said longitudinal groove,

(*f*) differential gear means carried by said carrier for rotating said typeshaft about its axis to present characters in printing position,

(*g*) input means external of said carrier for selectively driving said differential gear means,

(*h*) means external of said carrier and engaging the teeth of said typeshaft for moving the latter along its axis,

(*i*) and means for actuating said external means simultaneously with said input means whereby said typeshaft is rotated and bodily moved along its axis in said bushing while the carrier is moved laterally of said platen.

9. In a printing machine, the combination comprising

(*a*) an elongated type member having a plurality of characters disposed about the periphery thereof,

(*b*) an elongated toothed portion extending axially from said member,

(*c*) an input shaft,

(*d*) a gear sector fixed to one end of said shaft and engageable with said teeth,

(*e*) a frame secured to the opposite end of said shaft carrying a pinion for rotation with said shaft,

(*f*) first and second input pinions freely rotatable about said shaft and geared to said pinion,

(*g*) and means for rotating said input pinions to thereby rotatably index said type member about its axis through said input shaft.

10. In the printing machine as set forth in claim 9 wherein said means for rotating said input pinions include first and second rack means respectively engageable with said first and second pinions, means for yieldingly moving said rack means, and means for selectively stopping said rack means whereby the sum of the movement imparted by said first and second rack means is used to index the input shaft.

11. In a printing machine for printing upon a record medium, the combination comprising

(*a*) an elongated type member adapted to travel along a line transverse to its axis of rotation and having type characters disposed about its periphery,

(*b*) carriage means supporting said member for lateral character space movement along said transverse line,

(*c*) means for reciprocally moving said carriage along said line,

(*d*) a plurality of circumferential rows of teeth encircling said type member,

(*e*) input means mounted upon said carriage for rotating said type carrier about its axis including,

(*f*) an input shaft carrying a pinion at one end thereof and engaging said teeth,

(*g*) a frame secured to the opposite end of said shaft carrying an intermediate gear for rotation with said shaft,

(*h*) first and second pinions freely rotatable about said shaft and geared to said intermediate gear,

(*i*) means for rotating said first and second pinions to rotatably index said input shaft and thereby rotate said type member about its axis,

(*j*) and power actuating means engageable with said circumferential rows of teeth of said type member to bodily move the same along its axis of rotation simultaneously with the rotational movement of said type member by the first and second pinions.

12. In the printing machine as set forth in claim 11 wherein said power actuating means include a shaft having

a plurality of teeth thereon elongated on a direction parallel to its axis of rotation.

13. In the printing machine as set forth in claim 11 wherein the means for rotating said first and second pinions include first and second drive racks geared to said first and second pinions, said first and second drive racks each being provided with a plurality of abutments for limiting the linear travel of said racks, abutment position control mechanisms operatively associated with said first and second drive racks, said control mechanisms being effective to stop the abutments at positions individually significant with respect to electrical signals received by said mechanisms.

14. In the printing machine as set forth in claim 13, first and second yield links, resilient means interconnecting said first and second yield links with said first and second rack means respectively and cam means associated with said first and second yield links for driving said rack means through said resilient means.

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