

Sept. 26, 1967

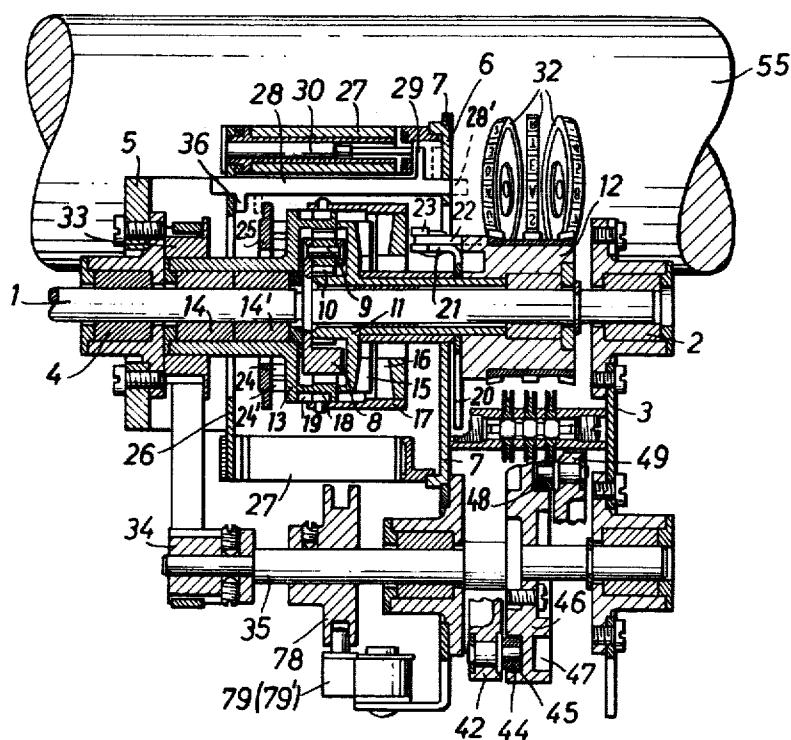
H. WEIDANZ ET AL.
TYPING APPARATUS HAVING PLURAL TYPE WHEELS
WHICH SELECTIVELY STRIKE PLATEN

3,343,642

Filed April 25, 1966

3 Sheets-Sheet 1

Fig.1



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3 Sheets-Sheet 2

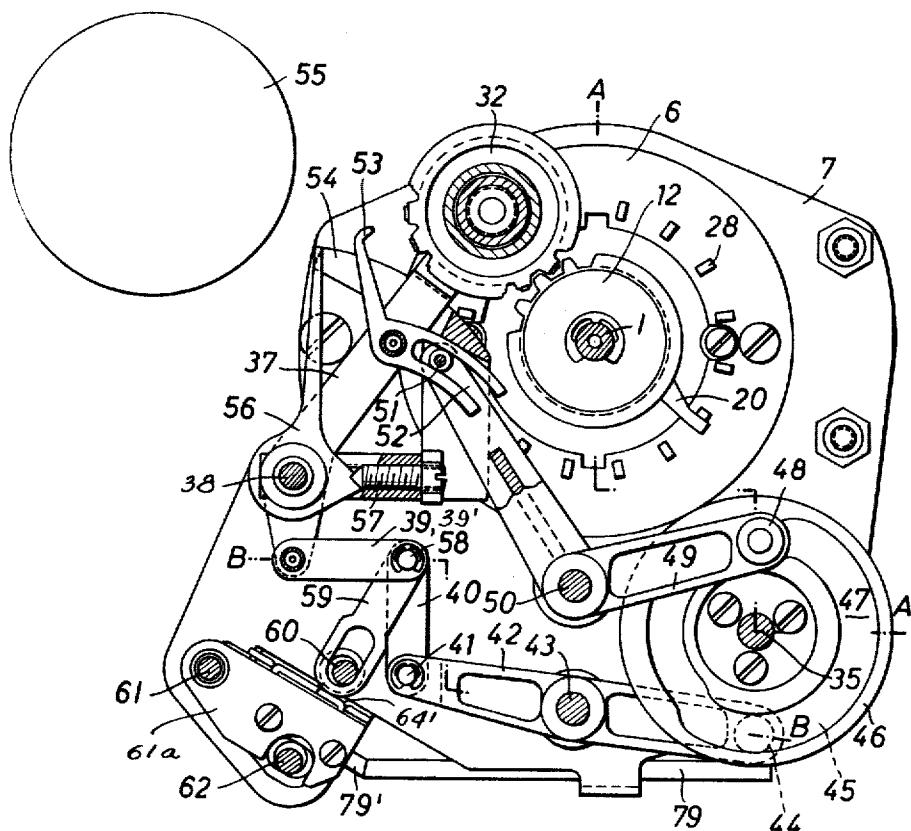


Fig. 2

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TYPING APPARATUS HAVING PLURAL TYPE WHEELS

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3 Sheets-Sheet 3

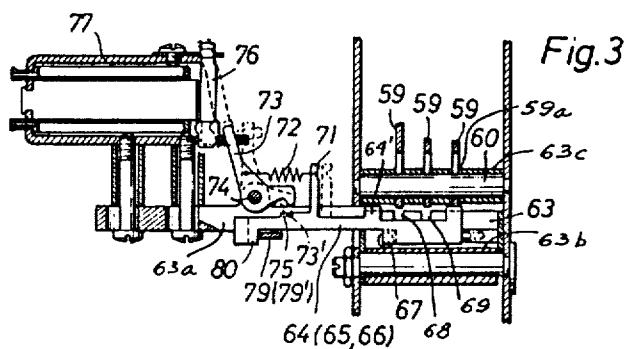


Fig.3

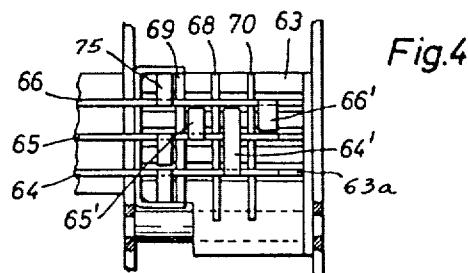


Fig.4

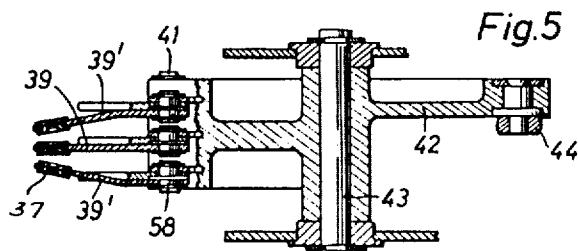


Fig.5

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3,343,642
TYPING APPARATUS HAVING PLURAL TYPE WHEELS WHICH SELECTIVELY STRIKE PLATEN
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19 Claims. (Cl. 197—18)

ABSTRACT OF THE DISCLOSURE

A typing apparatus comprising support means supporting a rotary type means having a plurality of type faces and being movable with the type means to and from an operative position in which one type face is in a printing position. The typing apparatus also comprises differential gear means including a rotary drive element, for example a planetary carrier, and rotary first and second driven elements, such as a sun gear and an orbit gear; control means connected with the first and second driven elements for blocking and releasing the same; and selector means for blocking rotation of the first driven element in different angular positions.

The present invention relates to a typing apparatus, and more particularly to a typing apparatus for business machines, particularly calculating and accounting machines in which digits and letters have to be typed.

In conventional typewriters, the type bars are moved toward and away from a platen mounted on a movable paper carriage. Other typewriters are known in which the typing means are moved relative to a stationary platen, and provide the type faces on a spherical or barrel-shaped type head. The type head is very light and permits a high writing speed, but the control mechanism for the selection and printing of a type face is complicated, and requires a great deal of space.

It is one object of the invention to overcome the disadvantages of known typing apparatus, and to provide a typing apparatus which is of compact and light construction, and capable of obtaining a very high typing speed.

Another object of the invention is to provide a typing apparatus which is particularly suited for business machines with a stationary paper support in which the typing apparatus is moved for typing successive characters or digits.

Another object of the invention is to provide a plurality of typing wheels, each of which carries type faces on the periphery thereof, and which are selectively rendered operative for typing a selected character by using a type face of any one of the type wheels.

Another object of the invention is to provide a typing apparatus in which the movement of the type means to and from the writing surface, and the rotation of type wheel means which carry the type faces, is controlled by differential gear means.

Another object of the invention is to provide type means which rotate in one direction for successively placing type faces opposite a printing area in contrast to type heads which have to be turned about two crossing axes for selecting a type face.

With these objects in view, one embodiment of the invention comprises support means supporting a rotary type means having a plurality of type faces, and being movable with the type means to and from an operative position in which one type face is in a printing position; differential gear means including a rotary drive element, for example a planetary carrier, and rotary first and second driven

elements, such as a sun gear and an orbit gear; control means connected with the first and second driven elements for blocking and releasing the same; and selector means for blocking rotation of the first driven element in different angular positions.

The type means, preferably a plurality of rotary type wheels mounted on corresponding support means, are connected with the first driven element, for example the sun gear, for rotation therewith, and the actuating means, preferably including a rotary cam and a cam follower for moving the support means of the type wheels to and from the operative position, are connected with the second driven element, for example the orbit gear, to be operated by the same.

15 The control means block the second driven element when the first driven element rotates with the type wheel means, but automatically releases the second driven element for rotation when the first driven element is blocked so that the second driven element is rotated by the drive element and causes movement of the support means and type wheel means to and from the operative printing position during rotation of the second driven element through a predetermined angle. After the second driven element has turned through this angle, the second driven element 20 is again automatically blocked and the first driven element 25 is again automatically blocked and the first driven element released for rotation by the drive element.

Selector means, preferably including a plurality of selector members, have a plurality of selecting positions associated with the type faces and being operable between 30 these positions for actuating the control means to block rotation of the first driven element in different angular positions so that the type wheel means stop in an angular position in which the type face associated with the respective selecting position is operative. Thereupon, the control 35 means first cause movement of the support means with the type wheel means to and from the printing position, and then causes again rotation of the type means before the selection of the next character and type face takes place.

40 In the preferred embodiment the selector members are individually operated by selector magnets which can be energized by switches operating by the usual manual keys, or by impulses received from remote stations.

45 Preferably, three type wheels and three movable supports are provided, and all three type wheels are simultaneously stopped when the first driven element is blocked by a selector means. Consequently, a further selection of one of the type wheels has to take place, and this is accomplished by other selector magnets, also energized and deenergized by switches operated by manual keys, or by impulses from a remote station. The second selector magnets control the cam followers by which the movable supports are individually operated so that only one of the three cam followers can transmit motion from a rotary 50 cam to one of the three supports, whereby only one type wheel on the respective support is moved to the printing position.

55 The above described mechanism interrupts the drive of the type wheels during the printing operation which requires movement of the type means toward the printing surface, and automatically starts rotation of the type means when the support has moved the type means back to its normal inoperative position.

60 The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary sectional view taken on line

A—A in FIG. 2, and illustrating a typing apparatus according to the invention;

FIG. 2 is a fragmentary side elevation, partially in section, illustrating the typing apparatus of FIG. 1;

FIG. 3 is a fragmentary sectional view illustrating a detail of the typing apparatus;

FIG. 4 is a plan view of the device shown in FIG. 3; and

FIG. 5 is a sectional view taken on line B—B in FIG. 2.

Referring now to the drawings, a main drive shaft 1 is driven by an electric motor and clutch, not shown, and is mounted at one end in a bearing 2 on a lateral frame wall 3, and at the other end in a bearing 4 provided in an open casing 5 whose cover 6 is secured to a lateral wall 7 of the frame. A differential gear means is driven by shaft 1 and disposed about the same, and includes a planetary carrier 8 secured to shaft 1 for rotation, and supporting planetary gears 9 for rotation about shafts 10. The planetary gears 10 mesh with a sun gear 11 which is freely rotatable on shaft 1 and has an elongated hub portion to which a gear drum 12 is secured. Gear drum 12 has three peripheral rows of gear teeth respectively meshing with type wheels 32, each of which carries a circular row of type faces representing together all characters and digits which are to be typed on a paper supported by a platen 55.

Planetary gears 10 also mesh with a drum 13 which is mounted for free rotation about shaft 1 on bearings 14 and 14'. A flange projects from the hub of sun gear 11 and has a lateral face provided with coupling fingers 15 cooperating with corresponding coupling fingers on a blocking member 16 whose outer circular periphery is secured to a tubular member 17 on which inwardly projecting guide members 18 are mounted.

It will be seen that the planetary carrier and the planetary gears 9 constitute the drive element of a differential gear transmission, which includes a first driven element 11 connected with type means 32 through drum-shaped gear 12, and the drum 13 constitutes a second element which can be driven by drive element 8, 9.

Guide members 18 project into peripheral guide slot 19 in a flange of drum 13. Blocking member 16 is mounted on the frame non-rotatable, but shiftable in axial direction of shaft 1 between the illustrated inoperative position, and an engaged position in which its coupling fingers 16 are located between coupling fingers of the driven element 11. When blocking member 16 is in the illustrated position, guide members 18 are located in portions of slot 19 which extend parallel to the axis of shaft 1 so that blocking member 16 is coupled with the driven element 13 and disengaged from the driven element 11, 15. When blocking member 16 is shifted to the left so that its coupling fingers engage coupling fingers 15, guide members 18 move into portions of slot 19 which extend in circumferential direction so that driven element 13 is free to turn.

Since blocking member 16 is non-rotatably mounted on the frame, and guide members 18 are located in axial slot portions of slot 19, rotation of the driven element 13 is blocked, and since coupling fingers 16, 15 are spaced, rotation of driven element 11 by drive element 8, 9 is possible so that drum-shaped gear 12 is rotated and drives the three type wheels 32 whereby groups of three characters or digits simultaneously pass the printing carrier of platen 55.

However, when blocking member 16 is shifted toward the left as viewed in FIG. 1 and fingers 16, 15 engage each other, the driven element 11 with gear 12 and type wheels 32 is blocked, but since guide members 18 move into circumferential slot portions of slot 19, driven element 13 can be rotated by drive element 8, 9 for a predetermined angle until guide members 18 pass into axial slot portions at the ends of the circumferential slot portions of slot 19 and are moved by the cam action of slot 19 toward the right as viewed in FIG. 1 until coupling member 16 is disengaged from the coupling fingers 15 of driven element 11, while guide members 18, located in

axial slot portions, couple blocking member 16 to driven element 13 whereby the latter is again blocked.

A latch means 20 is mounted on drum-shaped gear 12 and has three bent-over lugs 21, each of which carries a turnable angular lever 22 which carry rollers 23, and have ends located in recesses of drum-shaped gear 12.

When latch member 20 is stopped during rotation of gear 12, levers 22 are turned to positions in which rollers 23 engage coupling member 16 and push the same to the left as viewed in FIG. 1 to the above described coupling position in which driven element 11 and gear 12 are stopped, while guide members 18 move into circumferential slot portions of slot 19 and release driven element 13 for rotation through a predetermined angle determined by the length of slot 19.

A clearing plate 25 is mounted on axially extending bolts for axial movement on a stationary support plate 26 which carries, together with cover plate 6, a plurality of circumferentially spaced electromagnets 27, for example sixteen electromagnets. Support plate 26 and cover plate 6 have opposite registering slots in which sixteen selector members in the form of elongated slide plates 28 are mounted for movement in axial direction. Projections 36 and 29 determine the end positions of the selector slides 28. Each selector slide is associated with a group of three type faces on the three type wheels 32 which simultaneously pass the printing area on platen 55.

Electromagnets 27 and selector members 28 are respectively controlled by selector switches, not shown, operated by the keys of the keyboard of the machine, or are controlled by impulses from a remote station as is conventional for teletype operations. When an electromagnet 27 is energized, the respective selector member 28 is shifted to an operative blocking position located in the path of movement of the projecting arm of latch member 20, so that the same is stopped in a corresponding angular position of gear 12 and of type wheels 32, and causes shifting of blocking member 16 to block driven element 11 and thereby gear 12 and type wheels 32 so that a group of type faces associated with the actuated and operative selector member 28 is located opposite the platen.

A clearing plate 25 is mounted on bolts, not shown, on support plate 36 for movement in axial direction toward and away from the flange of drum 3, but non-rotatable. First and second clutch elements shown to be sliding teeth 24, 24' are provided on the confronting faces of clearing plate 25 and the flange of drum 13. When drum 13 turns, the cooperating slide teeth 24, 24' urge clearing plate 25 toward support plate 26, and during such movement, clearing plate 25 engages projection 36 of an actuated selector member 28 and shifts the same back to its normal inoperative position.

After the clearing of the previously selected selector member 28 has been completed, teeth 24' turn with drum 13 to a position permitting the axial movement of clearing plate 25 under the action of springs, not shown, to the right so that clearing plate 25 again assumes its initial position.

A gear pulley 33 is secured to drum 13 for rotation therewith, and is connected by a belt 33' with another gear pulley 34 on an actuating shaft 35 which is mounted in bearings on frame walls 3 and 7. Actuating shaft 35 carries a fixed actuating cam 46 by which the movement of the type wheels 32 to and from the printing position is controlled.

Consequently, type wheels 32 rotate as long as the first driven element 11 of the differential transmission is driven by the drive element 8, 9. When a key is actuated and a selector magnet 27 is energized, its armature 30 is shifted and engages with a pin a projection 29 of the respective selector member 28, shifting the same to a position in which the end portion 28' is located in the circular path of movement of the arm of latch member 20 so that the same is stopped while drum 12 continues to rotate with the type wheels until levers 22 are displaced and rollers 23 push blocking members 16 into engage-

ment with fingers 15. Blocking member 16 which until this moment has blocked rotation of drum 13 by rollers 18 located in axially extending slot portions of guide slot 19, now blocks rotation of the first driven element 11 with gear 12 and type wheels 32, while permitting rotation of the second driven element by the drive elements, namely the planetary gear carrier 8 and planetary gears 9 meshing with the orbit gear portion of the driven element 13.

Rotation of the driven element 13 and the teeth 24' causes axial displacement of the cooperating teeth 24 with clearing plate 25 so that the actuated selector member 28 is returned to its normal inoperative position and cleared. Since the driven element 13 with teeth 24' continues its angular displacement, teeth 24', 24 again assume a position permitting movement of the clearing plate 25 to the right to its initial position under the action of springs, not shown. When the driven element 13 has turned to a predetermined angle determined by the shape of guide slot 19, rollers 18 are urged out of the circumferential extending portion of guide slot 19, and enter an axially extending portion so that rotation of the driven element 13 is blocked, and since at the same time blocking member 16 is shifted out of engagement with coupling fingers 15, driven element 11 is released by the blocking coupling member 16 and planetary carrier 8 with planet gears 9 rotate the driven element 11 with gear 12 and type wheels 32.

While driven element 13 rotates through a predetermined angle determined by the shape of guide slot 19, pulley 33 drives pulley 34 with actuating shaft 35 and actuating cam 46 so that the movement of a selected type wheel 32 to and from the printing position is accomplished while all type wheels are stopped and driven element 13 rotates a predetermined angular distance.

From the above description it will become apparent that control means 15 to 23 are connected with the first and second driven elements by the coupling blocking member 16 for blocking the second driven element 13 when the first driven element 11 rotates with type means 32, for automatically releasing the second driven element 13 for rotation when the first driven element 11 is blocked by the coupling blocking member 16, and for again automatically blocking the second driven element 13 and releasing the first driven element 11 for rotation by the drive element 8, 9 after the second driven element 13 has turned an angle determined by the shape of guide slot 19 by which coupling blocking member 16 is shifted back to the initial position blocking the second driven element 13 and permitting rotation of the first driven element 11 with the type wheels 32. During rotation of the second driven element 13, actuating means including shaft 35 and cam 47 are operated to move a selected type wheel 32 to the printing position engaging platen 55 as will now be described with reference to FIGS. 2 to 4.

Three movable supports 37 in the form of double-armed levers are mounted on a shaft 38, a type wheel 32 being carried by each support 37 at the end of one arm, while the other arm is connected by toggle levers 39, 40 with a double armed lever 42 which is mounted on a stationary shaft 43 and has a cam follower arm with a cam follower roller 44 guided in a circumferential cam slot 45 of actuating cam 46.

Each pair of toggle levers 39, 40 is connected by a pivot means 58 to a fulcrum member 39 having a slot through which a pin 60 passes for guiding fulcrum member 59. Fulcrum members 59 are controlled by a selector device 61a which is mounted on stationary shafts 61 and 62, shaft 62 having an eccentric portion for adjusting the angular position of the selector device in relation to shaft 61.

When one of the three fulcrum members 59 is supported on the selector device in a manner which will be described hereinafter, the motion of cam follower lever 42 is transmitted through toggle levers 39, 40 to support

37 so that the respective type wheel 32 is moved toward and away from platen 55, and fulcrum member 59 and fulcrum pin 58 permit the transmission of motion from cam follower 42 to the respective support 37. The other two fulcrum members 59 are not supported by the selector device, and consequently the movement of cam follower 42 will only cause a different angular position of toggle levers 39, 40, but have no effect on the respective type wheel support 37.

10 The selector device includes a guide block 63 on which selector magnets 77 are mounted. Guide block 63 has three slots 63a for guiding three slides 64, 65, 66, as best seen in FIGS. 3 and 4. A row of locking balls 67 is provided in a guide casing 63b, and can spread in longitudinal direction a distance corresponding to the thickness of a slide 64, 65, 66, so that only one slide can be shifted between the positions shown in broken and solid lines in FIG. 3. Slides 64, 65, 66 have transversely projecting abutment portions 64', 65', 66'. In the inoperative position of the slides, the three fulcrum members 59, which are guided in slots 59a of casing portion 63c, can be moved down into slots 68, 69, 70 in guide block 63, since none of the abutments 64', 65', 66' is located under a slot 59a. However, if a selected slide 64, 65, 66 is shifted to the left to an operative position illustrated for slide 64, the respective abutment 64' is located under a fulcrum member 59 and covers the respective slot 70, as shown in FIG. 3, so that the respective fulcrum member 59 is supported on the abutment and supports the fulcrum pin 58, permitting the transfer of motion from cam follower 42 to support 37 of the respective type wheel 32. The motion is also transmitted to the toggle levers 39, 40 of the other two type wheel supports, but causes dipping of fulcrum member 59 into the corresponding slots 68 and 69 in guide block 63 so that the other two supports 37 are not moved with type wheels 32.

35 Each slide 64, 65, 66 has a projection 71 connected by spring 72 with a latch lever 73 which is controlled by the armature 76 of a selector magnet 77, three selector magnets being provided for controlling the positions of slides 64, 65, 66. Latch levers 73 are mounted on pins 74 on guide block 63 and cooperate with transverse lugs 75 on the three slides. As long as selector magnets 77 are not energized, springs 72 hold the latch levers 73 in the position shown in broken lines in FIG. 3 in which locking portions 73' engage the lugs 75 and prevent movement of slides 64, 65, 66 out of the inoperative position in which all three fulcrum members are free to move downward into slots 68, 69, 70.

50 Each key of the keyboard of the machine is not only connected with one of the selector magnets 27, but also to one of the three selector magnets 77, and when a key is actuated, one selector magnet 77 is energized, attracts its armature 76 and turns the respective latch lever 73 in 55 counterclockwise direction against the action of spring 72 to a position releasing the lug 75 of the respective slide, as shown for slide 64, so that spring 72 moves slide 64 to the left as viewed in FIGS. 3 and 4 from the position shown in FIG. 4 to the position shown in FIG. 60 3 in which the abutment 64' is located under the respective fulcrum member 59, and supports the same when cam follower 42 transmits motion to the toggle levers 39, 40. Consequently, only one support 37 will turn 65 toward and away from platen 55 for moving the respective type wheel 32 to a printing position in which the type face located opposite the platen will produce an imprint. Since the fulcrum members of the two other supports of the type wheels are inoperative, the other two type wheels are not moved by supports 37 to a printing position, but remain inoperative.

66 Actuating cam 46 has not only the endless cam groove 45 for cam follower roller 44 of cam follower lever 42, but has on its other side, another endless cam groove 47 guiding a cam follower roller 48 of a double-armed

angular cam follower lever 49 which is mounted on a pivot shaft 50 for angular movement. Angular lever 49 carries at its free end three rollers 51 which are respectively located in slots 52 of three locking latches 53 respectively mounted on the three supports 37 for angular movement between the illustrated inoperative position and a locking position in which the end portion of the respective locking latch 53 enters a recess between two teeth and type faces of the respective type wheel 32 for locking the same against rotation after the selected type face has assumed its proper position confronting the printing area of platen 55. Support levers 37 are guided in a guide member 54 so that the respective selected type face of any one of the three type wheels will engage the same printing area when the respective support lever 37 is actuated to move the type wheel toward the platen. As best seen in FIG. 5, the outer portions 39' of toggle levers 39 are bent so that support levers 37 and type wheels 32 are located in planes slanted to each other and intersecting with the platen in the printing area so that the type face of any type wheel 32 moved by its support 37 toward the platen engages the same printing area.

Adjacent each support lever 37, a spring 56 is mounted on shaft 38 and cooperates with locking latch 53 mounted on the same support lever 37. The position of each spring 56 is adjustable by a screw 57 so that during movement of the respective support lever 37 toward the platen 55, the respective locking latch will engage the end of the respective spring 56 and resiliently move into the recess of the respective type wheel 32 for locking the same while the selected type face engages the platen.

OPERATION

In the normal inoperative condition of the machine, which is also assumed between two key actuations, drive shaft 1 continuously rotates and drives planet carrier and planetary gears 9 which mesh with the sun gear portion of driven element 11 so that the same rotates with gear 12 and all three type wheels 32, while supports 37 are in the inoperative position shown in FIG. 2, and all selector slides 64, 65, 66 are in the inoperative position indicated in broken lines in FIG. 3, so that fulcrum members 59 are located opposite slots 68, 69 and 70, and no motion can be transmitted from cam 46 to type wheel supports 37. However, cam 46 is at a standstill, since driven element 13 is blocked by rollers 18 of blocking member 16 due to the shape of slot 19.

Each key of the keyboard of the machine is connected to one of the sixteen selector magnets 27 and to one of the three selector magnets 77 by key switches. Selector magnets 77 are respectively associated with the three type wheels 32, and selector magnets 27 are respectively associated with sixteen groups of aligned three type faces of the three type wheels 32, sixteen type faces being provided on each type wheel 32, and groups of three aligned type faces simultaneously passing the printing area on platen 55.

Consequently, actuation of a switch and energization of one of the sixteen selector magnets 27 will cause stopping of all three type wheels 32 in a position in which a group of three aligned type faces is located opposite the platen, but only one of the three aligned type faces is selected for printing by the energization of the respective selector magnet 77.

When a key has been actuated, and the respective selector magnet 27 has shifted the respective selector member 28 to a position in which its end portion 28' is located in the path of movement of latch member 20, the latter is engaged by the selector member in an angular position of gear 12 associated with a particular group of three type faces. Since latch member 20 is blocked against rotation, and gear 12 continues to rotate until blocked, rollers 23 shift blocking member 16 so that driven ele-

ment 11 is blocked with gear 12 and all three type wheels 32, while driven element 13 is released for rotation since rollers 18 are now located in a circumferential portion of slot 19, permitting planetary gears 9 to rotate the orbit gear portion of the driven element 13.

This rotary motion is transmitted by the pulley and belt drive 33, 34 to the actuating shaft 35 and actuating cam 46. Cam groove 47 becomes first effective to displace cam follower means 48, 49 so that all three locking latches 53 are turned by rollers 51 to a locking position engaging corresponding recesses of type wheels 32 for preventing further turning of the type wheels, which are at this moment no longer driven from sun gear 11 and gear 12.

Thereupon, cam groove 45 causes an angular displacement of cam follower means 42, 44 which is transmitted to the toggle levers 39, 40.

When the key of the keyboard was depressed, one of the three selector magnets 77 was energized whereby one of the three type wheels 32 was selected. The energized selector magnet 77 turns latch lever 73 to a position releasing the respective slide 64, (65, 66) so that the same is moved by spring 72 to a position in which the abutment 64', 65' or 66' is located under the respective associated fulcrum member 59. FIG. 3 shows selector slide 64 in the position in which its abutment 64' is located under a fulcrum member 59, while the other two fulcrum members are located opposite a cutout of selector member 64 and are free to move into slots 68, 69 when motion is transmitted from cam follower 42 to toggle levers 39, 40.

Consequently, only the fulcrum member 59 which abuts abutment 64' of selector slide 64 will hold fulcrum pin 58 so that motion can be transmitted from cam follower 42 to one of the supports 37 whereby only one type wheel 32, associated with one selector magnet 77 and one selector slide 64, is moved to the printing position in which the type face confronting the platen produces an imprint. The other two type faces on the other two type wheels, which were also selected under the control of selector magnet 27, remain inoperative since these type wheels are not moved to the printing position since the motion transmitting linkage of the respective two type wheels is rendered inoperative by the unsupported fulcrum members 59.

At the moment of impact of the selected type face, the respective locking latch 53 secured to the respective moving support 37 abuts spring 56 and is resiliently pressed into a recess of the type wheel to firmly lock the type wheel against rotation at the moment of impact so that a clear imprint is produced.

After the imprint is made, cam 46 continues its rotation under the control of driven element 13, and the actuated support 37 with its type wheel 32 is again retracted to the normal inoperative position.

While driven element 13 rotated to accomplish the printing movement of a selected support 37, the cam action of the teeth 24', 24 has urged clearing plate 25 to the left as viewed in FIG. 1 to return the previously selected selector member from its operative position to its inoperative position. After further turning of drive element 13, the shape of teeth 24', 24 permits return of the clearing plate 25 to its normal position under the action of spring means, not shown, provided between support plate 26 and clearing plate 25.

Directly after the imprint is made, a cam 78 on actuating shaft 35 shifts a clearing lever 79 whose arm 79' is located adjacent a shoulder formed by a projection 80 of selector slides 64, 65 and 66 so that the shifted slide, for example slide 64, is returned to its normal position and cleared, while latch portion 73' snaps behind shoulder 75 of the cleared slide to hold the same in the cleared position. When these operations have been accomplished, rollers 18 of blocking member 16 enter a portion of guide slot 19 which urges roller 18 to move in axial direction 75 toward the right as viewed in FIG. 1 so that blocking

member 16 is shifted to a position releasing coupling fingers 15 so that the sun gear and driven element 11 is again driven by the planetary gears 9, causing rotation of gear 12 and the three type wheels 32. The machine is ready for the next selection, with the type wheels rotating at high speed.

It is apparent that by operation of a selector member 28, a preliminary selection of three type faces is effected even before the operative support has returned with its type wheel to the normal position after producing an imprint. A preliminary selection of a support 37 and type wheel 32 is also accomplished, since if one of the selector slides 64, 65, 66 is selected and shifted, and the respective fulcrum member is still located in a slot 68, 69, 70, the abutment of the selected slide will abut the respective fulcrum member under the action of spring 72 until the respective fulcrum member is retracted, whereupon the respective slide will assume a position in which its abutment is located under the fulcrum member 59 associated with support 37 and type wheel 32 now selected.

The impact force is adjusted by adjustment of the angular position of shaft 62 by which selector device 61a and the abutment of the selector slides are raised or lowered so that the position of the fulcrum pin 58 is changed. The impact force can also be adjusted by screws 57 which vary the resilient force of springs 56 and consequently the resilient pressure of locking latches 53 which has to be overcome by the type wheels at the impact moment.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of typing apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a typing apparatus comprising a plurality of rotary type wheels controlled by a differential transmission, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is.

1. A typing apparatus comprising, in combination rotary type means having a plurality of type faces; movable support means supporting said type means for rotation; means mounting said support means for movement with said type means to and from an operative position in which one type face is in a printing position; actuating means for moving said support means to and from said operative position; a differential transmission including a rotary drive element, and rotary first and second driven elements, said type means being connected with said first driven element for rotation therewith, and said actuating means being connected with said second driven element to be operated by the same; control means connected with said first and second driven elements for blocking said second driven element when said first driven element rotates with said type means, for blocking said first driven element and automatically releasing said second driven element for rotation when said first driven element is blocked so that said second driven element is rotated by said drive element and operates said actuating means to move said support means to and from said operative position during rotation of said second driven element through a predetermined angle, and for again automatically blocking said second driven element and releasing said first driven element for rotation by said drive element after

said second driven element has turned said predetermined angle; and selector means having a plurality of selecting positions associated with said type faces and being operable between said positions for actuating said control means to block rotation of said first driven element in different angular positions so that said type means stop in an angular position in which a type face associated with the respective selecting position is selected whereupon said control means first cause movement of said support means with said type means to and from said printing position for producing an imprint of said selected type face and then cause again rotation of said type means.

2. A typing apparatus according to claim 1 and including a main drive shaft for driving said rotary drive element of said differential transmission, said differential transmission, said control means, and said selector means being disposed about said main drive shaft.

3. A typing apparatus according to claim 1 wherein said movable support means include a plurality of supports; wherein said type means include a plurality of type wheels respectively mounted on said movable supports; wherein said actuating means move only a selected one of said supports with the respective type wheel to an operative position; and wherein said supports are constructed and arranged so that a type face of any selected support and type wheel is located at the same printing area in said printing position.

4. A typing apparatus according to claim 1 wherein said selector means include a plurality of selector magnets having the same number as said type faces of said rotary type means, and the same number of selector members selectively operable by energized selector magnets to assume an operative position; and wherein said control means include a latch member connected with said first driven element for rotation, and a blocking member shiftable by said latch member between two positions blocking said first driven element or said second driven element, and releasing the other driven element for rotation by said drive element; and wherein said blocking member is shifted to a position blocking said first driven element and releasing said second driven element for rotation when said latch member engages an operative selector member so that said type means stops rotation together with said first driven element.

5. A typing apparatus according to claim 4 wherein said drive element includes a planetary carrier and planet gears; wherein said first driven element includes a sun gear meshing with said planetary gears, and said second driven element includes an orbit gear meshing with said planetary gears; and wherein said first and second driven elements have coupling means for being coupled with said blocking member; and wherein said blocking member is shiftable in axial direction of said drive element, and is non-rotatable so that a driven element coupled with said blocking member is prevented from rotation.

6. A typing apparatus according to claim 1 wherein said movable support means include a plurality of supports; wherein said rotary type means include a plurality of type wheels respectively mounted on said support for rotation; wherein said type wheels are all operatively connected with said first driven element and rotated by the same so that upon actuation of said control means all said type wheels are stopped whereby a group of type faces of said type wheels is adapted to be located opposite a printing area; and wherein said actuating means include a plurality of linkages respectively connected with said supports of said type wheels, each of said linkages including a fulcrum pin, and a fulcrum member supporting said pin; and including a selector device selectively operable to support only one selected fulcrum member and to permit free movement of the other fulcrum members so that said actuating means move only the support whose linkage has a fulcrum member supported by said selector device.

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7. A typing apparatus according to claim 6 wherein said selector device includes a plurality of selector magnets respectively associated with said type wheels, and a plurality of selector slides respectively operated by said selector magnets, each slide having an inoperative position permitting free movement of the respective associated fulcrum member, and an operative position supporting the respective fulcrum member so that motion is transmitted to the respective support for moving the type wheel carried thereby to said printing position.

8. A typing apparatus according to claim 1 wherein said type means includes a type wheel having peripheral type faces separated by recesses; and including locking latch means mounted on said movable support means and operated by said actuating means to engage one of said recesses for locking said type wheel against angular displacement.

9. A typing apparatus according to claim 8 wherein said actuating means includes a rotary actuating cam driven from said second driven element, first cam follower means connected with said movable support means and controlled by said actuating cam; and second cam follower means controlled by said actuating cam and including means operatively connected with said locking latch means for operating the same.

10. A typing apparatus according to claim 1 wherein said control means include a non-rotatable blocking member shiftable in axial direction of said rotary drive element between a first position blocking said second driven element and a second position blocking said first driven element against rotation, said blocking member including guide means and coupling fingers; wherein said second driven element is formed with a guide slot receiving said guide means of said blocking member and having cam slot portions for moving said blocking member from said second position to said first position after rotation of said second driven element through said predetermined angle; and wherein said first driven element has coupling fingers cooperating with said coupling fingers of said blocking member in said second position of the same for blocking said first driven element, while said guide means is located in a circumferential portion of said guide slot to permit rotation of said second driven element through said predetermined angle.

11. A typing apparatus according to claim 1 wherein said rotary type means include a rotary type wheel having peripheral type faces separated by peripheral recesses; and including locking latch means mounted on said support means and controlled by said actuating means for engaging one of said recesses for locking said type wheel against angular movement; and including a spring cooperating with said locking latch means and being engaged by the same in said operative position of said movable support means so that said locking latch means is resiliently pressed into the engaged recess, while the impact force of said type wheel is reduced by the action of said spring; and adjusting means for adjusting said spring and thereby the impact force.

12. A typing apparatus according to claim 1 wherein said actuating means include a rotary cam driven from said second driven element during rotation of the same through said predetermined angle, and cam follower means connecting said cam with said movable support means so that the speed of movement of said support means to and from said operative position is determined by said cam means.

13. A typing apparatus according to claim 12 wherein said rotary cam means is formed with an endless cam groove; and wherein said cam follower means includes a cam follower roller guided in said endless groove.

14. A typing apparatus according to claim 1 wherein said movable support means include a plurality of movable supports; wherein said rotary type means include a

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plurality of type wheels respectively mounted on said movable supports, each type means having a plurality of type faces; wherein said actuating means include a rotary cam driven from said second driven element and having an endless cam track, cam follower means engaging said endless cam track, and a plurality of linkages connecting said cam follower means with said movable supports, respectively; wherein said control means include a control member rotating with said first driven element, and a blocking means shiftable by said control member between two positions for blocking one of said driven elements and releasing the respective other driven element; and wherein said selector means include a plurality of selector members individually shiftable to operative position and arranged along a circular line concentric with the axis of rotation of said drive element and in the path of movement of said control member so that an operative selector member is engaged by said control member whereby said blocking means is shifted for blocking said first driven member and thereby said type wheels in a position in which type faces of all type wheels are simultaneously located opposite a printing area, and a selector device for selectively rendering one of said linkages operable so that only one support connected by the operable linkage is actuated by said cam follower means, whereas the other supports are disconnected by the inoperative linkages from said cam means.

15. A typing apparatus according to claim 14, wherein each of said linkages includes a pair of toggle levers, a fulcrum pin connecting said toggle levers, and a fulcrum member mounted on said fulcrum pin; and wherein said selector device includes a plurality of slides respectively associated with said linkages and being selectively movable between an operative position supporting an associated fulcrum member and the corresponding fulcrum pin so that the respective linkage transmits motion, and an inoperative position in which said fulcrum member and fulcrum pin are displaceable so that said toggle levers do not transmit motion.

16. A typing apparatus according to claim 1 including a main drive shaft; and wherein said drive element includes a planet carrier secured to said drive shaft and planetary gears on said planet carrier, wherein one of said driven elements includes a sun gear, and the other driven element includes an orbit gear meshing with said planetary gears; and including a gear meshing with said type means and connected with said first driven element for rotation about the axis of said drive shaft.

17. A typing apparatus according to claim 16 wherein said rotary type means include a plurality of type wheels; wherein said movable support means include a plurality of movable supports respectively supporting said type wheels; wherein said type wheels have alternating teeth and recesses, said teeth having said type faces, and said recesses meshing with said gear so that said type wheels are driven from said first driven element; wherein said selector means includes a plurality of circumferentially spaced selector members operable to actuate said control means to block said first driven element and said gear and type wheels; and including a selector device and means for selectively connecting said actuating means with one of said supports whereby only one of said supports is moved to said operative position by said actuating means.

18. A typing apparatus according to claim 17 wherein said actuating means include an actuating shaft, and an actuating cam secured to said actuating shaft and being operatively connected with said supports; and including a transmission connecting said second driven element with said actuating shaft so that said actuating cam rotates in a timed relation with said second driven element while the latter turns through said predetermined angle.

19. A typing apparatus according to claim 18 wherein said control means includes a blocking member having a normal position permitting rotation of said first driven

element and blocking rotation of said second driven element and of said actuating shaft so that said supports are not moved during rotation of said type wheels, said blocking member having a second position blocking said first driven element so that said type wheels stop, and releasing said second driven element for rotation by said drive element so that said actuating shaft is rotated with said actuating cam whereby to move a selected support and type wheel to an operative printing position and back while said type wheels are not rotated from said first driven element; and wherein said movable supports are movable with said type wheels in a plurality of angularly spaced planes intersecting at the printing area so that said printing wheels make imprints on the same printing area.

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