Jan. 3, 1967 RENTARO SASAKI 3,295,652

TYPE DRUM SELECTOR USING SLIDING PLATES

Filed March 23, 1965 3 Sheets-Sheet 1

Fig. 1

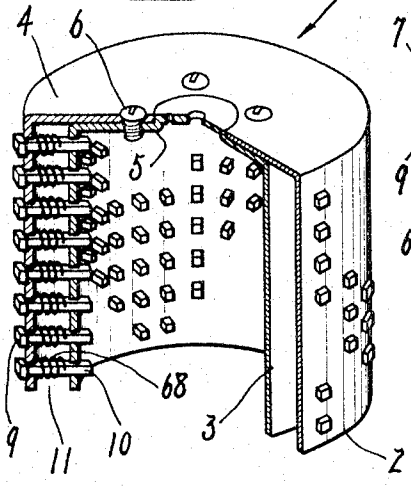


Fig. 2

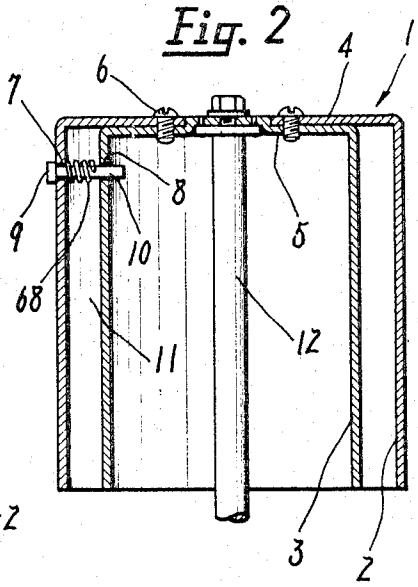
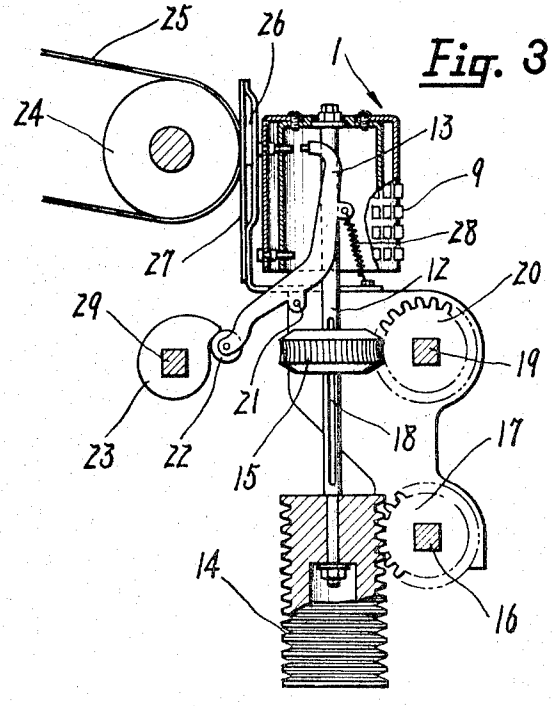


Fig. 3



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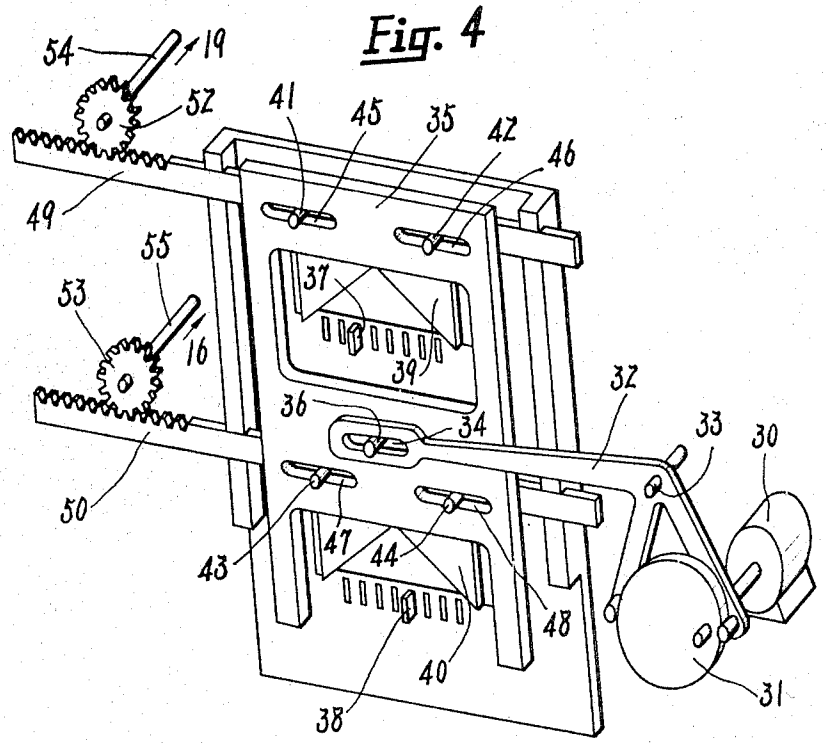
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Fig. 4



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Fig. 5

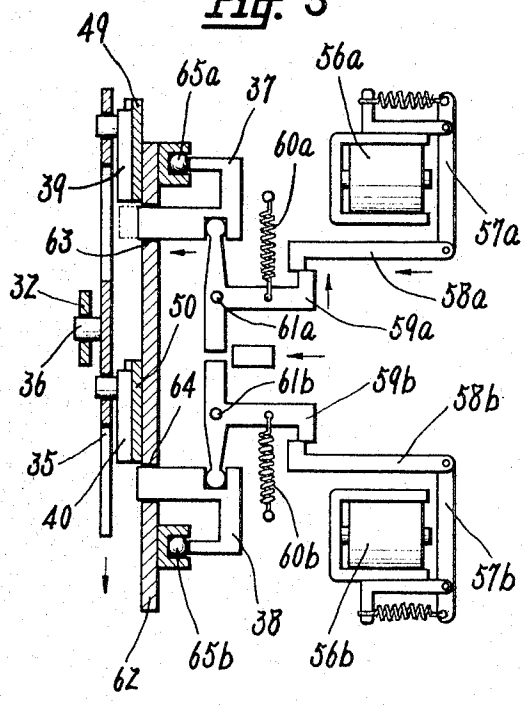
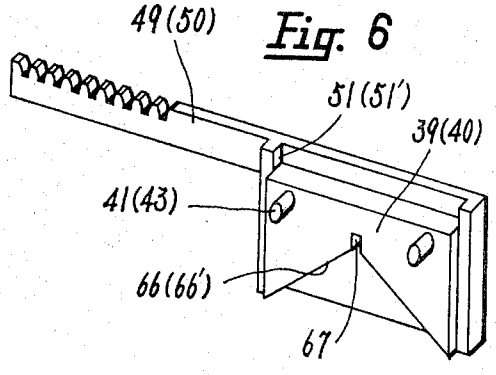


Fig. 6



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TYPE DRUM SELECTOR USING SLIDING PLATES

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3 Claims. (Cl. 197—53)

This invention relates to drum-type printers.

In a conventional ball type or drum type printer, in printing characters, an entire type case is rocked and is pressed against a platen and therefore, in containing types, the pitch between the types will be so large that, in case the number of characters is large, the type drum will be large and it will be difficult to increase the speed of the printer. There is another known system wherein, in printing characters, types are struck with a hammer to print on the paper. However, in such system, it is difficult to increase the number of copying sheets and not only is the paper apt to be stained with adjacent types but also the hammer will be broken frequently.

Further, in the prior art, in the case of selecting the position of the type drum, the mechanism is so complicated that it is difficult to compactly assemble the printer itself.

The objective of the present invention is to eliminate the above mentioned defects.

Therefore, an object of the present invention is to provide a type drum wherein the structure is simple and the type mounting capacity is large.

Another object of the present invention is to provide a small height type drum adapted to high speed printers.

A further object of the present invention is to provide a printer wherein types are struck from behind with a hammer inside a type drum so that characters may be clearly printed.

A still further object of the present invention is to provide a selecting mechanism which is simple in structure and is adapted to high speed printers.

In the accompanying drawings:

FIGURE 1 is a partly sectional perspective view of a type drum of the present invention;

FIGURE 2 is a vertical sectional view of the type drum shown in FIGURE 1;

FIGURE 3 is a vertical sectional view illustrating the related parts of the type drum and a hammer;

FIGURE 4 is a perspective view illustrating the essential part of a selecting mechanism of the present invention;

FIGURE 5 is a side view illustrating the selecting mechanism for selector fingers;

FIGURE 6 is a perspective view of a selection plate.

In FIGURES 1 and 2, the entire type drum is represented at 1. The type drum 1 consists of a cylindrical outside drum case 2 and a cylindrical inside drum case 3 set coaxially with said outside drum case 2. The upper end of the outside drum case 2 is bent inwardly, as at 4, and is secured to a flange part 5, of the inside drum case 3, with screws 6.

Both drum cases 2 and 3 are provided with fixed numbers of square holes 7 and 8, respectively, in aligned registration with each other along radii spaced uniformly angularly of the drum circumferences, so that the square shafts 10 of types 9 inserted in the respective registering square holes may be radially arranged. A spring 68 embraces the square shaft 10 of each type 9 in a space 11 formed between drum cases 2 and 3 so as to provide a returning force for the type. It is needless to say that each of the drum cases 2 and 3 can be divided axially into several portions so as to make it easy to fit the types.

A vertical shaft 12 is secured concentrically of the thus formed type drum and has a worm or rack for selection in the vertical direction and a worm wheel for selection in the rotary direction, so that positions for the vertical and rotary directions may be selected, whereby any desired type may be selected for engagement by the hammer.

FIGURE 3 is a view showing the relation between the type drum and the hammer according to the present invention. When the square shaft 10 of the type 9 arranged in the type drum illustrated in FIGURES 1 and 2 is struck at the end with a hammer 13, the type 9 will be projected outward. A vertical selection worm or rack 14 and a worm wheel 15 are secured to the shaft 12. Said vertical selection worm 14 is displaced by a vertical selection shaft 16 through a gear 17 so that the amount of the vertical movement of the shaft 12 may be controlled. The vertical movement of the worm wheel 15 is restricted, and the shaft 12 can slide vertically, through a spline 18, with respect to the worm wheel 15 but is restricted in the rotating direction.

The amount of rotation of the worm wheel 15 is controlled through a worm 20 secured to a rotary selection shaft 19. The details of such selecting mechanism will be explained later.

The type hammer 13 is set within the type drum 1 so as to operate to strike the type 5 shafts 10 at their radially inner ends. Said type hammer 13 is pivoted, in the center part, to a frame at 21 so as to be operated by a cam 23 in contact with a roller 22 at the end of the hammer 13. Thus, when the tip of the hammer 13 strikes the type 5, a character will be printed on paper 25 on a platen 24 through a ribbon 26. 27 is a ribbon guide to guide the ribbon 26. The hammer 13 is provided with a spring 28 to return the hammer to the original position.

According to the present invention, in the case of printing a character on receiving a signal, if the signal includes a component for selecting the amount of the vertical movement of the type drum and a component for selecting the amount of the rotary movement of the drum, when such signal is received, a specified amount of rotation will be given to the shaft 16 by the component for selecting the amount of the vertical movement so that the type drum 1 may be moved vertically by a specified amount through the worm wheel or gear 17, worm or rack 14 and shaft 12 and, on the other hand, a specified amount of rotation will be given to the shaft 19 by the component for selecting the amount of the rotary movement so that the type drum 1 may be rotated by a specified amount through the worm 20, worm wheel 15 and shaft 12. Thus, by the selecting operations along both of these coordinates, any desired type can be brought to and stopped at the character printing position, and made to print the character. The cam 23 and worm wheels 17 and 20 are restricted in the rotary direction with respect to the cam shaft 29 and shafts 16 and 19, respectively, but are slidable in the axial direction. After the completion of printing the character, by moving the above mentioned entire mechanism axially on the shafts 16, 19 and 29, the character printing operation can be continued.

Now the selecting mechanism in the type drum according to the present invention will be detailed. In the selecting mechanism of the present invention, while a selection plate having inclined surfaces is periodically moved, by the operation of a selection magnet corresponding to any character or signal, one of a plurality of selection fingers is projected so that said finger may come into contact with an inclined surface of said selection plate and said plate is slid and stopped so that said finger may be engaged with a fixed part of said selection plate. Thus, in response to the stopping position of said selection plate, through the mechanism of the selection worm and pinion, the rotation and vertical movement of the type drum will be

selected so that the character of the type may be selected.

Further, the present invention has as its essential parts plates having inclined surfaces of a fixed shape and groups of the selector fingers projected selectively into paths of movement of said plates. Each plate will move with its inclined surface engaged with the selected and projected selector finger so that said selector finger may be positioned at the end of the inclined surface. By the displacement of said plate in the direction intersecting with the direction of fingers movement, the characters can be selected.

With reference to FIGURES 4, 5 and 6, **30** is a selection clutch. When a clutch magnet (not illustrated) is excited by a character printing instruction pulse, a cam lever **32** will be oscillated around a shaft **33** as a center and the oscillation will be transmitted to a stud **36** projecting from a sliding plate **35** through a slot **34** in lever **32**, so that the sliding plate **35** is reciprocated up and down. **37** and **38** are, for example, eight selector fingers. By an operation mentioned below, the corresponding selector finger will stop in a position projecting from the other fingers. **39** and **40** are a rotary movement selection plate and a vertical movement selection plate, respectively, and are respectively fitted in slots **45** and **46** and slots **47** and **48** in the sliding plate **35** by studs **41** and **42** and studs **43** and **44**. **49** and **50** are a rotary movement selection rack and a vertical movement selection rack, respectively. As illustrated in FIGURE 6, the selection plate **39** (or **40**) is mounted in the recessed part **51** (or **51'**) of the selection rack **50** (or **49**) so as to be slidable vertically.

52 and **53** are selection pinions to drive selection shafts **54** and **55**, respectively, which will respectively rotate the shafts **19** and **16**, shown in FIGURE 3, directly or through a proper transmitting mechanism so that the shaft **12** of the type drum may be adjusted angularly and axially to selected positions, and a fixed character in the type drum may be selected to come to a position opposite the hammer.

FIGURE 5 is a view illustrating the selecting mechanism for the selector fingers. There are provided as many selector magnets **56***a* or **56***b* as there are fingers to be selected. In this embodiment, for example, there are provided eight selector magnets. When any one of them is selected and excited, an armature **57***a* or **57***b* will be attracted and a selector arm **59***a* or **59***b* will be disengaged by a connector **58***a* or **58***b* and will be rocked around a shaft **61***a* or **61***b* as a center by the force of a spring **60***a* or **60***b*, the selector finger **37** or **38** will be advanced in the direction indicated by the arrow and the tip of said finger will project forward through a hole **63** or **64** in a plate **62** and will be brought to a position wherein it can engage with the selection plate **39** or **40**.

In order to prevent simultaneous projection of two or more selector fingers by mistake, a plurality of longitudinally aligned balls **65***a* and **65***b* are provided in channel members mounted on the rear surface of panel **62**. The total displacement of the balls **65***a* and **65***b* in their respective channels is equal only to the width of the upper outwardly projecting end of one selector finger **37**, **38**, so that only one selector finger at a time may project between a pair of adjacent balls **65***a*, **65***b*.

The operation of the selecting mechanism will now be explained. If the selector magnets for determining the corresponding angular and axial positions of a character to be selected are predetermined, when a push button (not illustrated) is pushed by an operator, one magnet in each of the respective groups of selector magnets **56***a* and **56***b* will be excited, the armatures **57***a* and **57***b* will be attracted, the connectors **58***a* and **58***b* and the selector arms **59***a* and **59***b* will be disengaged and the selector fingers **37** and **38** will be projected and will be brought to positions wherein they can be engaged with the angular position selection plate **39** and vertical or axial position selection plate **40**.

On the other hand, as described later, the angular position selection plate **39** and the vertical or axial position selection plate **40** move periodically. At each intermittent excitation of the clutch magnet (not illustrated), the selection clutch will be operated, the selection cam **31** will be driven and the cam lever **32** will oscillate around the shaft **33** as a center in a direction in which the slot **34** made at the other end of the lever **32** will move downward. With the descent of the slot **34**, there will descend the sliding plate **36** which follows the vertical movement of said slot but moves freely in the horizontal direction relative to the slot due to the play part of rotary slot **34**. The rotary selection plates **35** and **40** are engaged with said sliding plate **35** through the studs **41** and **42** and **43** and **44**, respectively. Therefore, with the descent of the selection plate **35**, said two selection plates **39** and **40** will both descend. But, as described above, if one magnet in each of the respective groups of the selector magnets **56***a* and **56***b* is selected, the selector fingers **37** and **38** in the positions corresponding to the selected magnets will be projected from the front surface of the plate **62** and either one of the triangular inclined surface parts **66** and **66'** in each of the selection plates **39** and **40** will come into contact with said selector fingers **37** and **38**, respectively. With the further downward movement, the selection plate **39** and the selection plate **40** will move horizontally by the horizontal distances between the projected selector fingers **37** and **38** and the apices **67** of said triangular inclined surface parts **66** and **66'**, respectively. When the selector fingers **37** and **38** thus enter the respective apices **67** of said triangular inclined parts, the descent will stop. Therefore, the horizontal movements of the rotary selection plate **39** and vertical selection plate **40** will produce horizontal movements of the racks **49** and **50** and will determine the amounts of rotation of the pinions **52** and **53** meshed respectively with said racks.

Thus, the position of the rotary selection plate **39** will be determined. Through the rack **49**, pinion **52** and shaft **54** integral with the plate **39** and, as required, through any proper intermediate transmitting mechanism, the shaft **12** of the type drum **1** will be rotated from the shaft **19** shown in FIGURE 3 so that the type drum **1** may be adjusted in the angular direction.

The adjustment of the type drum in the vertical direction is made in the same manner. Through the vertical selection plate **40**, rack **50**, pinion **53** and shaft **55**, the shaft **12** of the type drum **1** will be moved axially or vertically by the shaft **16** so that the type drum **1** may be vertically or axially adjusted.

Thus, by selecting the positions in the angular direction and axial direction, any desired character in the type drum can be brought to the position opposite the type hammer **13** and platen **24** and can be printed.

What is claimed is:

1. In printing apparatus including a type drum carrying type members mounted for displacement radially of the drum and arranged in angularly and axially spaced relation each at the intersection of a respective angular coordinate with a respective axial coordinate, a hammer operable to radially project a type member then aligned therewith to print on a printing medium, adjusting means for displacing the drum angularly, adjusting means for displacing the drum axially, and selector means operable through the adjusting means to displace the drum angularly and axially to align a selected type member with the hammer: the improvement in which said selector means comprises a support panel; a pair of relatively elongated operators mounted on one surface of said panel for lengthwise displacement in one longitudinal direction in substantially parallel relation, each operator being in driving connection with a respective adjusting means; a pair of selector plates each mounted on a respective operator for displacement in a transverse direction substantially normal to said one longitudinal direction, and constrained against displacement in said longitudinal direction relative to its

associated operator; each selector plate having an outwardly opening, substantially isoceles triangular notch in its edge facing in said transverse direction, and the two notches facing in the same direction with each notch having an apex; a plurality of selector fingers arranged in two transversely spaced parallel rows extending in said longitudinal direction, each row extending across the path of movement of the notch in a respective selector plate; each selector finger being mounted through a respective aperture in said panel; respective means constantly mechanically biasing each selector finger to project from said one surface of said panel into the path of movement of the associated selector plate; respective latch means mechanically latching each selector finger against such projection; printing pulse responsive electromagnetic release means operable, when energized, to release the associated latch means from one selector finger in each row, in accordance with the drum coordinates of the character to be printed, for projection of the released fingers by the respective mechanical biasing means; and printing pulse responsive driving means operable, when energized, to reciprocate said selector plates initially in a direction to engage a sloping side of the associated notch with a projected selector finger to move the respective selector plate and its operator in said longitudinal direction an amount equal to the spacing of the respective projected selector finger, longitudinally of its row, from the apex of the respective notch.

2. In printing apparatus, the improvement claimed in claim 1, including means engageable by said selector fingers and providing for projection of only one selector finger in each row responsive to any single printing pulse.

3. In printing apparatus, the improvement claimed in claim 1, in which said printing pulse responsive electromagnetic release means comprises a respective electromagnetic release means operatively associated with each latch means.

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