

[54] **TYPE DRUM ASSEMBLY FOR AN ON-
THE-FLY PRINTER**

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[51] Int. Cl. **B41j 23/04**

[58] Field of Search. **197/16, 18, 48, 49,
197/44, 45, 55; 178/34**

[56] **References Cited**

UNITED STATES PATENTS

1,052,356	2/1913	Marchthal	197/49
3,343,642	9/1967	Weidanz et al.	197/18
2,363,253	11/1944	Larson	197/44
3,115,092	12/1963	Sasaki	197/49 X
3,334,721	8/1967	Hickerson	197/49 X
2,621,772	12/1952	Reppert	197/16 X

2,939,911	6/1960	Holstein	178/34
3,516,528	6/1970	Davidge et al.	178/34 X
3,404,765	10/1968	Gassino et al.	197/16 X

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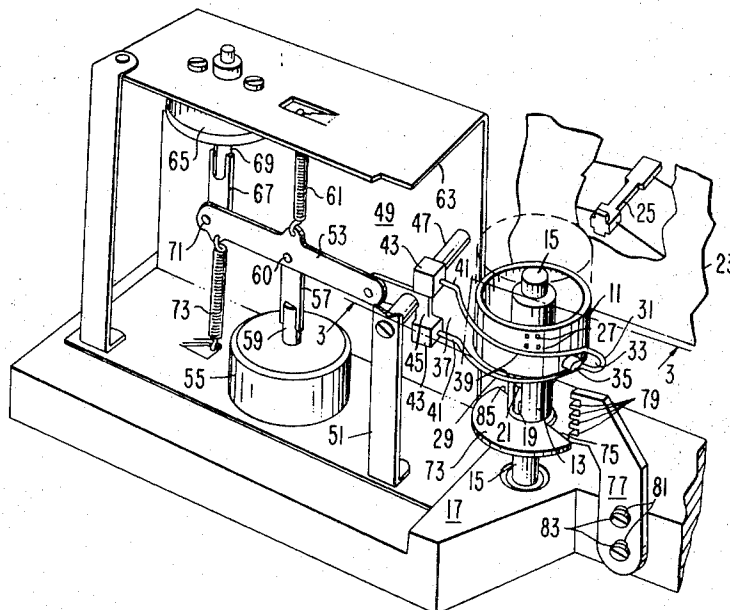
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[57]

ABSTRACT

A type drum assembly for an on-the-fly printer including a rotatable, cylindrical type drum, axially positionable during rotation, the drum having rows of characters grouped on its curved surface to form printing and non-printing phases of a rotation of the cylinder. A V-shaped guide, open at its small end and partially encompassing the drum, interacts with a cam follower stud on the curved surface of the drum for axially positioning the drum during the non-printing phase, the guide being shifted by the interaction of two solenoids acting on a lever pivoted to the guide. A semicircular flange, fixed to the type drum, rides between the teeth of a comb during the print phase of a rotation of the drum for maintaining the drum at the selected axial position.

11 Claims, 5 Drawing Figures



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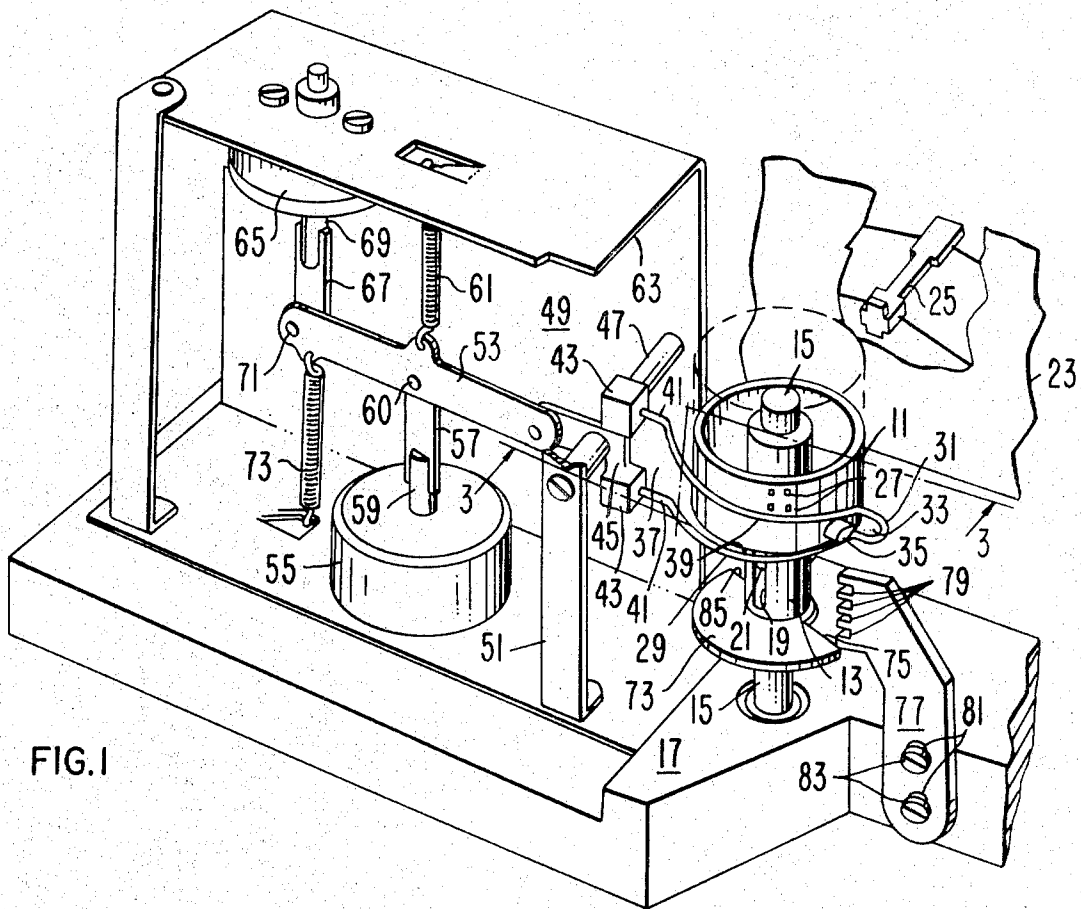


FIG. 1

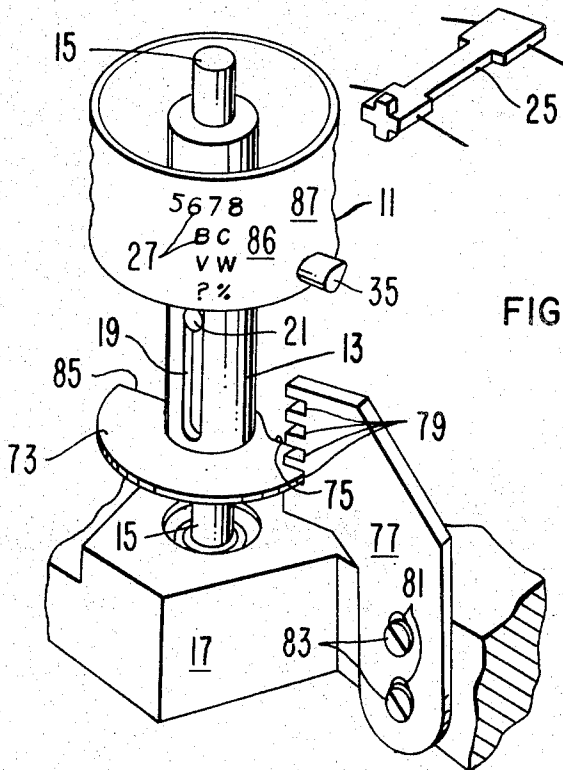
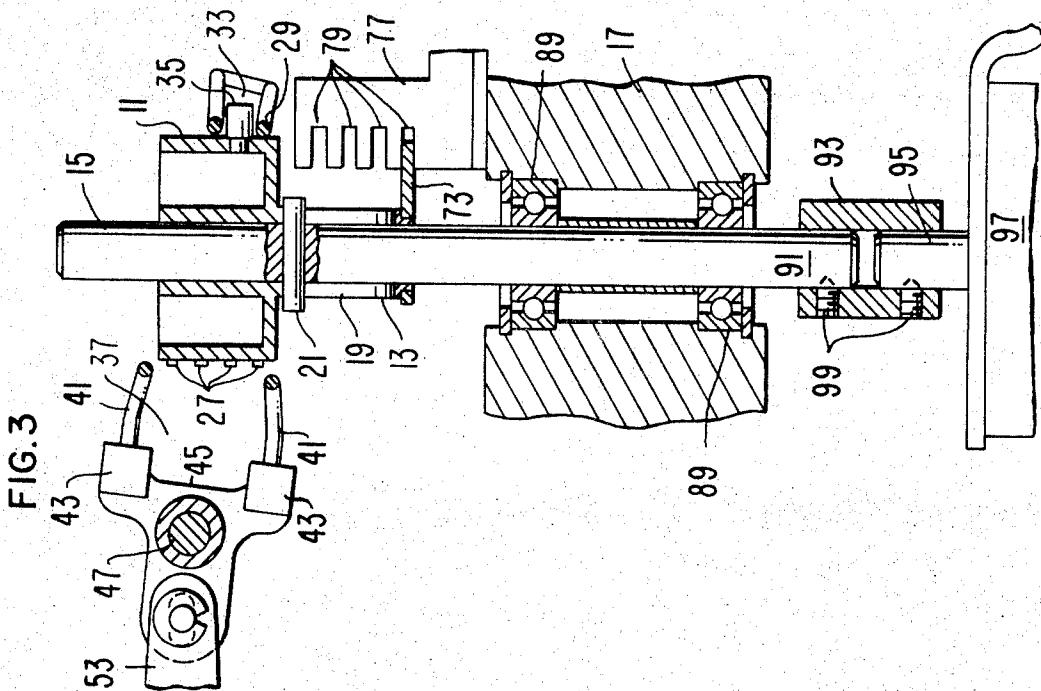
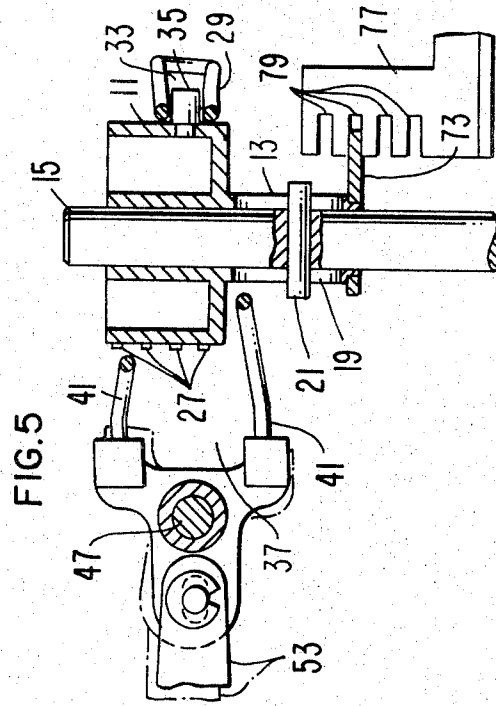
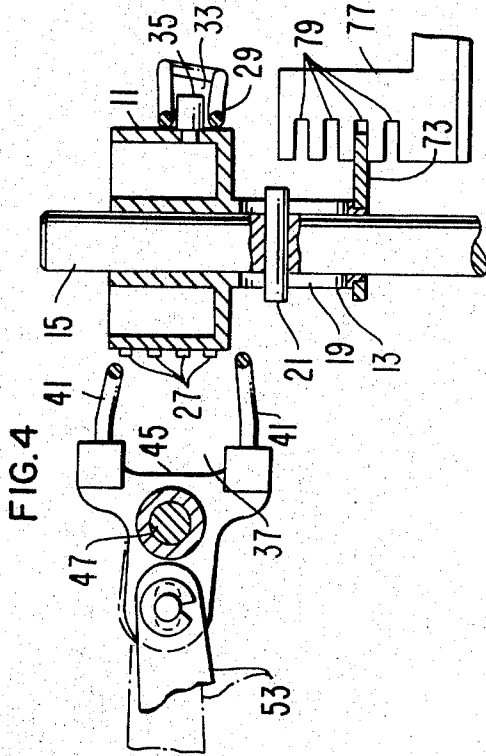


FIG. 2

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TYPE DRUM ASSEMBLY FOR AN ON-THE-FLY PRINTER

BACKGROUND OF THE INVENTION

The invention relates to a print head assembly for use in high speed, on-the-fly, printing, the font of print characters being distributed in rows on the curved surface of the print head and more particularly to improved means for positioning the print head and maintaining it at the proper line of print during the printing operation.

It has been well-known for some time in the high speed printing art to utilize a cylindrical print head on which the characters of a font of type are arranged in rows and the print head is positioned axially while being rotated.

Various means have been developed for axially positioning the head including gear and rack, multiple levers positioning a bale, yokes positioned by bell cranks and controlled by links and other bell cranks, cams and levers, and stop bars interacting with an extended horizontal arm. The discovery of accurate and simplified apparatus for quickly and precisely positioning a cylindrical print head axially at a print line during rotation has been the subject of continued search in the high speed printing art.

It is, therefore, the object of this invention to improve apparatus for axially positioning a cylindrical print head during on-the-fly, high speed printing.

SUMMARY OF THE INVENTION

A print head assembly for on-the-fly printing utilizes a rotatable, cylindrical type drum, axially positionable during rotation, the drum having rows of characters grouped on its curved surface to form printing and non-printing phases of a rotation of the drum. The drum is positioned during the non-printing phase by a pivotable V-shaped guide member, partially encompassing the drum, the inner surfaces of the V interacting with a cam follower stud on the curved surface of the drum. The guide member is pivoted by two solenoids acting directly and independently on fulcrum points on a lever pivoted to the guide. A semicircular flange fixed to the drum cooperates with teeth of a comb during the printing phase of a rotation of the drum to maintain the drum at a selected axial position.

The objects, advantages, and features of the invention will become more fully apparent from the following detailed description, appended claims, and accompanying drawings in which:

FIG. 1 is a perspective view of the print head assembly of the invention;

FIG. 2 is an enlarged perspective view of a portion of the print head assembly;

FIG. 3 is a cross section view of a portion of the assembly taken along the line 3 — 3 of FIG. 1, but with the head in the position of FIG. 2;

FIGS. 4 and 5 show a portion of the cross section of FIG. 3 showing the print head in different axial positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A type drum 11 (FIG. 1) having a depending sleeve 13 is slidably mounted on a vertical shaft 15 journaled

in a base 17. The drum 11 may be cup-shaped or hollow, as known in the art, to reduce the weight of the drum. The sleeve 13 has opposing slots 19 (only one being shown) through which a pin 21 is inserted in the shaft 15 to limit the axial motion of the drum 11 and to prevent rotation of the drum on the shaft.

Conventional means (not shown) are provided for moving a printing medium (such as paper and carbon) 23 across the curved surface of the drum 11. A print hammer 25 is mounted by conventional means for impacting the printing medium 23 against characters 27 raised on the curved surface of the drum 11.

A guide member 29 partially encompasses the curved surface of the drum 11. The guide member or cam 29 is V-shaped with the converging ends of the V pointing in the direction of rotation of the drum. Preferably the guide cam 29 is formed of heavy wire with a U-shaped portion 31 at the end of the V turned outwardly from the surface of the drum 11 to form an open end 33 of the V.

A stud 35 having a substantially teardrop-shaped cross section is fixed to the curved surface of the drum 11 with the small end of the teardrop pointed in the direction of rotation of the drum. The stud 35 is a cam follower and, upon entering the open end 37 of the V-shaped guide member 29, is cammed by one or the other of the inner surfaces 39 of the guide member 29 into the narrow outlet 33 of the V, precisely positioning the type drum 11 axially on the shaft 15.

The diverging ends 41 of the V-shaped guide 29 are fixed in the arms 43 of a T-shaped support 45 which is pivoted near the base of the arms on a shaft 47. The shaft 47 may be supported, for example, on a frame 49 and an angle iron 51, both mounted on the base 17. A lever 53 is pivotably connected to the T-shaped support 45 on the opposite side of the shaft 47 from the arms 43 supporting the guide cam 29.

A first solenoid 55 is mounted, for example, on the base 17 and has an extension 57 of its armature 59 pivotally attached substantially in the center 60 of the lever 53. A spring 61 is also attached at one end at the center of the lever 53 and may be connected at its other end to a horizontal portion 63 of the frame 49, the spring 61 providing bias against the retraction of the armature 59 by the solenoid 55.

A second solenoid 65 is mounted on the horizontal portion 63 of the frame 49 and has an extension 67 of its armature 69 pivotally connected to the end 71 of the lever 53 opposite that pivoted to the T-shaped support 45. A spring 73 is connected between the end 71 of the lever 53 and the base 17 to give a resisting bias to the retraction of the armature 69 of the second solenoid 65.

The arrangement of the solenoids 55, 65 and their connections to the lever 53 provides two fulcrum points 60, 71 on the lever. When neither solenoid 55, 65 is actuated the guide member 29 is in its lowest position. When the second solenoid 65 is actuated, but the first 55 is not, the lever 53 rocks about the center fulcrum 60 and the guide member 29 is lifted to its second position. When the first solenoid 55 is actuated and the second 65 is not, the lever 53 is fulcrumed about its end 71 and the guide member 29 is lifted to its third position. When both solenoids 55, 65 are actuated the guide member 29 is pivoted into its upmost position.

The interaction of the two solenoids 55, 65 acting against bias on the lever 53, therefore, precisely positions the guide member 29 and, through it and the stud 35, axially positions the type drum 11 on the shaft 15.

It is apparent that the mounting of the solenoids 55, 65, as described, is for convenience and compactness of arrangement. If desired, both solenoids could be on the same side of the lever 53.

Fixed to the sleeve 13 of the drum 11 is a substantially semicircular flange 73. The leading edge 75 of the flange 73 is substantially aligned with the cam follower 35. A comb 77 having a series of spaced channels 79 is adjustably mounted on the base 17 by slots 81 in the comb and machine screws 83. The channels 79 in the comb 77 are spaced to accept the flange 73 in the various positions of the type drum 11 determined by the guide cam 29. As the trailing edge 85 of the flange 73 leaves one of the channels 79, the stud 35 on the drum 11 is entering the open end 37 of the guide member 29. The interaction of the guide member 29 and cam follower 35, and flange 73 and comb 77, is such that the axial position of the type drum 11 on the shaft 15 is controlled during substantially half of the rotation of the drum by the guide member and during the other half of the rotation of the drum by the running of the flange through a channel 79 in the comb 77.

A font of type characters 27 is arranged in four rows on the curved surface of the type drum 11, each row being positioned for presentation to the print line of the printer by a respective one of the axial positions of the drum. In the preferred embodiment the type characters 27 are grouped to occupy just over one-fourth of the circumferential area of the drum 11 being centered preferably above, and within the projection of, the flange 73. In such an embodiment the center line of two consecutive characters may form a central angle of the drum of approximately 9°, 43', 36" with 10 characters in one line occupying approximately 97°, 16" of the circumference of the drum.

The balance of the curved surface of the drum is vacant providing a printing phase and a non-printing phase during each rotation of the drum 11. During the printing phase the drum is held at the line of print by the interaction of the flange 73 and one of the channels 79.

As shown in FIG. 2, the leading edge 75 of the flange 73 has entered the lowest channel 79 which is determined by the assembly when neither of the solenoids 55, 65 is actuated. The area 86 of the curved surface of the drum 11 containing the characters 27 has not yet reached the printing area, the vacant surface 87 of the drum 11 indicating that the rotation of the drum is still in the non-printing phase.

As shown in FIG. 3, the shaft 15 is journaled in bearings 89 fixed in the base 17 and the lower end 91 of shaft 15 is fixed in a sleeve 93. The drive shaft 95 of motor 97 is also affixed in the sleeve 93 as by set screws 99.

Motor 97 may be of any type known in the art providing a suitable number of revolutions per minute. In the preferred embodiment the motor 97 is of a constant high speed type providing 3,600 RPM. With this speed motor the type drum assembly of the invention will print 60 characters per second.

In FIG. 3 the guide bail 29 has axially positioned the drum 11 in the lowest position, as described with respect to FIG. 2. FIG. 4 shows the axial position of the print drum 11 when the guide bail 29 is in its second position and FIG. 5 shows the axial position of the print drum 11 when the guide member 29 is in its third position. In FIGS. 2, 3 and 4 the flange 73 has entered the appropriate channel 79 of the comb 77. Similarly the fourth position of the guide member 29 would present the flange 73 in the uppermost channel 79 during the printing phase of the rotation of the drum 11.

I claim:

1. A type drum assembly for an on-the-fly printer comprising:

a cylindrical type drum having rows of characters grouped on a first portion of its curved surface to form a printing phase and being devoid of characters on a second portion of its surface to form a non-printing phase of the continuous rotation of the drum, said drum being movable axially to present a selected row of characters at a print line; means for axially positioning the type drum with a selected row of characters at the print line during the non-printing phase of the continuous rotation of said drum; and

means independent of said positioning means for maintaining the selected row of characters at the print line during the printing phase and for releasing said print drum to said positioning means during the non-printing phase of the continuous rotation of said drum.

2. The type drum assembly of claim 1 wherein said positioning means includes a selectably positionable V-shaped cam, partially encompassing said drum and open at its smaller end, and cam follower means on the curved surface of said drum for interacting with the inner surfaces of said V-shaped cam.

3. The type drum assembly of claim 2 wherein said V-shaped cam is pivotable and also including means for precisely pivoting said cam in a series of axial positions with respect to said type drum.

4. The type drum assembly of claim 3 wherein said means for pivoting said cam includes a lever pivotally linked to said cam, said lever having two distinct fulcrum points and means for independently shifting said lever into different positions at said fulcrum points.

5. The type drum assembly of claim 4 wherein said means for independently shifting said lever include means for biasing said lever in one direction and solenoid means for shifting said lever in the opposite direction.

6. The type drum assembly of claim 5 including a pair of solenoid means operating against bias at each of said fulcrum points said pair of solenoid means acting on opposite sides of said lever.

7. The type drum assembly of claim 1 wherein said means for maintaining a selected row of characters at the print line during the printing phase and for totally releasing said type drum to said positioning means during the non-printing phase of a rotation of said drum include a substantially semicircular flange fixedly connected to said drum and a comb member having channels for receiving said flange at each position of said type drum at said print line.

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8. The type drum assembly of claim 7 wherein said characters are arranged in four rows and centrally grouped within the projection of said semicircular flange.

9. A type drum assembly for an on-the-fly printer comprising:

a cylindrical type drum having rows of print characters grouped on a first portion of its curved surface to form a printing phase and being devoid of characters on a second portion of its curved surface to form a non-printing phase of the continuous rotation of said drum, said drum being movable axially to present a selected row of characters at a print line;

means for controlling the axial position of said drum, said controlling means being actuatable during the printing phase of the continuous rotation of said drum;

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means rotating with said drum and interacting with said controlling means for axially positioning said drum during the non-printing phase of the continuous rotation of said drum; and

means for maintaining the axial position of said drum during the printing phase and for releasing said drum to said controlling means and positioning means during the non-printing phase of the continuous rotation of said drum.

10. The type drum assembly of claim 9 wherein said controlling means includes an elongated cam partially encircling said drum and said means rotating with said drum comprises a cam follower fixed on said drum.

11. The type drum assembly of claim 9 wherein said maintaining means includes a flange rotating with said drum and a slotted member for receiving said flange at different axial positions of said drum.

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