

[54] **SELECTIVE ROLLER INKER MEANS FOR HIGH SPEED SELECTIVE TYPE DRUM**

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[51] Int. Cl. **B41j 27/14**

[58] Field of Search **101/93 C, 103, 90, 101/348, 137, 207, 218, 106**

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[57] **ABSTRACT**

A printing apparatus for printing a color bar code and alpha-numerics on a label. The apparatus includes first and second groups of characters positioned on first and second portions, respectively, of a printing drum to form a ring of characters therearound. A first inking roll supplies a first ink to the first group of characters, and a second inking roll supplies a second ink to the second group of characters as the drum is rotated. A carriage having print hammers thereon is shifted slightly between first and second positions in timed relation with the rotation of the drum. Several rings of characters composed of the first and second groups of characters are placed axially along the drum. The bars used for printing the color bar code are aligned in a shuttling pattern on the drum, with the long dimension of the bars being transverse to the rotating axis of the drum.

2 Claims, 5 Drawing Figures

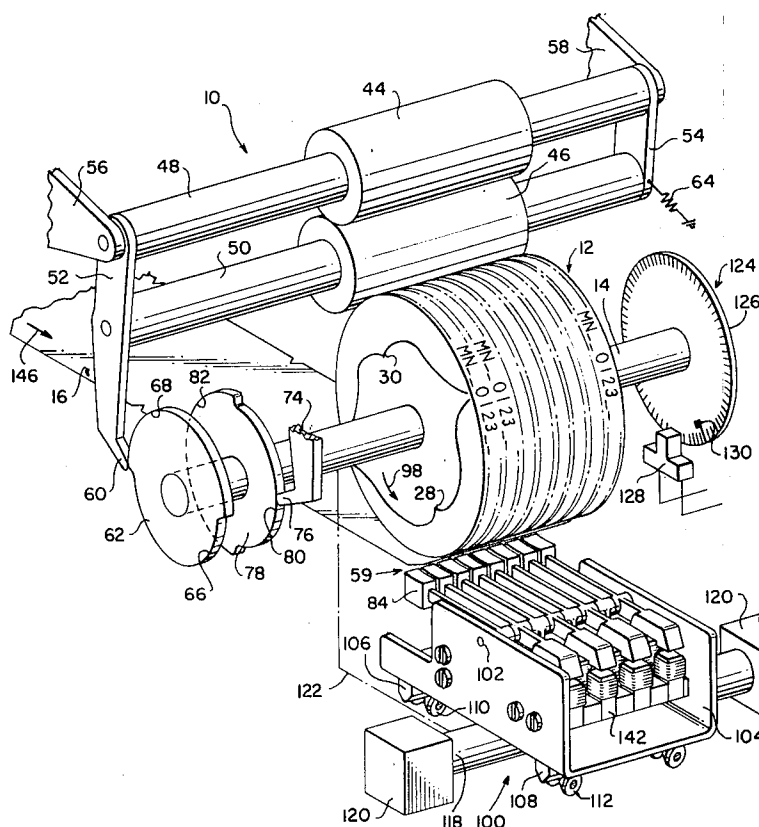


FIG. 1

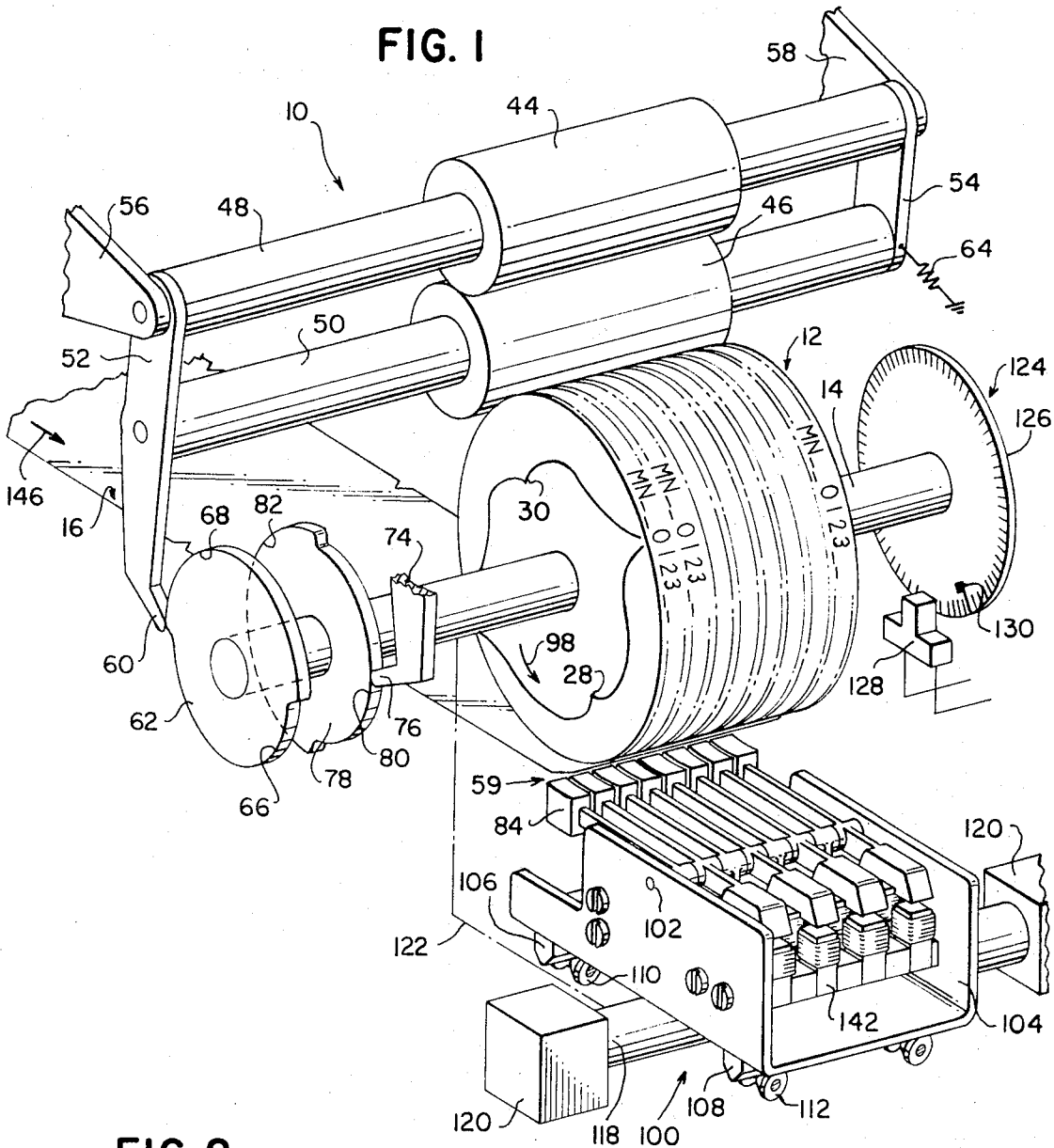


FIG. 2

30 28 30

MN— 0123 —4567—89AB—CDEF—GHIJ—KLMN— 0123 —

36 32 34 38

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FIG. 3

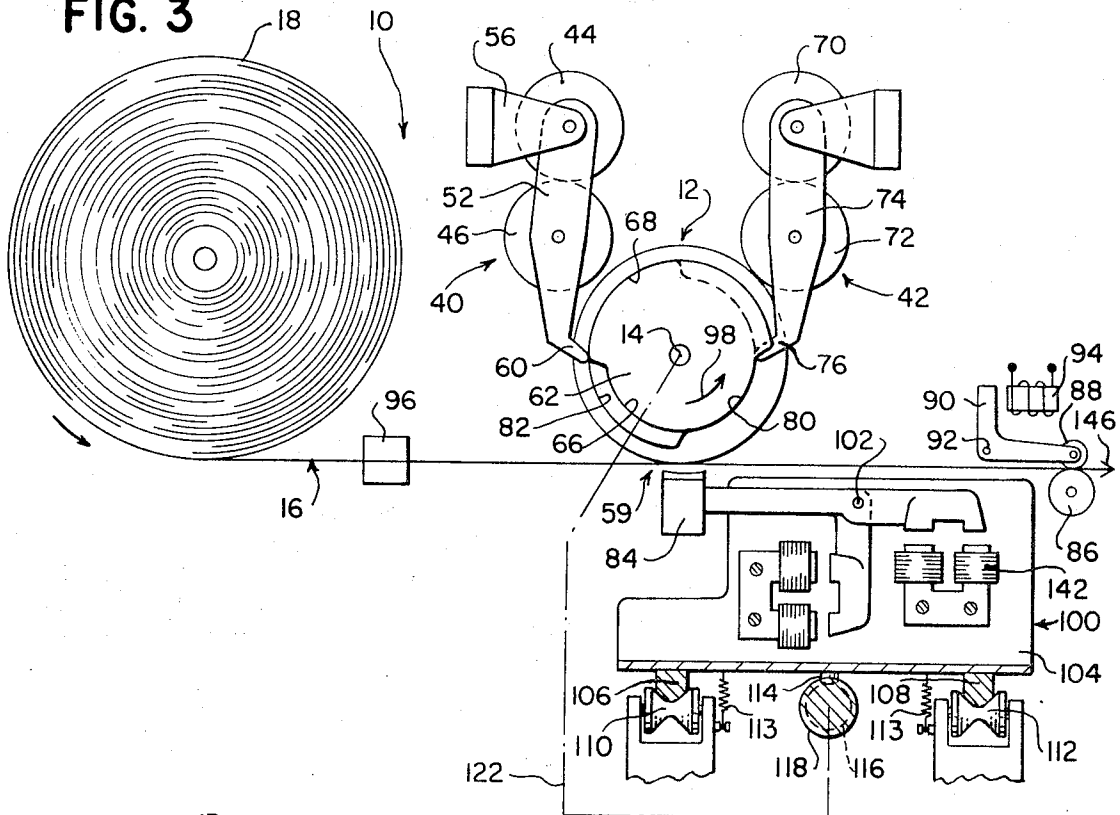


FIG. 5

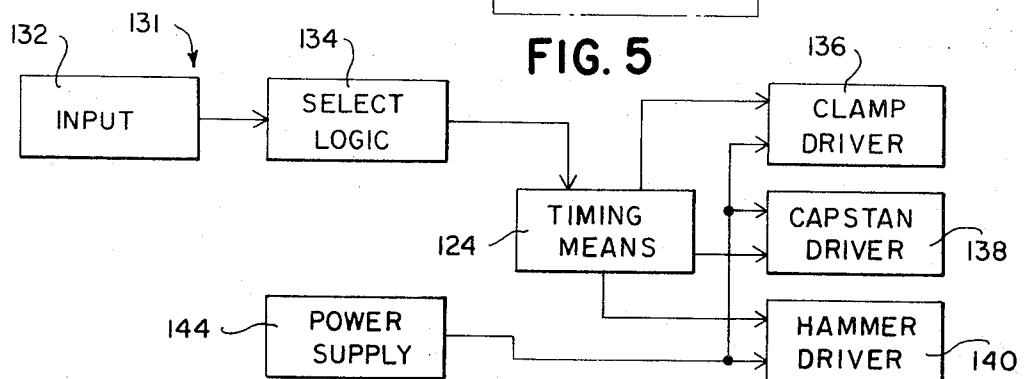
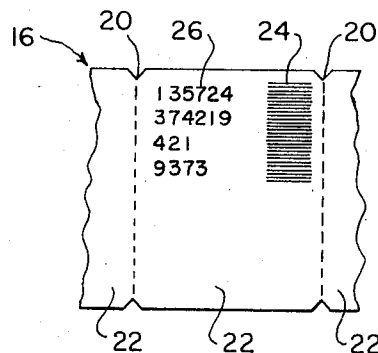


FIG. 4



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SELECTIVE ROLLER INKER MEANS FOR HIGH SPEED SELECTIVE TYPE DRUM

BACKGROUND OF THE INVENTION

This invention relates to a printer apparatus capable of printing characters in at least two inks on a record medium, and is especially useful for printing color bar codes and alpha-numerics on a label.

One of the problems with some of the prior-art printers which print coded "color bar" labels in two colors is that generally two printings are required to obtain one printed label. Under such circumstances, registration problems emerge. In addition, the requirement of two printings per label makes the cost of producing the label expensive.

Some prior-art printing techniques are shown in the following U.S. Pat. No. 3,012,499 to Amada Dec. 12, 1961 No. 3,218,968 to Childress et al. Nov. 23, 1965.

The present invention is especially adaptable for printing color-coded media which are to be printed in at least two colors and are to include alpha-numerics. When the medium is a label which is coded with color bars, the color bars may be printed in at least two colors, with adjacent "color bars" being printed close enough to be in contacting relationship with one another. In addition, the alpha-numerics may be printed in either of the two colors in order to emphasize them where appropriate. Because of the relatively simple construction of the invention, the printing cost for a record medium is low.

SUMMARY OF THE INVENTION

This invention relates to a printer apparatus for printing characters on a record medium. The apparatus includes a printer drum which is rotated at a constant speed. A first plurality of characters is positioned on a first portion of the periphery of the drum, and a second plurality of characters is positioned on a second portion of the periphery of the drum. The first and second pluralities of characters lie substantially in an imaginary plane which is perpendicular to the rotating axis of the drum. A first inking means is used for inking the first portion of the drum with a first ink, and a second inking means is used for inking the second portion of the drum with a second ink. Feed means are employed to feed the record medium to a print station where a hammer printing means is located. The hammer printing means includes a carriage means on which a plurality of print hammers is located; the carriage means shifts between first and second positions relative to the drum. As the drum rotates, the print hammers are selectively actuated in response to a control means so as to print the characters in the first and second inks. The characters may include alpha-numerics and a coded configuration like a bar code.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a general view, in perspective, of this invention showing a printer apparatus including a printer drum, inking means, and hammer means mounted on a shiftable carriage means.

FIG. 2 is a diagram showing an arrangement of pluralities of characters as they are positioned on the printer drum.

FIG. 3 is a side elevational view of the printer apparatus of this invention shown in FIG. 1. A portion of the carriage means is shown in cross section to show a

means for slidably mounting and shifting the carriage means. Additional details of the inking means for inking the printer drum in first and second inks are also shown.

FIG. 4 is a plan view of a record medium (in this instance, an individual label) which may be printed by this invention.

FIG. 5 is a general schematic diagram of a control means used with this invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a general view, in perspective, of the printer apparatus of this invention, which is designated generally as 10. The apparatus includes a printer drum 12 supported on and fixed to a shaft 14 to be rotated thereby. The shaft 14 is rotatably supported in bearings (not shown) and is driven at a constant rotational velocity by a conventional drive means (not shown).

The record medium illustrated with this invention is a tape 16 supplied from a feed roll 18 (FIG. 3). The tape 16 is notched and perforated (as at 20 in FIG. 4) to provide a plurality of individual labels 22. The labels 22 are coded, as at 24, by a group of "color bars," which group expresses data about an item to which the label is to be affixed. Alpha-numerics 26 show what is coded at 24, enabling the label to be human-readable as well as machine-readable. While the printer 10 may be used to print a variety of bar codes, it is especially adaptable for printing bar codes which require printing in at least two different "inks" and which require that an individual "color bar" of one ink be placed in contacting juxtaposition with the "color bar" of a second ink.

The characters to be printed on the label by the drum 12 (FIG. 1) are arranged into two general groups. A first plurality 28 of characters is positioned around a first portion of the periphery of the drum 12, as shown in FIG. 1, and a second plurality 30 of characters is similarly positioned around a second portion of the periphery. The first and second pluralities of characters lie substantially in a plane which is perpendicular to the rotating shaft 14 supporting the drum.

The first plurality 28 of characters is shown on a flat surface in FIG. 2. The characters include alpha-numerics which are interspersed with bars, like 32. Note that the bars 32 are displaced angularly around the periphery of the drum, and, in addition, successive bars are displaced in an axial direction (as viewed in FIG. 1), so as to produce a shuttling pattern. The particular dimensions of the bars 32 and their relative spacing are, of course, dependent upon a particular application for which the printer is used.

In one application of the printer 10, the bars 32 are 0.312 of an inch long and approximately 0.015 of an inch wide. Each bar 32 is displaced in an axial direction along the drum for a distance of 0.015 of an inch, so that the 12 bars from 32 to 34 (FIG. 2) are contained in a distance of 0.180 of an inch. The alpha-numerics shown in FIG. 2 have a height which is less than 0.180 of an inch, and they are interspersed between the bars as shown. The bars like 32 and 34 produce "color bars" of printing as shown at 24 in FIG. 4. Note that the bar 32 of the first plurality 28 of characters is in the lowermost position, as viewed in FIG. 2, while the bar 34 is in the uppermost position in the shuttling pattern, and the bar 36 of the second plurality 30 of characters is in the lowermost position, while the bar 38 of the second

plurality is in the uppermost position. The reason for this arrangement will become apparent during a discussion of print hammer actuation to be described later herein. In the embodiment shown, there are eight groups of first and second pluralities of characters, as shown in FIG. 3. All of the first pluralities 28 of characters are on one half of the drum 12, and all of the second pluralities 30 of characters are on the remaining half of the drum, as shown in FIG. 2. The pluralities of characters are placed close enough so that the final printings of color bars 24 (FIG. 2) are located 0.015 of an inch on centers throughout the width of the label. Placing the first and second pluralities of characters on separate halves of the drum facilitates the inking of them.

FIG. 3 shows the general arrangement for the inking means used for inking the first and second pluralities 28 and 30, respectively, of characters. A first inking means 40 is shown on the left side of the drum 12, and a second inking means 42 is shown on its right side.

The first inking means 40 (FIG. 3) includes a porous-type ink supply roller 44 (sold under the trademark "Porelon" by S. C. Johnson & Son, Inc., Racine, Wisconsin, United States of America) and an inking roller 46, which are mounted, respectively, on separate shafts 48 and 50, which shafts are rotatably supported in arms 52 and 54. The shafts 48 and 50 are parallel to each other and spaced close enough to keep the ink supply roller 44 in contact with the inking roller 46 to supply ink thereto. The upper ends of the arms 52 and 54 are pivotally supported, respectively, in frame members 56 and 58 (FIG. 1), and the lower end 60 of the arm 52 rides on the periphery of a cam 62, which is fixed to the shaft 14 to rotate therewith. The lower end 60 is kept in contact with the cam 62 by a tension spring 64 (FIG. 1), which rotates the lower ends of the arms 52 and 54 counter-clockwise, as viewed in FIG. 3.

The cam 62 (FIGS. 1 and 3) has a camming surface which includes a low portion 66 and a high portion 68, with suitable interconnecting portions as shown. When the lower end 60 of the arm 52 engages the high portion 68 of the cam 62, the inking roller 46 is out of contact with the drum 12, and, when the lower end 60 engages the low portion 66 of the cam 62, the inking roller 46 is in contact with the first plurality 28 of characters to ink them as the drum 12 rotates.

The second inking means 42 (FIG. 3) is constructed in the same manner as the first inking means 40, just described. It includes an ink supply roller 70, an inking roller 72, and an arm 74 with a lower end 76, which engages the camming surface of a cam 78 (FIG. 1). The cam 78 is fixed to the shaft 14 to be rotated thereby and has a low portion 80 and a high portion 82. When the lower end 76 of the arm 74 engages the high portion 82 of the cam 78, the inking roller 72 is out of contact with the drum 12, and, when the lower end 76 engages the low portion 80 of the cam 78, the inking roller 72 is in contact with the second plurality 30 of characters to ink them. The first and second pluralities of characters 28 and 30 are not shown in their correct angular relationship in FIG. 1 relative to their respective inking rollers 46 and 72. This was done merely to facilitate the showing of the shuttling pattern of the bars 32 and 36 of the first and second pluralities of characters.

In the embodiment shown, the first inking means 40 was used to deposit a green ink on the first plurality 28 of characters, while a black ink was deposited on the

second plurality 30 of characters by the second inking means 42. The combination of black and green inks with a white background on the label 22 (FIG. 4) provides three "colors" for printing the "color bars" of the code 24. Selective color printing for the alphanumerics 26 (FIG. 4) is also possible. While the drum 12 (FIGS. 1 and 3) is shown as being capable of printing in only two "colors," the concept of this invention may be expanded to print in more than two colors. For example, the drum 12 could be designed to print in three colors by enlarging its diameter, if necessary, to place three pluralities of characters around the periphery thereof. A third inking means, similar to those (40 and 42) shown in FIGS. 1 and 3, could be used to ink the third plurality of characters. Each plurality of characters would occupy one third of the periphery of the drum instead of one half, as is shown in FIGS. 1 and 3. While the inks are described as black and green, it is obvious that magnetic inks, ultra-violet inks, or other inks having separately detectable characteristics may be used.

The printing of the characters on the record medium is accomplished at a print station 59 (FIG. 3) as follows. The tap 16 is fed between the drum 12 and a group of print hammers (like 84) by a conventional capstan 86 and pinch roller 88. The pinch roller 88 is mounted on one end of an L-shaped lever 90, which is pivotally mounted on a pin 92. A solenoid 94, when energized, rotates the lever 90 to force the pinch roller 88 against the capstan 86, which is of the "modulated" variety. The capstan 86 has a high-frequency oscillation (1 kilocycle) superimposed on a steady forward rotation of 1,000 revolutions per minute, so that a dwell period of approximately 250 microseconds occurs every millisecond. The modulated capstan 86 and pinch roller 88 provide for good position accuracy of the tape 16 under the drum 12. A conventional paper clamp 96 is needed to hold the tape 16 during printing, due to the contact forces between the moving drum 12 (moving in the direction of the arrow 98) and the print hammers 84.

The print hammers 84 are positioned below the drum 12 (FIGS. 1 and 3) at the print station 59 and are mounted in a carriage means 100. There are eight print hammers (like 84) in the embodiment shown, which are pivotally mounted on a shaft 102 located within a carriage 104. The print hammers 84 are conventional and are nested, as shown, so as to obtain compactness. Each hammer 84 is located on centers 0.180 of an inch apart, and each face thereof has a width which is slightly less than 0.180 of an inch, to provide a clearance between adjacent hammers. Because the width of a plurality of characters as measured between the bars 32 and 34 in an axial direction is 0.180 of an inch, it becomes necessary that the carriage means 100 be shifted axially if the outermost bars, like 32 and 34, are to be printed by a print hammer whose width is less than 0.180 of an inch.

The carriage means is so designed as to be shiftable in an axial direction relative to the drum 12 by the construction shown in FIGS. 1 and 3. The underside of the carriage 104 (as viewed in FIG. 3) has secured thereto parallel guide rods 106 and 108, whose cross-section complement the V-shaped pulleys 110 and 112, respectively. The guide rods and pulleys accurately locate the carriage 104 as it is shifted in an axial direction. Suitable springs like 113 (FIG. 3), placed in tension, pre-

vent the carriage from moving upwardly (as viewed in FIG. 3) and out of the pulleys 110 and 112. To shift the carriage 104, a pin and a barrel cam are used. The underside of the carriage has depending therefrom a fixed pin 114 (FIG. 3), which engages a conventional barrel cam 116, which is fixed to rotate with a shaft 118, which is rotatably mounted in supports 120 (FIG. 1). The shaft 118 is rotated in timed relation with the shaft 14 by conventional gearing shown as a dashed line 122.

The shifting relationship of the carriage means 100 relative to the drum 12 is as follows. When a bar 32 (FIGS. 1 and 2) is opposite a print hammer 84, the carriage means 100 is located in the leftmost position, as viewed in FIG. 1. As the drum rotates in the direction 98, the carriage means 100 begins to move to the right, and, by the time the drum 12 rotates about a half-revolution, the bar 34 (FIG. 2) of the first plurality 28 of characters is opposite the right-hand edge of an associated print hammer 84. The carriage means remains in the rightmost position until the bar 38 (FIG. 2) of the second plurality 30 of characters is opposite its associated print hammer, and, thereafter, the carriage means 100 is shifted to the left (as viewed in FIG. 1). By this technique, each print hammer 84, having a face width of less than 0.180 of an inch, is capable of printing the bars (from 32 to 34) of the characters, which are spaced to cover an axial distance of 0.180 of an inch. It is apparent that there is one print hammer 84 for each ring of characters composed of the first and second pluralities 28 and 30, respectively.

To coordinate the actuation of a particular print hammer 84 with the rotation of the drum 12, a conventional timing means 124 is used. It is represented in FIG. 1 by a timing disc 126 and a pick-up 128. The timing disc 126 includes conventional timing marks with a starting mark 130 to establish an orientation of the drum relative to the print hammers 84.

A control circuit 131 for operating the printer apparatus 10 is shown in block form in FIG. 5. The control circuit 131 may be conventional and includes an input 132, which includes a keyboard for entering thereupon the data to be coded and printed on the label 22. The input data is then forwarded to a circuit entitled select logic 134, which selects the particular characters to be printed in accordance with the particular code employed, and the output therefrom is routed to the timing means 124, which includes the timing disc 126. The output of the timing means 124 goes to a clamp driver 136, a capstan driver 138, and a hammer driver 140, which conventionally control the paper clamp 96, the capstan 86 (and the solenoid 94), and hammer actuators, like 142, which actuate the appropriate hammers 84. A suitable power supply 144 is used to supply the necessary electrical power to the apparatus 10.

During printing, the paper tape 16 is held stationary by the clamp 96 (FIG. 3). When each label is being printed, the bar code 24 (FIG. 4) is printed first, and then the paper clamp 96 is released, enabling the capstan 86 and the pinch roller 88 to move the tape 16 in the direction of the arrow 146 (FIG. 1) until the next area of the tape to be printed upon is under the print station 59. As the drum 12 rotates, the first and second pluralities 28 and 30 of characters are alternately positioned at the print station 59, enabling printing of selected alpha-numerics or color bars in either of the two colors of inks provided. When a "color bar" of a third "color" is desired, the background of the label is used

for that particular color bar position. For example, if the background of the label is white, a white "color bar" is "printed" by not energizing the associated print hammer 84 for a complete revolution of the printer drum 12. In the embodiment shown, the rightmost column of figures (including the 4 and the 9) on the left of the label 22 (as viewed in FIG. 4) would be printed after the printing of the color bars 24, and, after an indexing of the tape 16, the adjacent column of figures (including the 2 and the 1) would be printed next. The leftmost column of figures (including the 1, the 3, the 4, and the 9) would be printed last to complete the printing of a label 22.

What is claimed is:

1. A printer apparatus for printing characters on a medium, comprising:
 - a printing drum rotated at a constant speed;
 - first and second pluralities of characters mounted on first and second portions, respectively, of said drum to form a ring of characters thereon;
 - said drum having a plurality of said rings of characters in parallel relationship with one another and positioned axially along the rotating axis of said drum;
 - each said plurality of characters including alpha-numerics and rectangular bars, with the long dimension of each said bar being oriented transversely to the rotating axis of said drum, and each said bar being angularly displaced from one another and also axially displaced from one another to form a shuttling pattern in each said ring of characters to enable the bars to be printed on said medium in side by side relationship with the long dimension of said bars being transverse to the rotating axis of said drum;
 - a printing station, and feed means for feeding the medium thereto in a direction which is perpendicular to the rotating axis of said drum;
 - first inking means for inking with a first ink the first portion of the drum containing said first plurality of characters and comprising:
 - a cam member fixed to rotate with said drum, and having a low camming surface and a high camming surface;
 - an inking roller and an ink supply roller for supplying said first ink to said inking roller; and
 - lever actuating means having a follower arm riding on said camming surfaces of said cam member so as to move said inking roller into engagement with said first portion of the drum only when said arm rides on said low camming surface;
 - second inking means for inking with a second ink the second portion of the drum containing said second plurality of characters and comprising:
 - a second cam member fixed to rotate with said drum, and having a low camming surface and a high camming surface;
 - a second inking roller and an ink supply roller for supplying said second ink to said inking roller; and
 - second lever actuating means having a second follower arm riding on said camming surfaces of said second cam member so as to move said second inking roller into engagement with said second portion of the drum only when said second arm rides on said low camming surface of said second cam member;

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hammer printing means located at said station and including print hammers spaced in an axial direction along said drum, with one print hammer being provided for each said ring of characters for striking the corresponding characters on said drum in response to a control means so as to selectively print characters in said first and second inks on said drum;
 said bars within each said plurality of characters being spaced over a fixed distance as measured in an axial direction, and each said print hammer having a fixed width as measured in said axial direction, with the width of each said print hammer

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being slightly less than said fixed distance; and mounting means for slidably mounting said hammer printing means for movement between first and second positions along a line parallel to the rotating axis of the drum in timed relationship therewith to enable each said print hammer to strike all its associated alpha- numerics and rectangular bars.

2. The printer apparatus as claimed in claim 1 in which each said rectangular bar is placed in said shuttling pattern so that when printed on said medium the sides of adjacent bars are in contacting relationship.

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