

Jan. 28, 1969

L. GRAY, JR

3,424,082

HIGH SPEED TRANSFER PRINTER

Filed July 6, 1966

Sheet 1 of 4

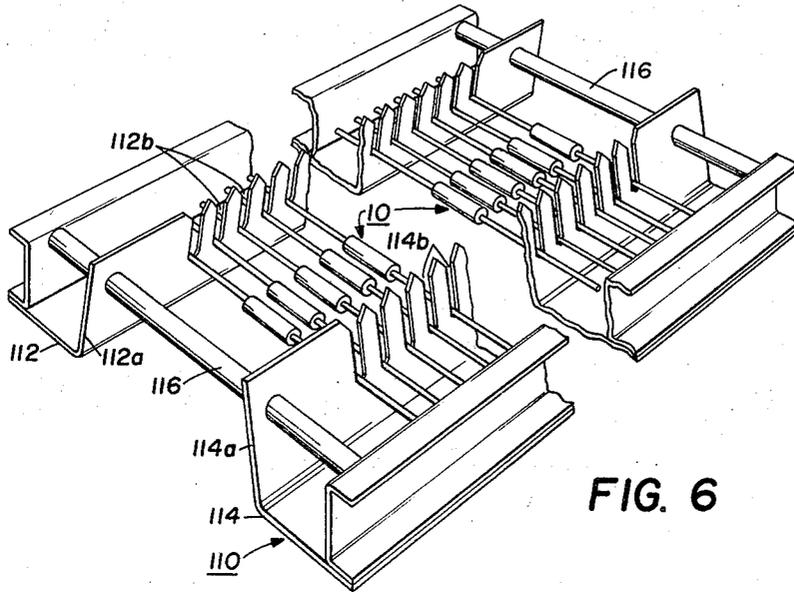


FIG. 6

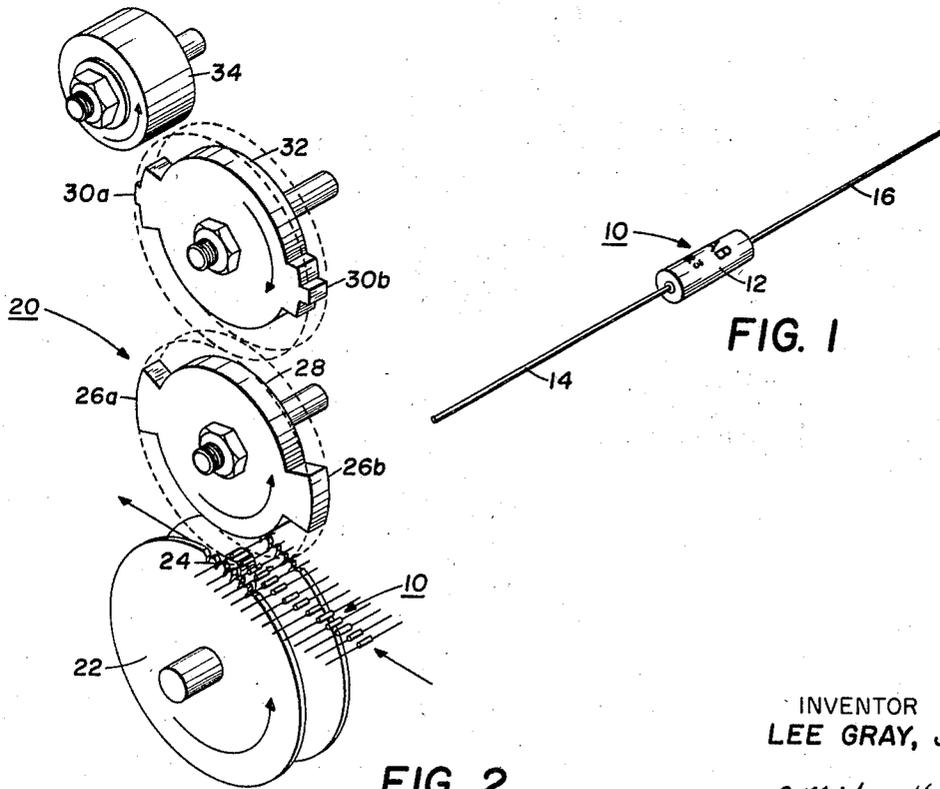


FIG. 1

FIG. 2

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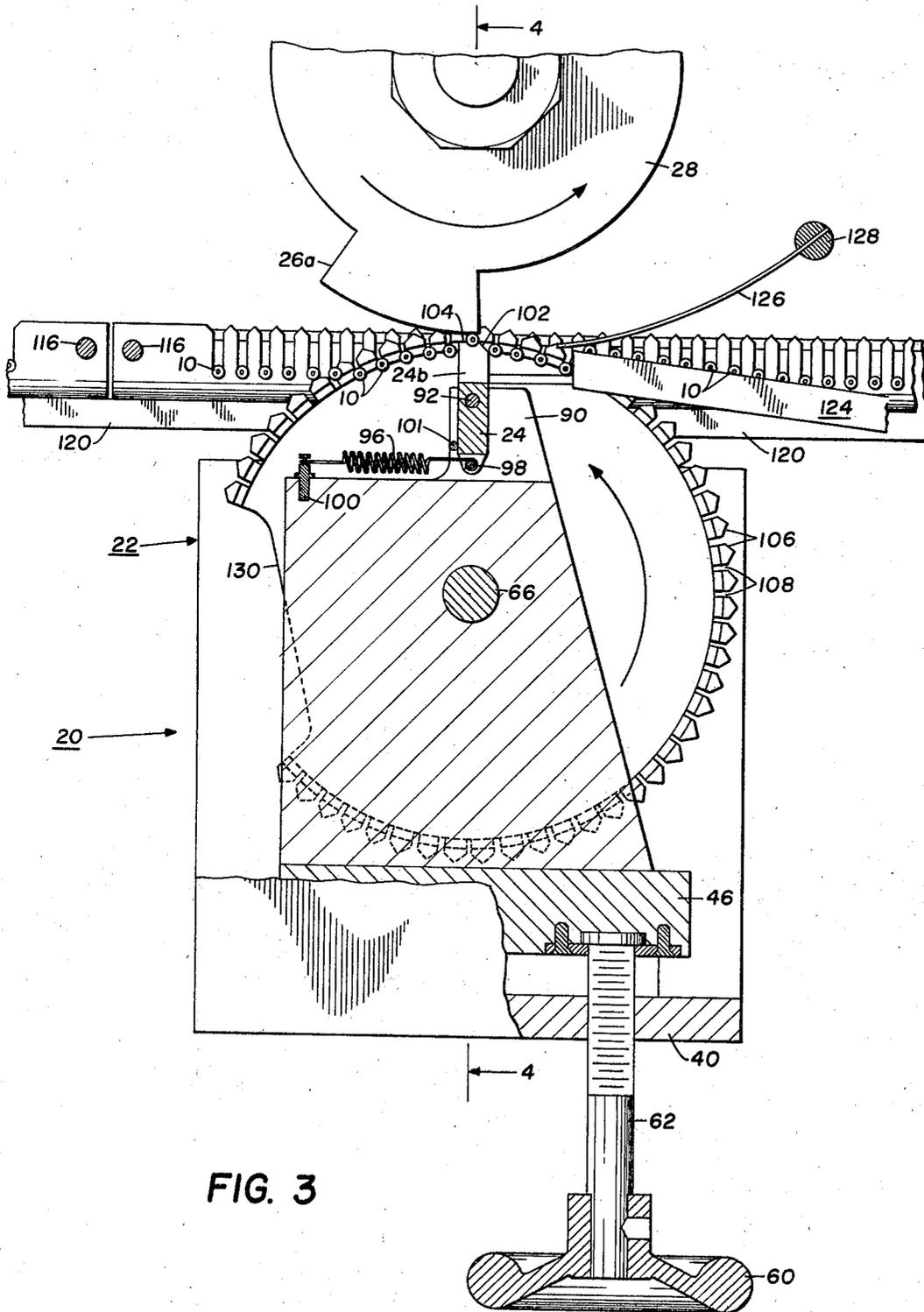


FIG. 3

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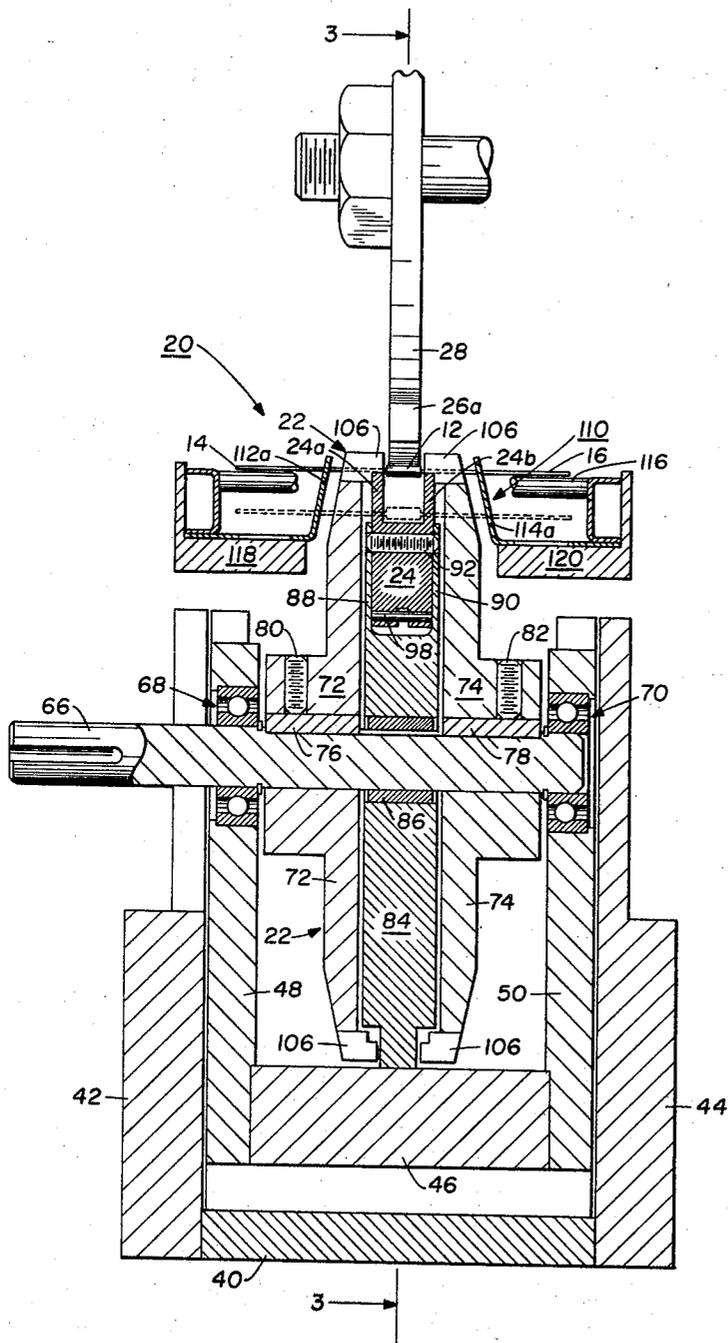


FIG. 4

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3,424,082

HIGH SPEED TRANSFER PRINTER

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U.S. Cl. 101-40

10 Claims

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ABSTRACT OF THE DISCLOSURE

A transfer printing device is disclosed for imprinting information on the body of electrical components which are caused to move along a path generally tangential to a rotating transfer path in a particular timed sequence. Each component is arranged to traverse a very short portion of a path which is outwardly displaced from the remainder of its path such that each component is sequentially positioned in the path of the transfer pad to permit information to be imprinted on the body of the component.

This invention relates generally to transfer printing and more particularly, but not by way of limitation, relates to a machine for printing identifying characters on electrical components of the type having a generally cylindrical body with a pair of axially extending lead wires, commonly referred to as axial lead components.

Many electrical components which require only two leads, such as resistors, capacitors, diodes, etc., are packaged in a generally cylindrical body with a relatively stiff lead wire extending axially from each end of the body. It is important that various characters be printed on the surface of the body to identify the component. The machines heretofore employed for this purpose have been comprised generally of an indexing conveyor system for successively moving the components past a printing station. After each component is indexed to the printing station, a mechanism is provided to lift the component upwardly into the path of a rotating transfer wheel having a resilient transfer pad which carries the ink impression to be printed on the cylindrical body. As the leading edge of the pad engages the cylindrical body, the body begins to spin so that the ink characters are transferred to the body without smearing the ink. This type of printer performs the printing function well, but is too slow. Further, this type of printer cannot be operated at higher rates because the conveyor system must be indexed, the component raised, the characters printed, and the component lowered before the next component can be indexed into position at the printing station and the procedure repeated. As a result, the maximum rate at which these machines can be operated is about three or four thousand components per hour.

A principal object of this invention is to provide a machine for printing characters on an axial lead component at much higher rates, such as for example, a rate of 24,000 components per hour.

Another object is to provide such a device which is relatively simple and trouble free in operation and has a long service life.

Still another object is to provide such a printing device which has no indexing mechanism and therefore is relatively inexpensive to build.

These and other objects and advantages are accomplished by continuously moving the axial lead components along a path generally tangential to a rotating transfer pad in timed sequence such that as each component traverses a very short path adjacent the path of the transfer pad, the transfer pad engages and rotates the components and prints the desired characters on the com-

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ponents. More specifically, the short path adjacent the path of the transfer pad is raised above the remainder of the path followed by the components so that only one component will be raised into the path of the transfer pad at any one time. In accordance with a more specific aspect of the invention, the leads of the component are supported on and slide along a pair of parallel rails spaced apart to receive the cylindrical body between the rails. The axial lead components are moved along the rails by a drum which rotates in synchronism with the transfer wheel and has radially extending slots which receive the lead wires of the components. In accordance with another aspect of the invention, the components are transferred onto the rotating drum from a carrier moving horizontally below the transfer wheel in synchronism with the drum and the components returned to the carrier after the characters are printed. In accordance with another aspect of the invention, the components are sequentially loaded on the periphery of a continuously rotating drum as the drum continues to rotate, the components are sequentially moved radially outwardly, one at a time, over a predetermined arc of the drum and during this period the component is engaged by the rotating transfer surface to transfer the ink symbol to the component.

The novel features believed characteristic of this invention are set forth in the appended claims. The invention itself, however, as well as other objects and advantages thereof, may best be understood by reference to the following detailed description of an illustrative embodiment, when read in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a typical axial lead component;

FIGURE 2 is a simplified perspective view, somewhat schematic, of a printer constructed in accordance with the present invention;

FIGURE 3 is a detailed side elevation of a printer constructed in accordance with the present invention with portions of the structure broken away to better reveal details of construction;

FIGURE 4 is a sectional view taken substantially on lines 4-4 of FIGURE 3;

FIGURE 5 is a plan view of the printer illustrated in FIGURE 3; and

FIGURE 6 is a perspective view of a typical carrier used in the processing of axial lead components.

Referring now to the drawings, and in particular to FIGURE 1, an axial lead component is indicated generally by the reference numeral 10 and is comprised of a cylindrical body 12 and a pair of axially extending lead wires 14 and 16. The cylindrical body 12 typically encapsulates a resistor, capacitor, diode or other electronic component requiring only two leads and may vary in diameter over a considerable range. The specific purpose of the machine presently to be described in detail as an exemplary embodiment of the invention is to print reference characters or symbols on the surface of the cylindrical body 12 somewhat as illustrated in FIGURE 1 so that the component can be properly identified and classified.

Referring now to the somewhat schematic perspective view of FIGURE 2, a transfer printing machine constructed in accordance with the present invention is indicated generally by the reference numeral 20. The printing machine 20 is comprised of a rotating drum, indicated generally by the reference numeral 22, having a plurality of radially extending slots each of which is adapted to receive a component 10. The components 10 are sequentially loaded into the slots of the drum 22 as the drum 22 continues to rotate. As each of the components 10 approaches top center of the drum 22, the component

engages a pedestal 24 and is raised upwardly, and therefore radially outwardly in the slots, by an inclined plane on the pedestal, and then moves across a generally horizontal tip of the pedestal. The surface of the horizontal tip is of such a length in relation to the spacing between the slots that only one component at a time is raised, i.e., moved radially outwardly in its slot. As the raised component traverses the horizontal tip of the pedestal, one of the resilient transfer pads 26a or 26b carried by the rotating transfer wheel 28 engages the body 12 of the component, causing the component to roll on the surface of the transfer pad so that the ink characters carried by the transfer pad will be transferred to the body of the component.

The ink characters are initially formed on the transfer pads 26a and 26b by a mechanism comprised of a conventional type wheel 32 which rotates counter to the transfer wheel 28 and in precise synchronism with the transfer wheel so that ink characters will be printed on the transfer pads without smearing. Ink is applied to the type 30a and 30b by a conventional ink supply wheel 34 which rotates counter to the type wheel 32 with precisely the same rim speed as that of the type in the holders 30a and 30b. As mentioned, the means for forming the ink characters on the transfer pads 26a and 26b is conventional. The present invention is concerned with the mechanism for presenting the components 10 to rotating transfer pads 26a and 26b, which mechanism will now be described in detail.

Referring now to the detailed drawings in FIGURES 3, 4 and 5, a support for the drum 22 is comprised of a base plate 40 and upright side plates 42 and 44. A vertically movable carriage is comprised of a bottom plate 46 and vertical side plates 48 and 50 which slide in dovetail grooves 52 and 54 formed in the side plates 42 and 44, as can best be seen in the plan view of FIGURE 5. Jibs 56 and 58 are provided to prevent lateral play of the side plates 48 and 50 within the dovetail grooves. The carriage may be raised and lowered by rotating a hand wheel 60 on a shaft 62 which is threaded through the bottom plate 40 and rotatably connected to the bottom plate 46, as can best be seen in FIGURE 3.

A shaft 66 is journaled by ball bearings 68 and 70 in the upright plates 48 and 50 of the movable carriage. The drum 22 is comprised of a pair of discs 72 and 74 which are splined on the shaft 66 by keys 76 and 78, respectively, which are secured in place by set screws 80 and 82, respectively.

A pedestal support plate 84 is mounted on the bottom plate 46 and extends upwardly between the disks 72 and 74. A loose fitting sleeve bearing 86 is positioned in the plate 84 and around the shaft 66. The upper end of the pedestal support 84 is bifurcated to form arms 88 and 90 which support a trunnion pin 92. A pedestal 24 is pivotally mounted on the pin 92. The upper end of the pedestal 24 is also bifurcated to form arms 24a and 24b which are so spaced as to engage the axial leads 14 and 16 on either side of the body 12 of a component 10. A spring 96 is connected to a pin 98 in the lower end of the pedestal 24 and is secured to a pin 100 on the pedestal support plate 84. The purpose of the spring 96 is to bias the pedestal 24 into the vertically upright position illustrated in FIGURE 3. The pedestal 24 is stopped in the upright position by a suitable stop 101 extending between the arms 88 and 90 mounted on the support plate 84, but not illustrated. The upper end of each of the arms 24a and 24b of the pedestal forms a support or guide rail having an inclined portion 102 and a horizontally extending flat portion 104. It will be noted that the flat portion 104 is located vertically above the axis of the shaft 66.

Each of the disks 72 and 74 of the drum 22 has a plurality of teeth 106 which form a plurality of radially extending slots 108. The slots 108 are just wide enough to receive the leads 14 and 16 of the devices 10, and the teeth 106 are of sufficient length to retain the leads in the slots

as the leads pass up the inclined plane 102 and over the flat surface 104 of the pedestal 24. The interior configuration of the teeth 106 is such as to project over the ends of the arms 24a and 24b of the pedestal 24 into close proximity of the body 12 of the device, as can best be seen in FIGURE 4, to reduce bending moments on the leads during the printing process. The surface of the resilient transfer pad 26a on the wheel 28 has a width which will pass between the teeth 106 of the two disks 72 and 74.

During the final stages of fabricating axial lead components, a large number of the components are typically transported in a tray such as indicated generally by the reference numeral 110 in FIGURE 6. Therefore, it is desirable to transfer the components 10 from the tray 110 to the drum 22 and then return the components to the tray after the printing process is completed. The tray 110 is comprised of a pair of longitudinally extending channels 112 and 114 having a cross-sectional configuration as illustrated in FIGURE 4. The channels 112 and 114 are interconnected at the ends thereof by transverse bars 116. The channels 112 and 114 have inner flanges 112a and 114a in which are formed a plurality of slots 112b and 114b for receiving the leads 14 and 16 of the components.

The trays 110 are propelled along slide rails 118 and 120 by a chain conveyor system (not illustrated) which is precisely synchronized with the rotation of drum 22. It will be noted that the flange portions 112a and 114a pass on opposite sides of the disks 72 and 74 of the drum 22. A pair of inclined rails 122 and 124 extend from below the level of the components when they are resting in the bottom of the slots 112b-114b and converge at a higher level between the teeth of the two disks 72 and 74, as best seen in FIGURE 5, to both center the bodies 12 of the components, and also raise the components so that they will drop into the slots 108 of the drum 22. A leaf spring 126, which is mounted on a post 128, is provided to insure that the devices fall into the slots 108.

It will be noted that the bars 116 across the ends of the trays 110 are positioned well below the upper ends of the teeth 106 and also below the upper end of the pedestal 24. A substantial notch 130 is therefore provided in the periphery of each of the disks 72 and 74 of the drum 22, and movement of the carrier trays is synchronized with movement of the drum so that both the trailing bar 116 of the leading tray 110 and the leading bar 116 of the trailing tray 110 will be received in the slot 130 as the drum 22 rotates and the carrier trays pass the printing station. Also, as each of the bars 116 engages the upper end of the pedestal 24, the pedestal pivots around pin 92 against the bias of spring 96 to permit the bar to pass, then is returned to the upright position by the spring.

In the operation of the apparatus heretofore described, the desired type is set in the print heads 30a and 30b and ink is provided on the ink supply wheel 34. The position of the upper end 104 of the pedestal 24 is then adjusted by means of the hand wheel 60 so that the body of an axial lead component whose leads are resting on the surfaces 104 of the pedestal 24 will be positioned so as to be engaged by the surfaces of the transfer pads 26a and 26b. The carrier trays 110 are then loaded on the slide rails 120 and when engaged by lugs on a conveyor chain, are moved along the slide rails 120. Movement of the carrier trays 110 is precisely timed with rotation of the drum 22 so that the leading bar 116 will enter the slot 130. As the carrier tray 110 moves along the slide rails 120, the inclined rails 122 and 124 engage the leads of the component and begin to raise the leads upwardly within the slots 112b and 114b of the tray 110. When the components reach the ends of the inclined rails 122-124, the leads drop downwardly into the radial slots 108 of the drum 22. Spring 126 insures that the leads of the components drop into slots 108. As the drum 22 rotates,

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the leads of the component on the drum successively engage the inclined surfaces 102 at the upper end of the pedestal 24 so that the components are successively raised, one at a time, to the horizontal surface 104. Rotation of the transfer wheel 28 is synchronized with rotation of the drum 22 so that at approximately the instant a component reaches the leading edge of the horizontal portion 104 of the pedestal rail, that is the position illustrated in FIGURE 3, the leading edge of transfer pad 26a engages the cylindrical body of the component causing it to rotate within the slot of the drum 22 as it continues to move across the surface 104. Although there is initial slippage between the transfer pad 26a and the component body, the component body is soon rotated at a speed such that there is no slippage between the body of the component and the transfer pad. The ink image imprinted on the transfer pad from the type wheel 32 is located on the transfer pad 26a at a point trailing the leading edge of the transfer pad by a distance sufficient to insure that the transfer pad is not slipping over the surface of the component as the ink engages the component. By the time the component has reached the edge of the surface 104, the transfer pad 26a has passed to the extent necessary to print the desired characters on the surface of the component, and the component then falls back into the bottom of its respective slot 108 on the drum 22.

After the transfer pad 26a has passed, the next succeeding component 10 reaches the leading edge of the horizontal portion 104 of the pedestal. Transfer pad 26b then engages the component starting it rolling and transferring the characters to the body of the component as the component continues to travel across the surface 104 of the pedestal. It is important to note that only one component at a time traverses the surface 104, so that only one component is raised to a sufficient height to be contacted by the transfer pad 26a or 26b. As the drum 22 continues to rotate, the components again enter the slots 112b-114b of the carrier tray 110 and leaves the slots of the drum 22. As the end of the carrier tray 110 approaches the print station, the trailing bar 116 again enters the slot 130 in the drum 22 and pivots the pedestal 24 downwardly against the force of spring 96 as it passes the print station. The leading bar 116 of the next successive carrier tray 110 is also received in the slot 130 at the same time, and the cycle repeated.

From the above detailed description of a preferred embodiment of the invention, it will be appreciated by those skilled in the art that a simplified device for printing characters on axial lead components has been described. The apparatus utilizes no indexing mechanism, but instead utilizes only continuously moving, and primarily only rotating, components. As a result, the device can be operated at a much higher printing rate. In order to achieve the highest rate possible, it is important that the components be closely spaced on the carrier trays 110 and on the drum 22. As a result, it is necessary to sequentially raise the individual components at the print station so that the rotating transfer pads 26a and 26b will contact only one component at a time. The drum 22 permits the use of narrow slots 108 to attain better positional control of the components and provides a means for gripping the leads close to the body 12 to prevent bending of the leads when the transfer pad strikes the body. In accordance with the broader aspects of the invention, however, the components may merely be moved at a constant rate of speed horizontally by a suitable carrier and sequentially raised vertically by an inclined plane to a surface extending generally tangentially to the path of the transfer pad where the components can be engaged one at a time by the transfer pads.

Although a preferred embodiment of the invention has been described in detail, it is to be understood that various changes, substitutions and alterations can be made

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therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. In a high speed transfer printer for printing on the cylindrical bodies of axial lead components or the like, the combination of:

a rotating transfer wheel having a transfer surface which travels through a predetermined arcuate printing path as the wheel rotates,

guide means for guiding a series of axial lead components along a path including a short portion displaced outwardly from said path and extending generally tangentially to the predetermined arcuate printing path such that the outwardly displaced short portion of the path of the surface of the cylindrical bodies substantially coincides with the predetermined arcuate printing path of the transfer surface, and

means for continually moving a series of the axial lead components over the guide means in timed sequence with the rotation of the transfer wheel such that during the period the surface of the cylindrical body of each component travels along the outwardly displaced short portion of the path coincident with the predetermined arcuate printing path of the transfer pad, the transfer surface engages the surface of the cylindrical body and transfers ink carried by the transfer surface to the cylindrical body.

2. The combination defined in claim 1 wherein the guide means comprises a pair of rails spaced to engage and support the axial leads while receiving the cylindrical body between the rails.

3. The combination defined in claim 1 wherein the guide means comprises rail means disposed adjacent the bottom of the arc of the transfer pad having an upper surface on which the components are supported and over which the components are moved, the upper surface having a relatively short portion raised above the adjacent portions that is positioned adjacent the arcuate path such that a component traversing the short portion of the surface will be engaged by the rotating transfer pad, the short portion being sufficiently short that only one component will be traversing the short portion at any one time, and of sufficient length that the component will remain on the short portion for a period of time sufficient for the transfer pad to transfer the printing to the component.

4. The combination defined in claim 1 where the guide means is adapted to support the components in the vertical direction and the means for continuously moving the components along the path comprises drum means rotated in synchronism with the transfer wheel and having a plurality of circumferentially spaced, radially extending slots for receiving the components, the drum means being positioned relative to the guide means and the radial slots being of such an extent that the components will move radially outwardly in the slots as they are moved across the guide means by rotation of the drum means.

5. In a high speed transfer printer for printing on the cylindrical bodies of axial lead components or the like, the combination of a rotating transfer wheel having a transfer surface which travels through an arcuate path, and a rotating drum means having a plurality of peripherally spaced means each adapted to receive an axial lead component, the drum means including means for sequentially moving the components radially outwardly from the drum means as each component passes through a selected small angle of rotation of the drum, the rotating drum means being positioned relative to the transfer wheel such that as each component is successively moved outwardly, its path intersects the path of the transfer surface, and the rotating drum means being synchronized with the rotating transfer wheel such that the transfer surface will engage each component while it is intersecting the path of the transfer wheel.

6. The combination defined in claim 5 wherein the

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transfer wheel rotates on a generally horizontal axis and the rotating drum means comprises a pair of disks rotating on an axis disposed parallel to and below the axis of the transfer wheel, the disks having peripherally spaced, radially extending grooves for receiving the oppositely extending leads of axial lead components and being spaced to receive the bodies of the components therebetween, and a camming means disposed adjacent the top of the disks and positioned and adapted to sequentially engage the components as the drum rotates the components past the camming means and move the components radially outwardly and upwardly within the respective slots such that the component passing over the camming surface will be contacted by the transfer surface.

7. The combination defined in claim 6 wherein the camming means comprises a pair of spaced camming surfaces disposed to engage the leads of the component on each side of the body.

8. The combination defined in claim 6 wherein the camming means is disposed between the disks and is comprised of a pair of surfaces spaced to engage the leads close to each end of the body, and wherein each of the disks includes means forming the walls of each of the grooves which extend over the upper surfaces of the camming means for engaging the sides of the leads close to the body of the components to reduce bending moments on the leads when the transfer surface engages the component.

9. The combination defined in claim 6 further characterized by a carrier tray having a pair of parallel side

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members spaced to pass on each side of the drum means with a plurality of spaced vertically extending slots in each side member for receiving the oppositely extending lead wires of the component, means for moving the tray past the drum in synchronism with the drum, and means for transferring each of the components to the drum for printing and returning the component to the tray after printing.

10. The combination defined in claim 9 wherein the tray has a transverse bar interconnecting the side members, and the drum means is adapted to pass the transverse bar as the side members are moved along each side of the drum means.

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