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(54) Adjustable spindle assembly for rollfeed media in an inkjet printer/plotter

(57) A spindle assembly for rollfeed media in a printer/plotter includes a spindle having differently sized hubs which are removably mounted on the spindle. One end of the spindle is used for axial referencing and includes an end cap having an axial latch and a rotational stop for manually actuated engagement/disengagement with hubs of different sizes, shapes and configurations. Each pair of matching hubs have outwardly extending arms for gripping a roll of media in a predetermined radial and axial location on the spindle. In a preferred embodiment, a small diameter spindle includes hubs capable of gripping opposite ends of either one inch diameter or two inch diameter rollfeed media cores. In addition, a hub design incorporates a plurality of cantilever arm members which require relatively low insertion force in order to adequately install the hubs into the rollfeed media cores.

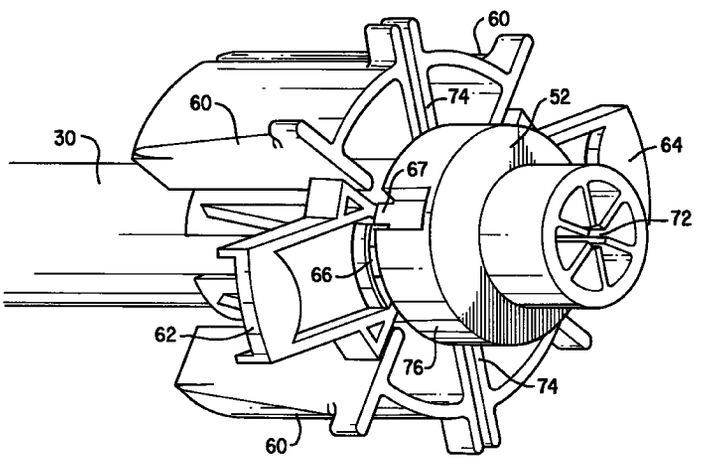

FIG.7

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Description

Background of the Invention

This invention relates generally to printers and plotters, and more particularly to techniques for using rollfeed media in inkjet printers/plotters.

There are many types of tray devices in printers which have the capability of handling different sizes and types of media, including adjustments for media having different lengths and/or widths. However, in large format printers/plotters which typically use rollfeed media of different sizes and types, it has been more difficult to provide mechanisms, devices and techniques for efficiently and precisely feeding media from different rolls into a media path of a large format printer such as the DESIGNJET large format printers/plotters of Hewlett-Packard Company.

Some large format plotters provide a stand for holding multiple spindles with different rolls all at the same time, thereby allowing selective use of different rollfeed media without having to change spindles in the plotter.

Another approach provides hubs permanently mounted in the rollfeed media cores. Nevertheless, there still remains a need for a simplified rollfeed technique which allows a user the choice of keeping only one rollfeed media on the printer/plotter for one set of plots, and then substituting another rollfeed media for a new set of plots, or where necessary replacing a depleted rollfeed media by easily removing the hubs and reinserting such hubs into a another core which still has a supply of media.

Brief Summary of the Invention

Accordingly, it is a primary object of the invention to provide an adjustable spindle assembly for handling rollfeed media of different sizes and types in a printer/plotter, without any special installation tools.

Thus, the invention provides a spindle assembly for rollfeed media in a printer/plotter which includes a spindle having differently sized hubs which are removably mounted on the spindle One end of the spindle is used for axial referencing and includes an end cap having an axial latch and a rotational stop for manually actuated engagement/disengagement with hubs of different sizes, shapes and configurations. Each pair of matching hubs has outwardly extending arms to grip and hold a roll of media in given radial and axial location on the spindle.

In the Illustrated embodiment, a small diameter spindle assembly includes hubs capable of gripping opposite ends of either one inch diameter or two inch diameter rollfeed media cores. In one version a hybrid hub can be positioned on the spindle for either large or small diameter rollfeed media cores. In another preferred version one set of hubs is used for smaller diameter rollfeed media cores, while a different set of hubs is used for larger diameter rollfeed media cores.

In addition, a hub design incorporates a plurality of cantilever arm members which require relatively low insertion force in order to adequately install the hubs into the rollfeed media cores.

Brief Description of the Drawings

Fig. 1 is a front perspective view of a large format inkjet plotter having a rollfeed media unit permanently integrated into the plotter, which has the capability of incorporating the beneficial features of the present invention;

Fig. 2 is a perspective view of a large format inkjet plotter having an optionally mounted rollfeed media unit, which has the capability of incorporating the beneficial features of the present invention;

Fig. 3 shows the inkjet plotter of Fig. 2 with the media being fed from the roll along a media path past a print zone and out of the plotter in connection with initiating a plot;

Fig. 4 shows the inkjet plotter of Fig. 2 with the media being retracted backwardly along the media path onto a roll in connection with a cessation of any subsequentr plots on this particular media at this time;

Fig. 5 is a back view of the rollfeed media unit of Fig. 2, showing a spindle assembly unit of the present invention mounted without any media roll thereon;

Fig. 6 is an interior end view of a large diameter hub incorporating certain features of the present invention;

Fig. 7 is an exterior right end view of the spindle assembly unit of the present invention incorporating the large diameter hub of Fig. 6;

Fig. 8 is an exterior right end view of the spindle assembly unit of Fig. 7 mounted in a right frame sub-assembly, with the tension springs removed;

Fig. 9A shows a top view of the right end of the spindle assembly without any hub;

Fig. 9B shows a top view similar to Fig. 9A with a large diameter hub fully connected to a rollfeed media core;

Figs. 10A through 10F show a sequence of steps for removing a spindle assembly from a plotter, replacing a pair of large diameter hubs with a pair of small diameter hubs, mounting rollfeed media having a small diameter core onto the spindle assembly, and thereafter re-installing everything back onto the plotter;

Figs. 11, 12 and 13 show a side view, an exterior end perspective view, and a interior end perspective view of a small diameter hub incorporating certain features of the present invention; and

Figs. 14, 15 and 16 show a side view, a perspective view of a large diameter end, and a perspective view of a small diameter end of a hybrid hub incorporating certain features of the present invention.

Detailed Description of Exemplary Embodiment

Generally speaking, the invention provides a spindle assembly for rollfeed media in a printer/plotter which includes a spindle having differently sized hubs which are removably mounted on the spindle. One end of the spindle is used for axial referencing and includes an end cap having an axial latch and a rotational stop for manually actuated engagement/disengagement with hubs of different sizes, shapes and configurations. Each pair of matching hubs has outwardly extending arms to grip and hold a roll of media in a given radial and axial location on the spindle. In the preferred embodiment both the left-hand and right-hand hubs are identical, even though only on of the hubs (in the preferred embodiment the right-hand hub) is fixedly attached to the spindle rod, through the endcap.

In the illustrated embodiment, a small diameter spindle assembly includes hubs capable of gripping opposite ends of either one inch diameter or two inch diameter rollfeed media cores. In one version a hybrid hub can be positioned on the spindle for either large or small diameter rollfeed media cores. In another preferred version one set of hubs is used for smaller diameter rollfeed media cores, while a different set of hubs is used for larger diameter rollfeed media cores.

In addition, a hub design for large diamter media cores incorporates a plurality of cantilever arm members which require relatively low insertion force in order to adequately install the hubs into the rollfeed media cores.

Referring now to Fig. 1, a typical printer/plotter unit 25 is shown having a traversing carriage 20 which moves back and forth along a carriage scan Y axis, with an encoder strip 22 to indicate the position of the carriage and its print cartridges 23. Legs 24 are provided for support and stability. A roll feed unit 26 is incorporated permanently on the front of the printer/plotter and is capable of incorporating the unique features of the present invention. A rotating platen 27 pulls the media off the roll feed and through the print zone where the carriage scans across it in successive swaths, after which the media 28 goes into a collection bin 29.

A newer version of large format inkjet printer incorporating an optional rollfeed unit is shown in Fig. 2. The manner of attachment of such optional rollfeed unit as well as the spring-loaded seats for dispensing the media under back-tension into the plotter are more fully described in the aforementioned co-pending applications, all of which are incorporated herein by reference. A spindle rod 30 and its removably mounted right-hand hub 32 and left-hand hub 34 are shown schematically in Fig. 2 and are described in more detail hereinafter.

As shown in Fig. 3, directional arrows indicate the direction of movement of the media off a roll 35 and through the printer during an initial startup procedure, with a printer cover 36 raised, a paper bail 38 up, and a paper release lever 40 available to assist in the manual media alignment procedure.

Fig. 4 shows the procedure for returning unused media back onto the roll 35 by manually reversing 42 the direction of rotation of the roll while the printer cover 36 is raised, the paper bail 38 is up, and the paper release lever 40 is in a "paper release" position.

Fig. 5 shows a back view of the optional rollfeed unit, including top pivot holes 44 and bottom clips 46 on side frame members 48 for securing the unit to the printer. The spindle rod 30 is shown with a large diameter right hand hub 50 mounted thereon (without any rollfeed media).

Fig. 6 shows the details of a preferred form of large diameter hub, and Fig. 7 shows it partially mounted on the spindle rod 30 in conjunction with a right endcap 52. The hub includes two pair of back-to-back elongated flex-arms each having a radial portion 54, a lateral portion 56, and truncated reverse-radial portion 58. When a hub 50 is inserted into a rollfeed core, the flex arms move both inwardly and laterally to accomodate the force transferred through the four tapered shoulders 60 located at the junction between the lateral portion 56 and the reverse-radial portion 58. Such a long lever arm results in relatively low insertion force. Limit protrusions 61 prevent excessive lateral movement of the flex arms, while the terminal edge 63 is held from excessive radial movement by the outer surface of the cylindrical hub body 65. Stop members 62 abut the end of a rollfeed core, and any media extending beyond the edge of the core is stopped by a solid wing 62 and an opposing slotted wing 64. The solid wing includes an axial slot 66 for engagement with a matching tab 67 for preventing relative rotation between the right-hand hub and endcap, while the slotted wing has a small ledge 69 which engages an arrow stop 68 on the endcap to prevent relative axial movement between the right-hand hub and endcap. A central bearing 72 provides a right end reference, and flex arm ends 74 abut an outer surface of the large diameter portion 76 of the endcap to provide a further controlled reference for the rollfeed media.

Fig. 8 shows a right end of a large-diameter spindle assembly mounted in a right frame sub-assembly. A plastic wall 78 provides a reference surface for the bearing 72.

Figs. 9A and 9B show the right end of a large diameter spindle assembly before and after mounting inside of a two-inch core 80, respectively

Referring to Figs. 10A through 10F, the sequence of steps is illustrated in a self-explanatory way for removing a spindle assembly for a first diameter rollfeed media core and replacing it with a spindle assembly for a smaller diameter rollfeed media core.

First the spindle assembly is removed from the plotter by pulling each end out of the spring-loaded seats in the end frame sub-assemblies (Fig. 10A). Then the left-hand hub is slid off the left end of the spindle rod (Fig. 10B). The right-hand hub is securely attached to the spindle assembly and requires additional steps for removal. First the spindle is placed with its left endcap against the floor, and then both wings of the right-hand

hub are pushed firmly down to dislodge it from the right endcap (Fig. 10C). Once the right-hand hub has been freed, it can be slid off the left end of the spindle rod.

The new right-hand smaller diameter hub is slid on the left end of the spindle rod and moved towards the right end. It is necessary to spread apart slightly the hub wing having a gap, then rotate it to match the gap with a little arrow latch on the right endcap, and push it further along the spindle until it snaps onto such little arrow latch (Fig. 10D). The new smaller-diameter rollfeed media is then inserted over the left end of the spindle rod into engagement with the right-hand smaller diameter hub, after which the left-hand smaller diameter hub is inserted over the left end of the spindle rod into engagement with the core of the new rollfeed media (Fig. 10E). Finally the entire new rollfeed spindle assembly is re-installed back onto the printer (Fig. 10F).

Figs. 11-13 show a small diameter hub suitable as a left-hand or right-hand hub of the type re-installed in Fig. 10E. It includes a completely slit wing 90 and six tapered shoulders 92. Both slit wing 90 and a solid wing 92 include the same ledge and axial slot needed for referenced secure engagement with the right endcap, similar to the large diameter hub.

Figs. 14-16 schematically show a hybrid endcap with a small diameter tapered shaft 94 and an oppositely facing larger diameter tapered shaft 96, with a large diameter central ring 98 for referencing an end cap as well as the end of a rollfeed core.

Claims

1. A spindle assembly for mounting rollfeed media to be printed on an inkjet printer comprising:

   a spindle rod having a referencing endcap mounted on one end of said spindle rod, including an external reference datum on said referencing endcap facing away from said spindle rod and an internal reference datum on said referencing endcap facing toward said spindle rod;

   a hub capable of slidable mounting on said spindle rod as well as rotatable movement around said spindle rod, said hub having a datum surface for engagement with said internal reference datum of said referencing endcap, and said hub further having a plurality of radial arms for holding a first rollfeed media core;

   holding means interconnecting said hub and said referencing endcap for securing said hub in a predetermined position relative to said referencing endcap.

2. The spindle assembly of claim 1 which further includes an optional hub having a plurality of radial arms for holding a second rollfeed media core of a different diameter.

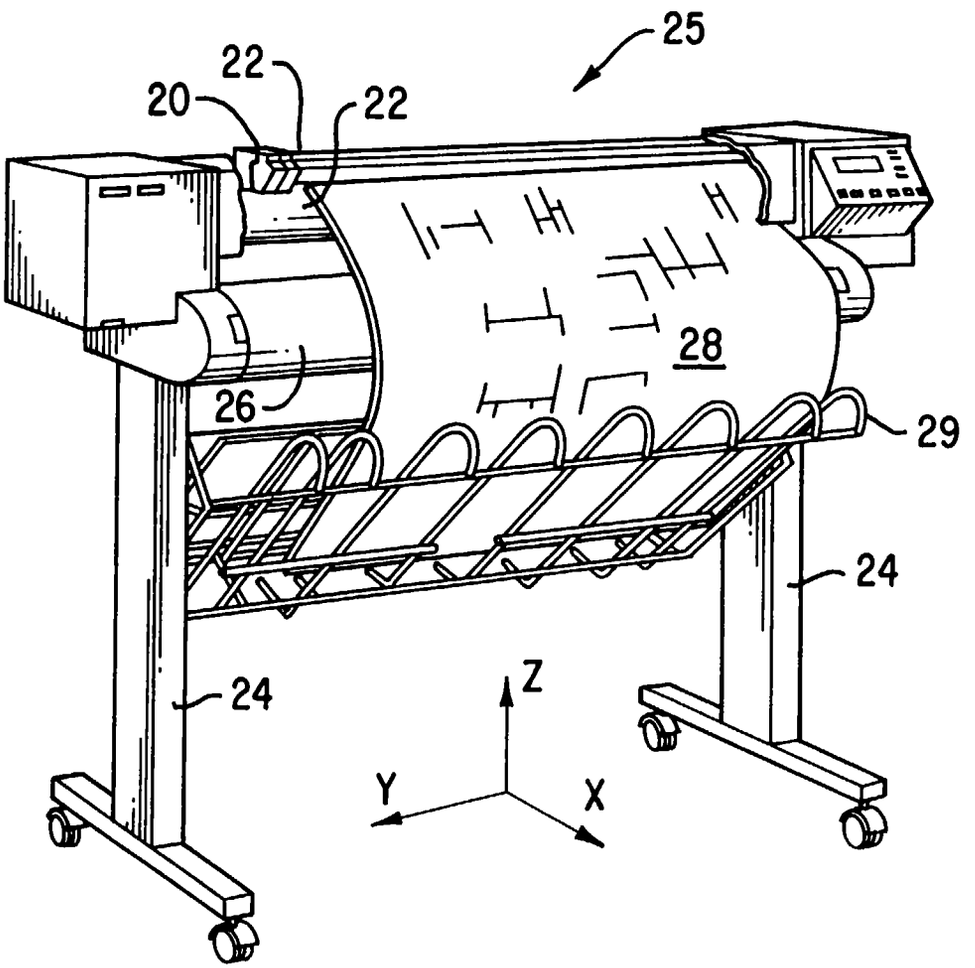

FIG. 1

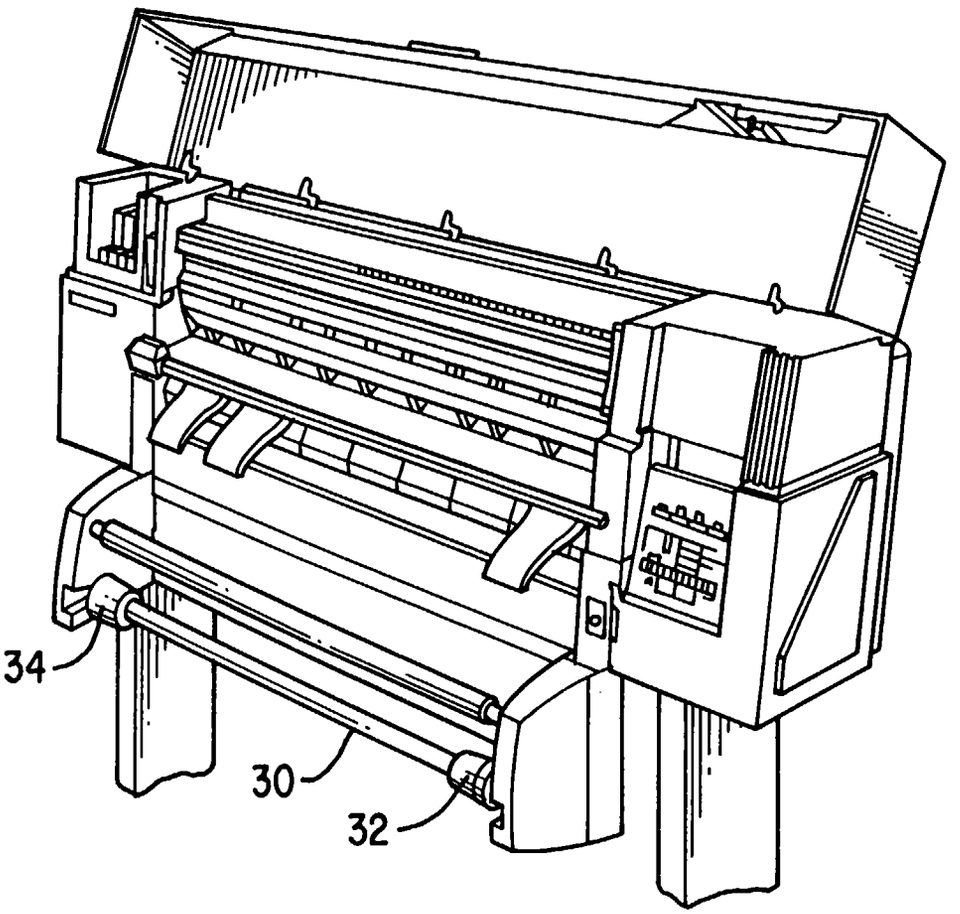

FIG. 2

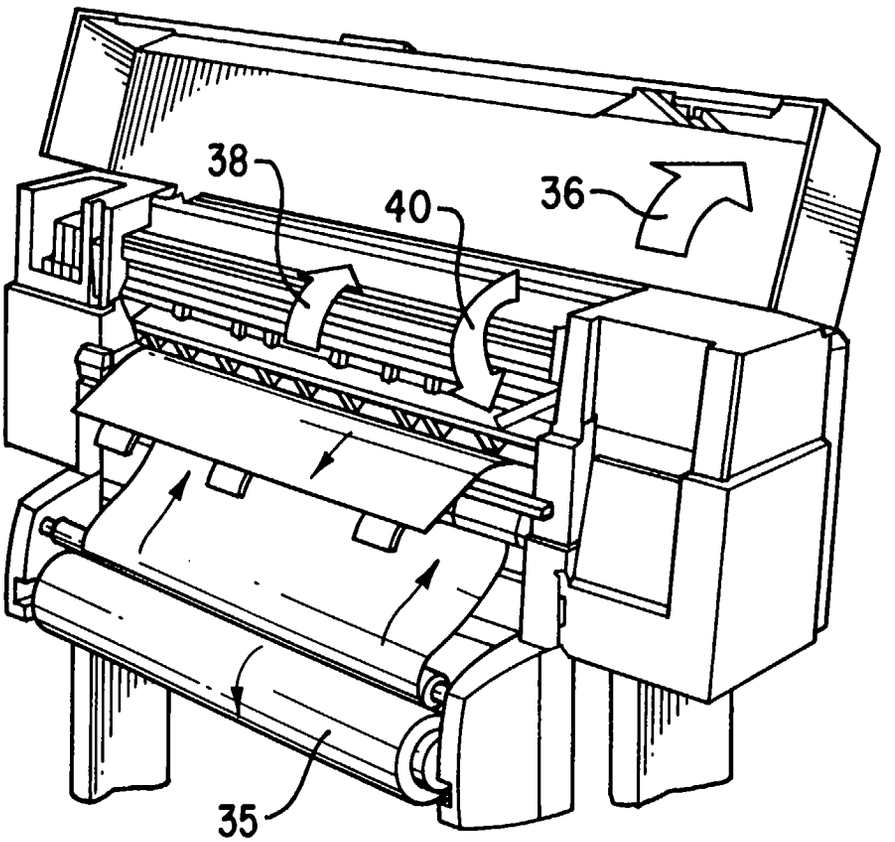

FIG. 3

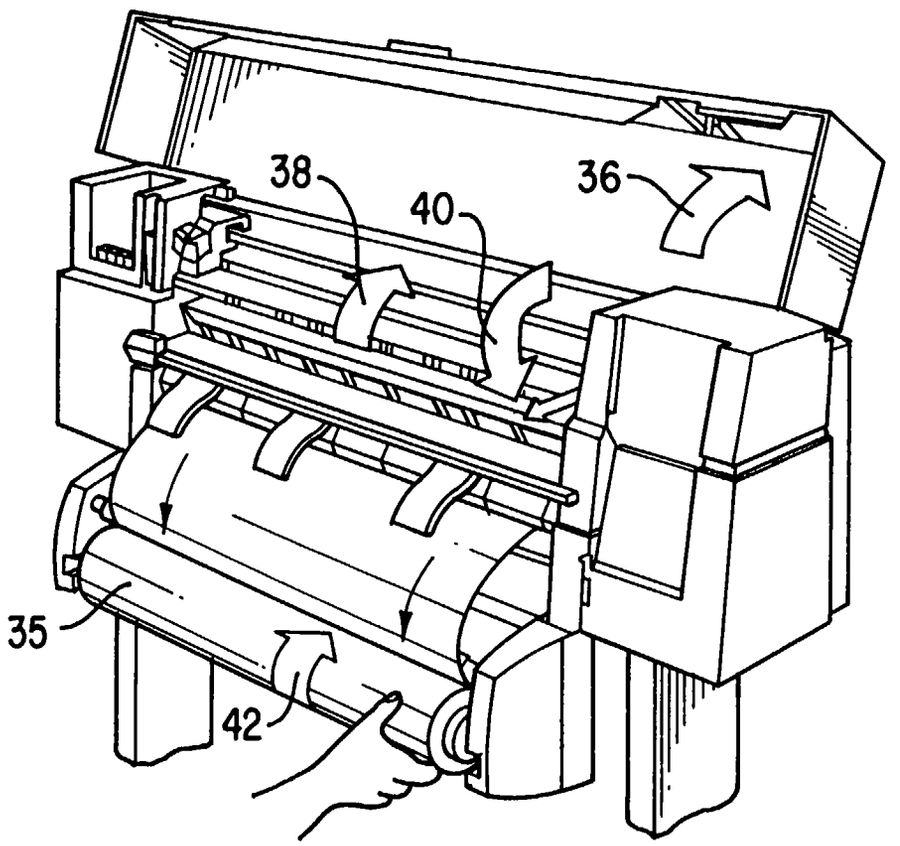

FIG. 4

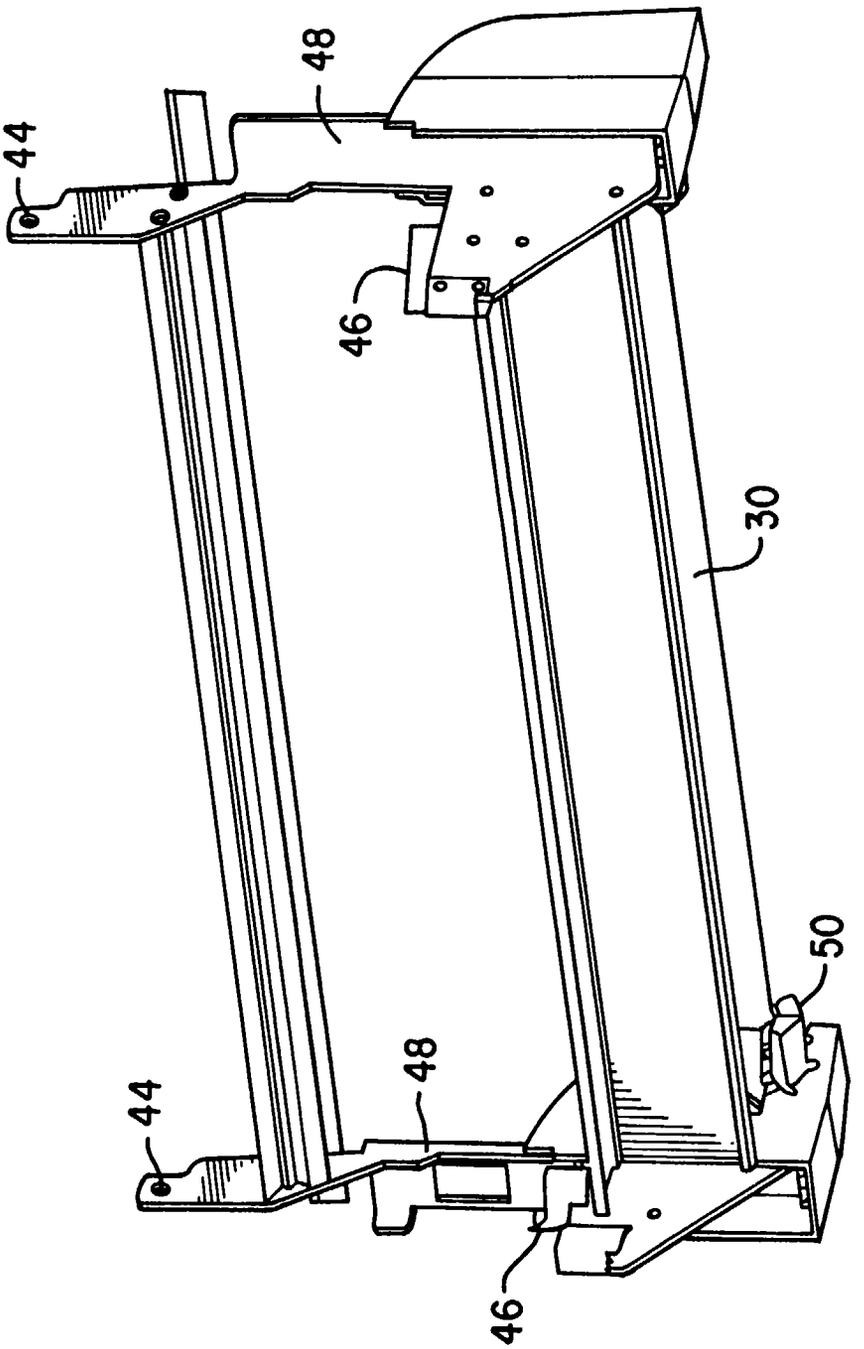

FIG. 5

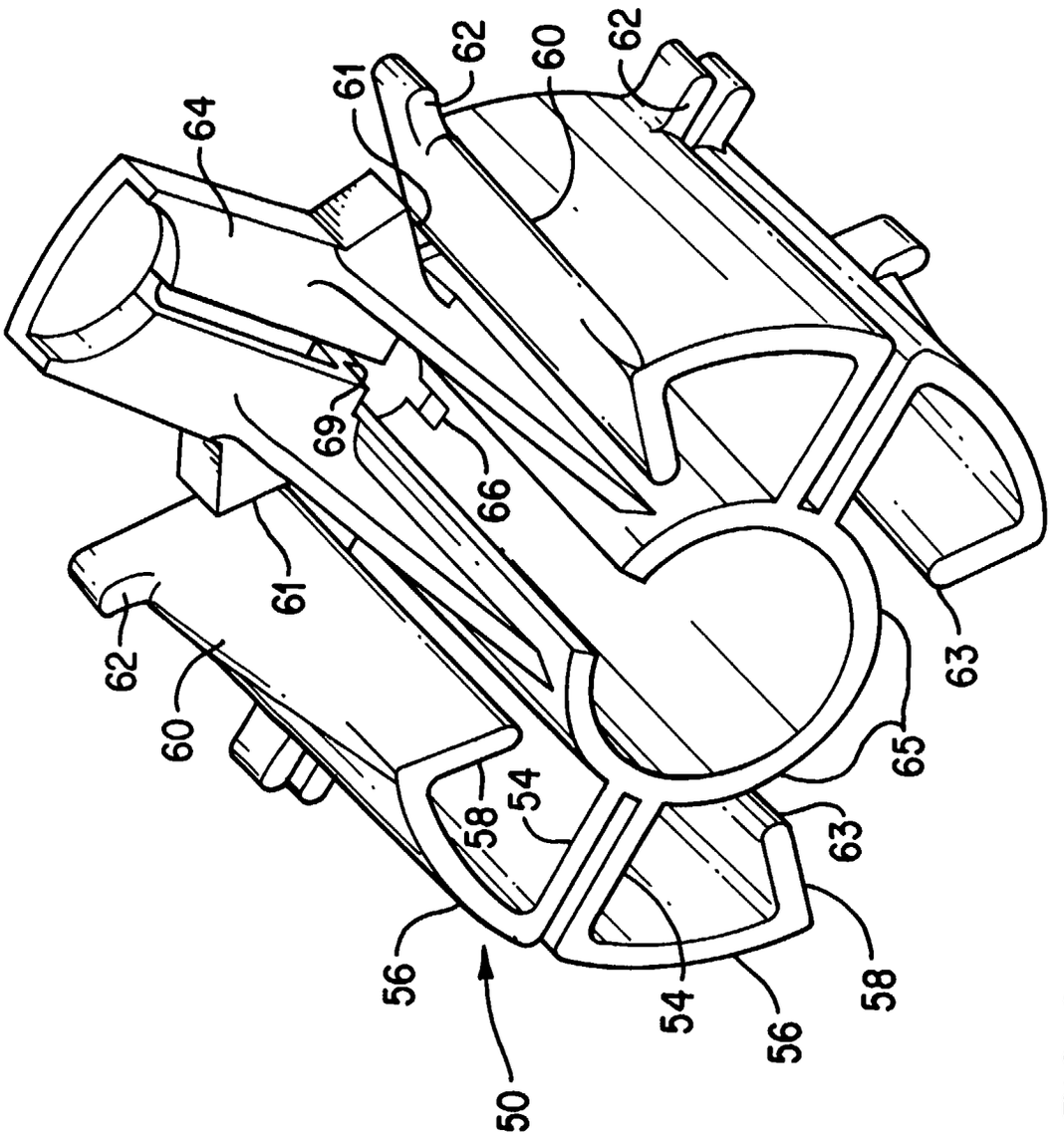

FIG. 6

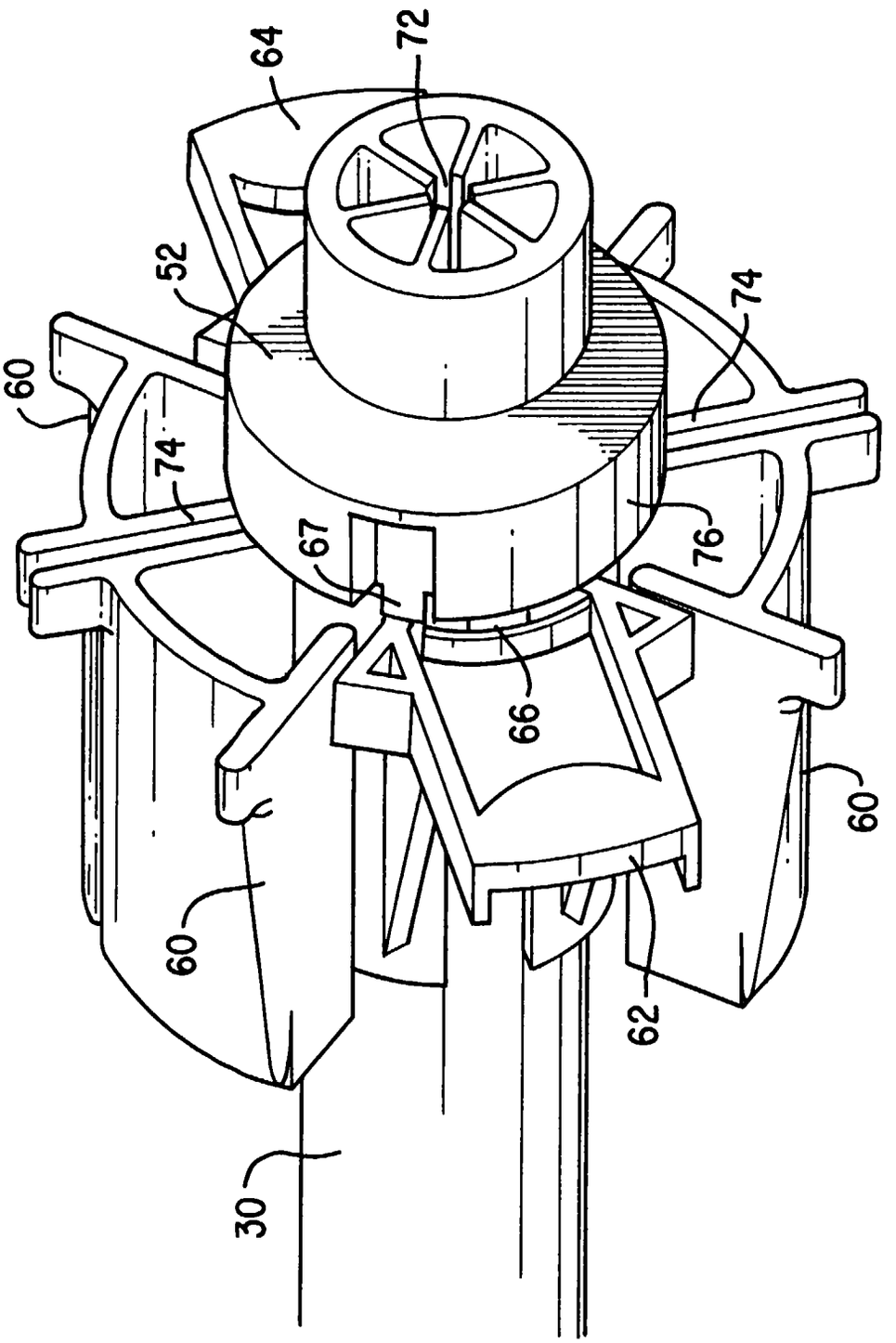

FIG.7

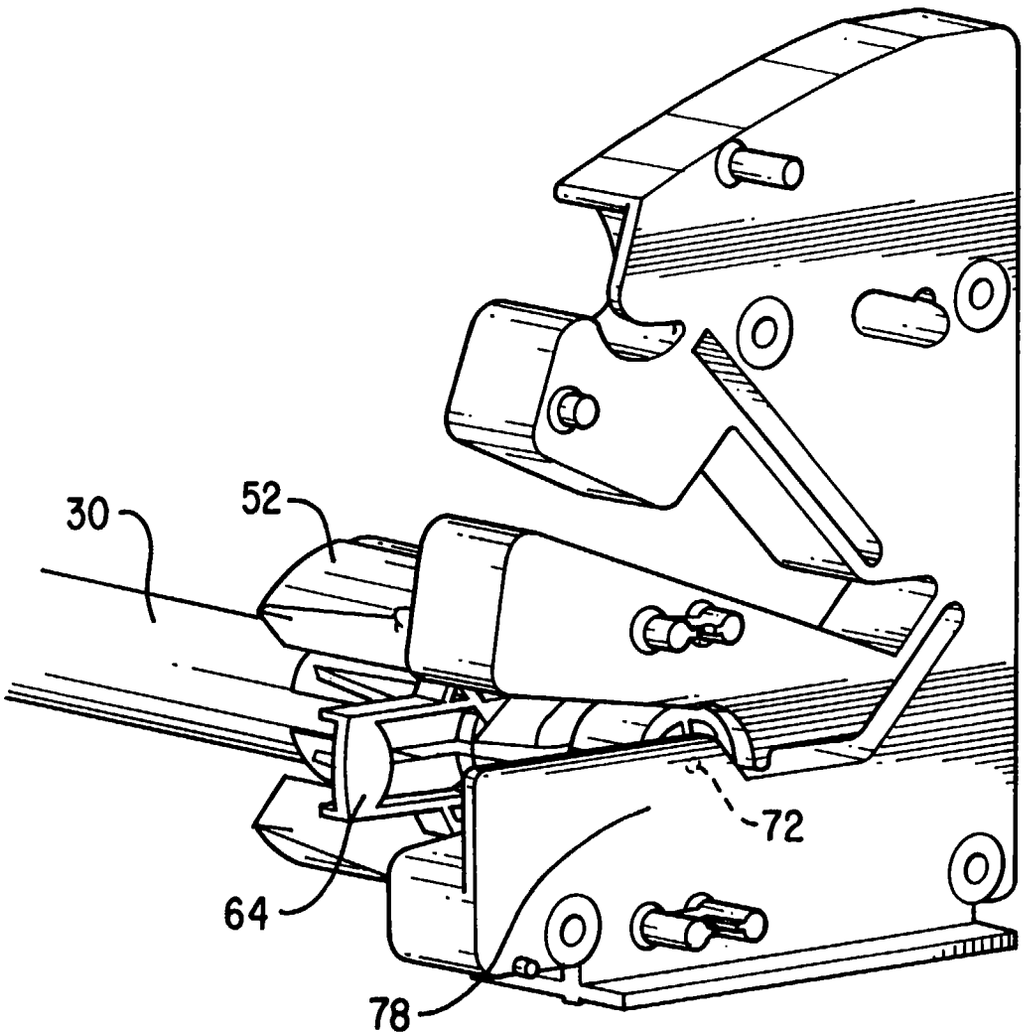

FIG. 8

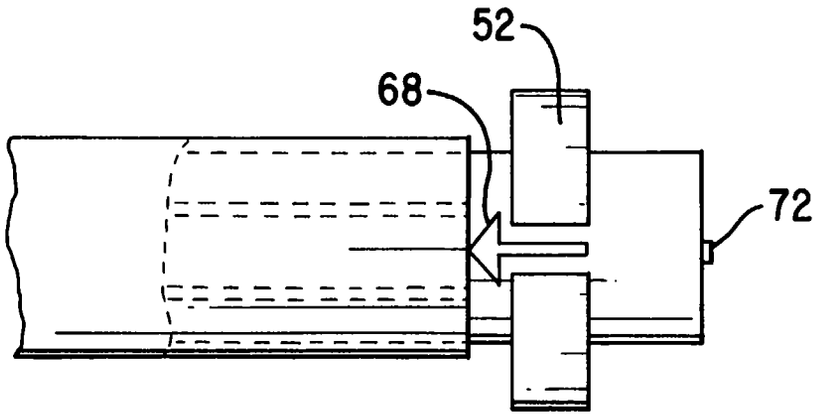

FIG. 9A

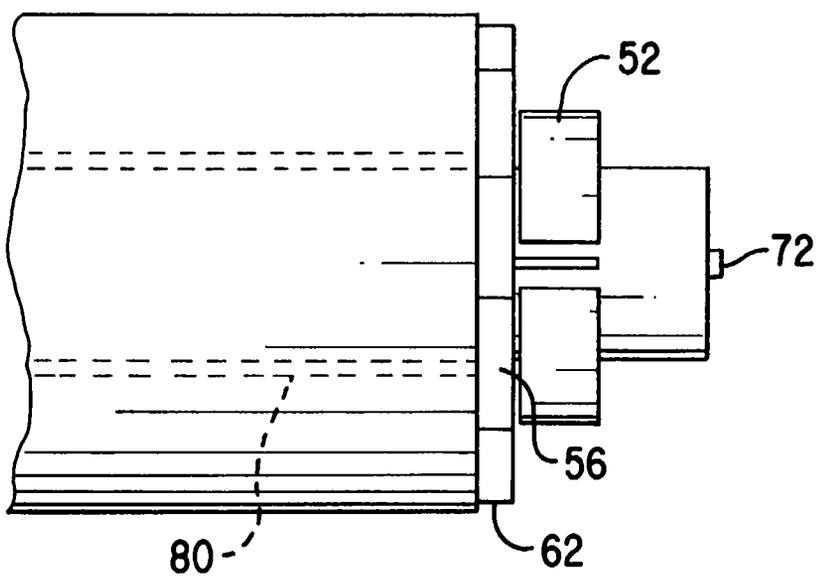

FIG. 9B

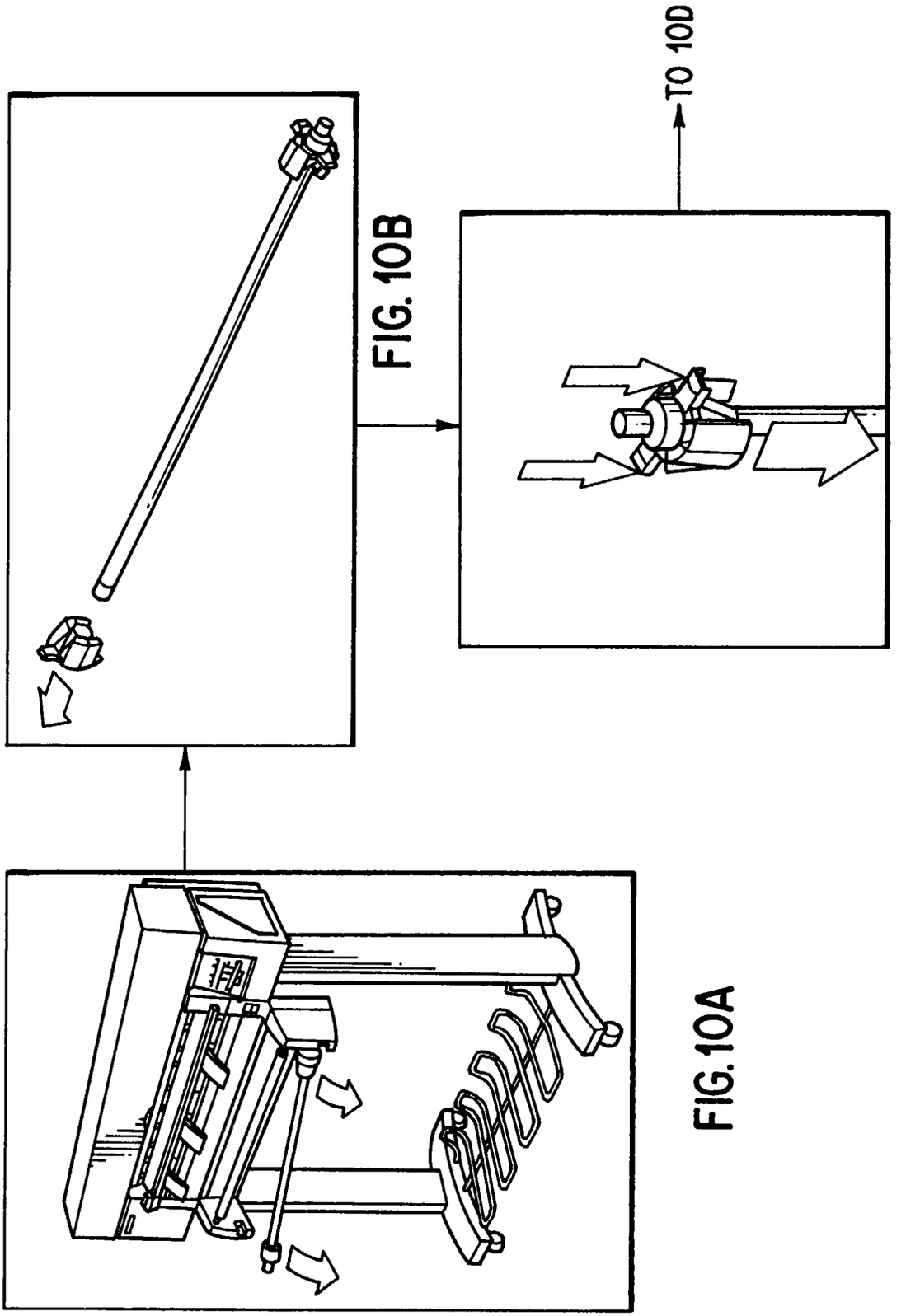

FIG. 10B

FIG. 10C

FIG. 10A

FROM 10C

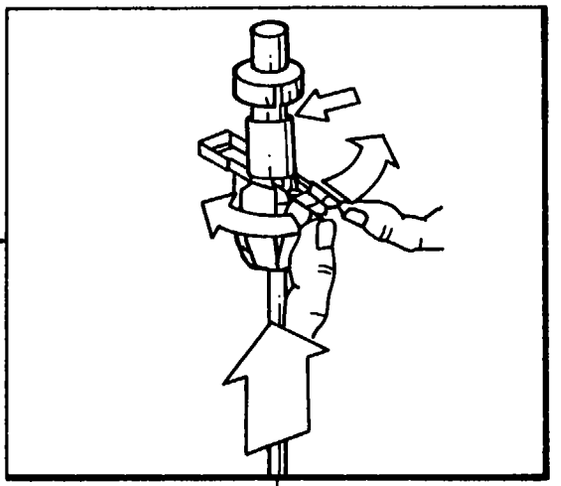

FIG. 10D

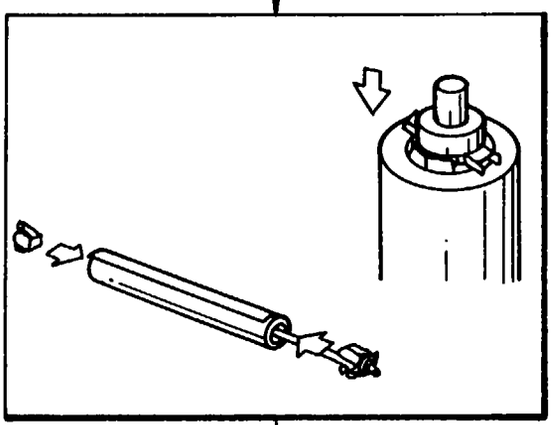

FIG. 10E

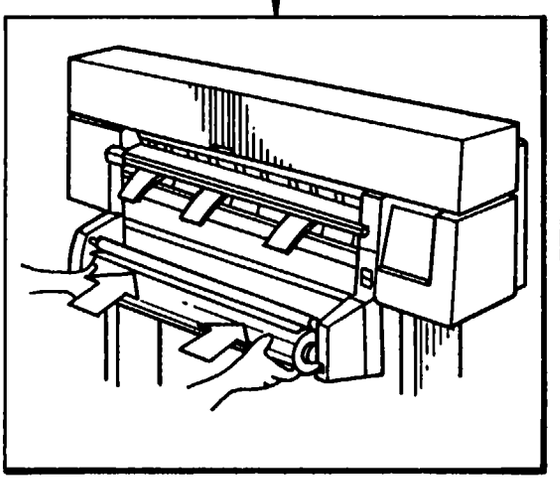

FIG. 10F

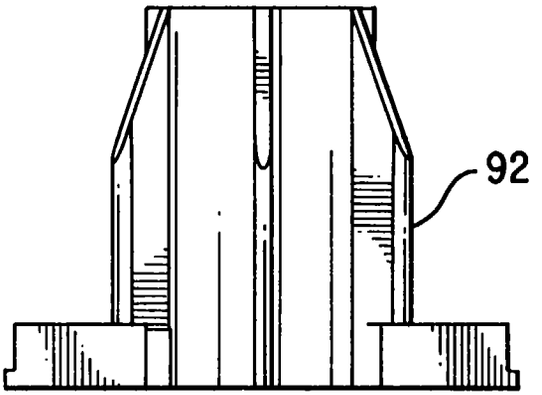

FIG. 11

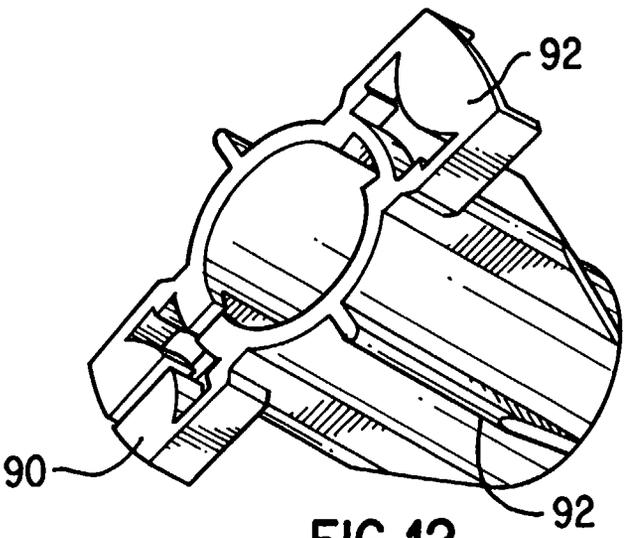

FIG. 12

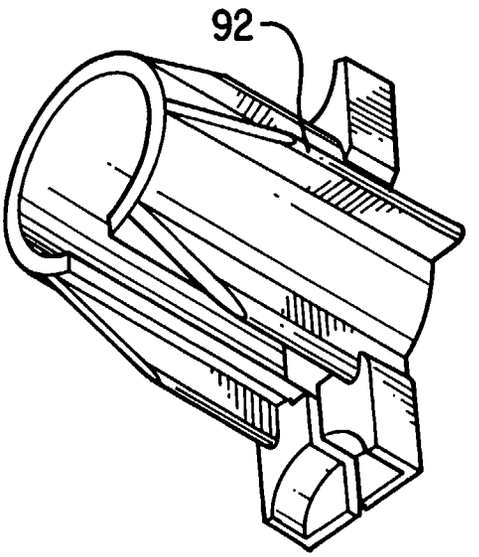

FIG. 13

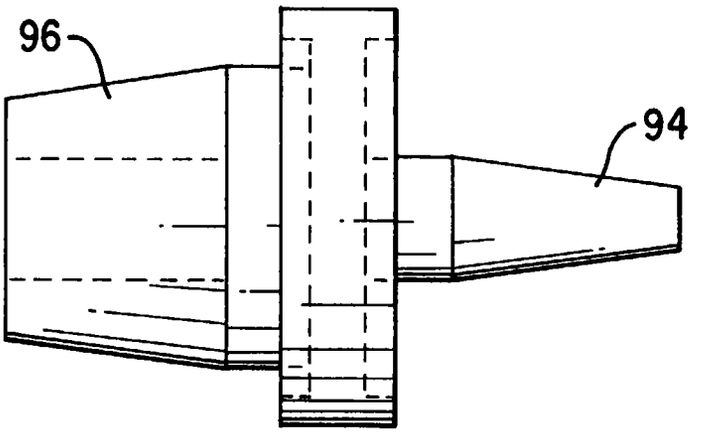

FIG. 14

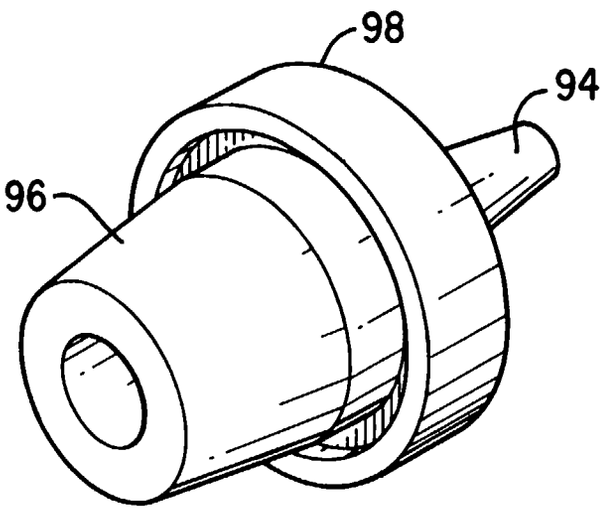

FIG. 15

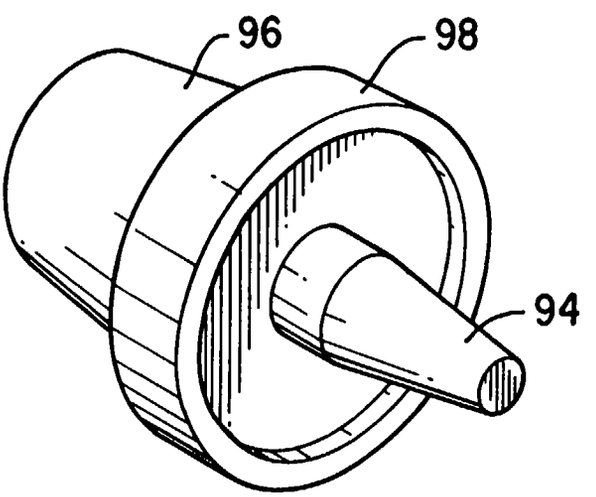

FIG. 16