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Europäisches Patentamt  
European Patent Office  
Office européen des brevets



11 Publication number:

**0 595 265 A2**

12

**EUROPEAN PATENT APPLICATION**

21 Application number: **93117346.2**

51 Int. Cl.<sup>5</sup>: **B41J 31/10**

22 Date of filing: **26.10.93**

30 Priority: **29.10.92 US 968932**

43 Date of publication of application:  
**04.05.94 Bulletin 94/18**

84 Designated Contracting States:  
**DE FR GB**

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54 **Apparatus and method for loading a dye donor in a thermal printer.**

57 An apparatus and method are provided for loading a dye donor web in a thermal printer. The apparatus includes a take-up spool and a dye donor web having a leader with adhesive material thereon, top and bottom surfaces, and first and second parallel longitudinal edges. The take-up spool has a body and first and second alignment lines positioned on the body to receive the web with the parallel edges aligned with the alignment lines and secured with the adhesive. The method comprises swinging open a door of the printer and providing access to first and second spaced apart guiding support members, and to third and fourth spaced apart guiding support members one of which has a color indicia thereon. The method includes inserting a dye donor web take-up spool between the first and second guiding support members, inserting a supply spool having a dye donor web wound thereon between the third and fourth guiding support members so that an insertion label on the supply spool is adjacent the color indicia, and unwinding a portion of the dye donor web and positioning a donor web leader on the take-up spool with parallel edges of the leader aligned with alignment lines on the take-up spool.

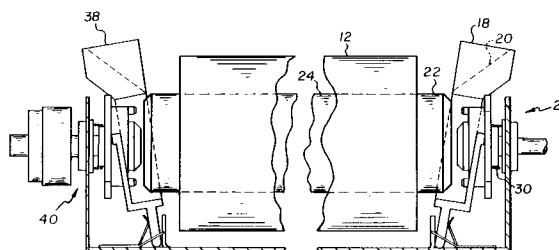


FIG. 2

**EP 0 595 265 A2**

### Cross-Reference to Related Applications

This application is related to copending Application Serial No. 896,016, filed June 9, 1992 for A Dye Donor Web Loading Apparatus For A Thermal Printer, i.e. 9310 9225.8.

### Technical Field

This invention relates generally to thermal printers, and, more particularly, to an apparatus and method for correctly loading a donor web wound upon a spool in a thermal printer.

### Background of the Invention

It is desirable to have a thermal printer in which it is easy to accurately load the dye donor ribbon. It is desirable to make the printer as easy to use as practical while being cost effective in the manufacturing process. Some thermal printers have a disposable dye donor cartridge mounted in the printer to hold the dye donor supply and take-up spools and offer convenience of use because it is relatively easy to insert and remove the cartridge. This is especially true in instances where the cartridge is keyed to be insertable with only one orientation. While cartridges offer convenience, they are expensive and discarded after one use. Unfortunately, attempts to make cartridges reusable to conserve resources have failed because it is difficult to re-wind fragile dye donor in a cartridge at the point of use.

To eliminate the problems associated with cartridges, some printers have configurations facilitating mounting the donor spools in the print engine without the benefit of a cartridge, while other printers mount the spool in the printer door, again without cartridges. Where spools are used without cartridges, there are also problems that arise. Space is always a consideration and there is not always sufficient room for all hands to manipulate the spools, regardless of whether the spools are full or empty. The spool can be mispositioned on the drive elements and therefore completely inoperative, or may cause annoying printing errors.

A problem with spool only systems wherein the dye donor web is connected to both the supply and take-up spools during manufacturing is that the pushing motion used during loading sometimes causes the user to wrinkle the new donor with ensuing print artifacts. It is therefore preferable to have the dye donor web attached only to the supply spool before loading. Proper location of the supply and take-up spools can always be accomplished as disclosed in copending application Serial No. 896,016, the disclosure of which is incorporated herein by reference.

A problem can arise with the dye donor web even after both the supply and take-up spools are properly located and inserted. The problem is squarely removing the web from the supply spool and squarely receiving and accumulating the web onto the take-up spool to thereby prevent wrinkling of the web and waste of dye donor. In the past, the dye donor web was started on the take-up spool by holding the web with the fingers and winding several revolutions about the take-up spool to get the web started. While acceptable alignment can be achieved using the fingers in this manner and eyeballing the results, using the fingers and eyes requires a degree of physical coordination and skill. Accordingly, it will be appreciated that it would be highly desirable to squarely engage the dye donor web with the take-up spool without the need for great skill of physical dexterity.

Another method for engaging the dye donor web with the take-up spool is to attach the leading end of the web to the spool with a piece of an adhesive tape or the like. U.S. Patent No. 5,030,311 discloses an adhesive tape used to attach one end of a web to a spool. While tape will securely hold the web to the spool, care must be taken to squarely align the tape on the spool to prevent wrinkling of the web. Unfortunately, using tape alone requires the operator to carefully eyeball the alignment which, again, is a skilled operation. It is therefore desirable to have a method for attaching the donor web to the take-up spool so that the web is accumulated on the take-up spool without wrinkling and for correct color plane alignment.

### Summary of the Invention

The present invention is directed to overcoming one or more of the problems set forth above. According to one aspect of the present invention, a dye donor take-up spool for receiving a dye donor web with the dye donor web having a leader, top and bottom surfaces, and first and second parallel longitudinal edges, comprises a body, and first and second alignment lines positioned on the body to receive the dye donor web with the parallel edges aligned with the alignment lines.

According to another aspect of the present invention, a dye donor web comprises a leader, top and bottom surfaces with the top surface having a repeating series of color patches thereon, first and second longitudinal edges extending parallel to one another, and an adhesive material on the leader.

According to another aspect of the present invention, a method for loading a dye donor web into thermal printer, comprises swinging open a door of the printer and providing access to first and second spaced apart guiding support members attached to the door and to third and fourth spaced

apart guiding support members attached to the door, one of the third and fourth support members having a color indicia thereon. The method includes inserting a dye donor web take-up spool having first and second alignment lines thereon between the first and second guiding support members, inserting a dye donor supply spool having a dye donor web wound thereon between the third and fourth guiding support members so that an insertion label or marking or other indicia on the supply spool is adjacent the color indicia, and unwinding a portion of the dye donor web and positioning a donor web leader on the take-up spool with parallel edges of the leader aligned with the alignment lines on the take-up spool.

These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

### **Brief Description of the Drawings**

Figure 1 is diagrammatical longitudinal sectional view of a preferred embodiment of a thermal printer with the cover open exposing a dye donor web and loading guide supports.

Figure 2 is a somewhat enlarged, diagrammatic view of a dye donor web supply spool being inserted into the guide supports of Figure 1 with some parts shown in section and some parts cut away.

Figure 3 is a side view of a guide support similar to the view shown in Figure 2, but illustrating the guide support in the locked position.

Figure 4 is a left side view of the guide support member illustrated in Figure 3.

Figure 5 is a diagrammatic view illustrating the alignment of spools with portions of the spools having indicia.

Figure 6 is a diagrammatic view similar to Figure 5, but illustrating another preferred embodiment wherein the supply spool has an alignment label.

Figure 7 is a somewhat enlarged plan view of the dye donor web showing the leader and adhesive surface of the web of Figure 5.

Figure 8 is a longitudinal sectional view taken along line VIII-VIII of Figure 7.

Figure 9 is a sectional view similar to Figure 8, but illustrating another preferred embodiment.

Figure 10 is a sectional view similar to Figures 8 and 9, but illustrating another preferred embodiment.

### **Detailed Description of the Preferred Embodiments**

Referring to Figures 1-2, a loading apparatus 10 for loading a dye donor web 12 into a thermal printer is illustrated. The printer has a base portion 14 and a door or cover portion 16 that is hingedly connected to the base portion 14 and movable between a closed position and an open position. At the closed position, the door 16 abuts the base 14, and, at the open position, the door 16 is swung away from the base 14 forming an angle greater than about 90 degrees. The door 16 swings an arc greater than 90 degrees in moving from the closed position to the open position to thereby provide easy access for inserting a new dye donor web and removing an expended dye donor web.

The dye donor web loading apparatus 10 includes a first guiding support member 18 attached to the door 16 and movable between a locked position and an unlocked position. The guiding support member 18 has a slot 20 therein that is dimensioned to receive an end portion 22 of a dye donor web spool 24. The slot 20 has a tapered portion 26 for guiding an end portion 22 of the spool 24. Preferably, the end portion 22 of the spool 24 is also slightly tapered. The dye donor web loading apparatus 10 also includes a first means 28 for biasing the first support member 28 toward the locked position. The first means 28 preferably includes a coiled spring 30 in contact with the first member 18 for biasing the first member 18 towards the locked position.

Referring to Figures 1-4, the loading apparatus 10 includes a bracket 32 pivotally connected to the first guiding support member 18 and fastened to the door 16 of the thermal printer. The bracket 32 engages the first support member 18 to thereby limit travel of the support member 18 towards the locked position.

The web loading apparatus 10 includes means 34 for detecting when the first guide support member 18 is in the locked position. The means 34 may include a microswitch 36 or other device to sense the position of the guide support member 18.

The dye donor web loading apparatus 10 also includes a second guiding support member 38 that is spaced from the first guiding support member 18 and attached to the door 16. The second guiding support member 38 is movable between a locked position and an unlocked and works in concert with the first guiding support member 18 to receive a dye donor web spool 24. As with the first support member 18, the second support member 38 is biased by a biasing means 40 toward the locked position.

Referring to Figures 1-5, in the same manner that the first and second guiding support members

18, 38 form a pair of members and act concert to load the web 12, so do third and fourth guiding support members 42, 44. The third and fourth members 42, 44 are constructed in a similar manner to the first and second elements 18, 38 and include biasing means 46, and 48, respectively. The first pair of support members 18, 38 receives supply spool 24a while the second pair of support members 42, 44 receives the take-up spool 24b so that the dye donor web 12 can be wound from supply spool 24a onto the take-up spool 24b as the web traverses a path through the printer to effect thermal printing.

Referring to Figure 5-7, the dye donor web 12 has a repeating series of yellow, magenta and cyan color patches extending between its parallel longitudinal edges, and has a leader 50 to be aligned between alignment lines 52a, 52b scribed around the circumference of the take-up spool 24b. The leader 50 attaches to the take-up spool 24b, which is preferably symmetric to eliminate problems with incorrect end for end insertion. As an alternative, all or part of the take-up spool may be color coded to match the support members 42, 44 and coordinate installation.

The take-up spool 24b may be constructed of a plastic or cardboard material with instructions imprinted on the spool or near the spool in a particular color. Preferably, the take-up spool 24b is a reusable, recyclable, extruded white plastic material with instructions or directions in colors which have been found to be emotionally neutral for machine operators, such as green or yellow, for example. The supply spool 24a is similar in construction to the take-up spool 24b but is preferably different in length to prevent swapping of the supply and the take-up spools.

While the take-up spool 24b poses no real insertion problem, the supply spool 24a must be oriented properly for the donor web 12 to pay off the supply spool 24a and traverse an operative path to the take-up spool 24b. This can be facilitated by an indicia so that one end of the supply spool 24a can be matched with a coded guiding support member 18. Matching guarantees correct end for end insertion so that the web pays off the spool correctly. The indicia may be a color paper or painted label 58 or the like (Figure 5), or may simply be a line 60 of discernible width, or several lines (Figure 6). The indicia may also be formed in other ways, such as scoring the plastic material of the spool or changing the appearance of a portion of the supply spool to make it easily discernible. The indicia is positioned on the supply spool so that it is visible when the donor web is wound on the spool.

The leader portion 50 preferably has a color coded label 54 which verifies that the leader 50 is

to be attached to the take-up spool 24b. The color coded label 54 is preferably a removable paper label which, when removed, exposes a sticky tape or surface 56 on the leader 50 for easy attachment to the take-up spool 24b. Depending upon the manner in which the web 12 is wound onto the take-up spool 24b, the sticky surface 56 may be on the top surface of the web 12 with color patches, or on the bottom surface. Alternatively, the sticky surface 56 may be present on both surfaces of the web. While the supply and take-up spools 24a, 24b may be attached to the web 12 during manufacture, it is preferable to attach the web 12 only to the supply spool 24a during manufacture, and have the operator use the color coded label 54 and adhesive surface 56 which facilitates easy step by step insertion and attachment for a variety of models of machines without fear of dropping the spool and ruining the dye donor web 12.

Referring now to Figures 7-10, the leader 50 may simply be the leading end portion of the web 12, or may be different from the remainder of the web 12. The leader 50 may have a square end portion or a tapered end portion similar to the leader in U.S. Patent No. 4,710,781, and there may be black and clear patches along with the yellow, magenta and cyan color patches as is known in the art. To facilitate handling, the leader 50 is preferably stiffer or less flexible than other portions of the web 12. Stiffness may be achieved by having the leader 50 constructed of a different material or a denser material (Figure 8). The stiffness may be obtained by having the leader 50' made thicker than the remainder of the web 12' (Figure 9). Alternatively, the leader 50'' may be constructed of the same material as the remainder of the web 12'' with the paper cover 54' extending over a large portion or the entire leader 50'' to make the leader 50'' easy to handle.

Operation of the present invention is believed to be apparent from the foregoing description, but a few words will be added for emphasis. First, the door is opened past vertical to make the inside fully accessible. A new dye donor web is then installed by aligning one spool with the two slots that face each other in one guide assembly to receive the spool. The proper guide slots can be chosen by observing the indicia or color code, noting the alignment of the donor web on the spool, or noting the length of the spools, whichever applies. Where colors or indicia are used, these are matched. Where spool lengths are different, only one spool will fit each pair of guiding support members. And where the donor web is off center, both spools cannot be inserted unless so inserted correctly. The aligned spool is pushed into the facing slots thereby causing the guide members to unlock and move against the biasing springs. As

the spool is pushed farther, the guide members spring back locking the spool in position. The other spool is inserted into its guide members the same way. The tapered ends of the spools act as self-centering devices to aid the alignment. The tapered ends also aid in removal of a used spool which is removed by pulling it straight out of the slots. If desired, one support member may be pushed aside to assist removal, but pushing is not necessary.

With both spools inserted, the leader 50 is unwound from the supply spool 24a a distance sufficient to engage the take-up spool 24b. The leader 50 is placed between the alignment lines 52a, 52b on the take-up spool 24b so that the parallel longitudinal sides of the web 12 lie between the alignment lines 52a and 52b. The adhesive surface 56 of the leader 50 is then exposed by removing the paper covering 54, and the leader 50 is pressed onto the spool 24b.

While the invention has been described with particular reference to the preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements of the preferred embodiment without departing from the invention. For example, while the invention has been described with reference to a color coded label, other indicia, such as a printed line of some width or a color coded spool end, could be used. In addition, many modifications may be made to adapt a particular situation and material to a teaching of the invention without departing from the essential teachings of the present invention.

The present invention provides a cartridge free dye donor loading system that is simple to use and that prevents incorrect insertion of the spools. It also provides simple access to the spools for easy insertion and removal. The alignment lines facilitate correct attachment of the web to the spool to prevent wrinkling of the donor.

It can now be appreciated that there has been presented an apparatus and method for attaching the donor web to the take-up spool so that the web is accumulated on the take-up spool without wrinkling and with correct color plane alignment. The dye donor web engages the take-up spool without the need for great skill, physical coordination, or manual dexterity. In one embodiment the apparatus includes a dye donor take-up spool for receiving a dye donor web which has a leader, top and bottom surfaces, and first and second parallel longitudinal edges. The spool comprises a body and first and second alignment lines positioned on the body to receive the dye donor web with the parallel edges aligned with the alignment lines. In another embodiment the apparatus includes a dye donor web which comprises a leader, top and bottom surfaces

with the top surface having a repeating series of color patches thereon, first and second longitudinal edges extending parallel to one another, and an adhesive material on the leader for attaching the web to the take-up spool.

The method comprises swinging open a door of the printer and providing access to first and second spaced apart guiding support members attached to the door and to third and fourth spaced apart guiding support members attached to the door, one of the third and fourth members having a color indicia thereon; inserting a dye donor web take-up spool having first and second alignment lines thereon between the first and second guiding support members; inserting a dye donor web supply spool having a dye donor web wound thereon between the third and fourth guiding support members so that an insertion label on the take-up spool is adjacent the color indicia, with dye donor web having a leader, top and bottom surfaces, and first and second parallel longitudinal edges; and unwinding a portion of the dye donor web and positioning the donor web leader on the take-up spool with the parallel edges aligned with the alignment lines.

It can also be appreciated that there has been described a thermal printer. The thermal printer, comprises a base, a door hingedly moveable between a closed position at which the door abuts the base and an open position at which the door is swung away from the base, a dye donor web supply spool, and a dye donor web having a leader, top and bottom surfaces, and first and second parallel longitudinal edges, and being wound upon the supply spool. First and second spaced apart guiding support members attached to the door act in concert to load the supply spool therebetween. A dye donor web take-up spool has first and second alignment lines thereon. Third and fourth spaced apart guiding support members attached to the door act in concert to load the take-up spool therebetween with the take-up spool being positioned to receive the donor web leader with the parallel edges aligned with the alignment lines.

As is evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the examples illustrated, and it is therefore contemplated that other modifications and applications will occur to those skilled in the art. For example, while the leader is illustrated with the adhesive portion behind the tapered portion, the tapered portion can also have a sticky surface. It is accordingly intended that the claims shall cover all such modifications and applications as do not depart from the true spirit and scope of the invention.

## Claims

1. A dye donor take-up spool for receiving a dye donor web, said dye donor web having a leader, top and bottom surfaces, and first and second parallel longitudinal edges, and said spool having a body; characterized by
  - a first and second alignment lines positioned on said body to receive said dye donor web with said parallel edges aligned with said alignment lines.
2. A dye donor web having a body having top and bottom surfaces, and first and second longitudinal edges extending parallel to one another, and a repeating series of color patches on said top surface, characterized by:
  - a leader attached to said body; and
  - an adhesive material on said leader.
3. A dye donor web, as set forth in claim 2, further characterized by a removable cover on said adhesive material.
4. A dye donor web, as set forth in claim 2, further characterized by said leader being stiffer than said body.
5. A thermal printer having a dye donor web supply spool, and a dye donor web wound upon said supply spool and having a body with top and bottom surfaces and first and second parallel longitudinal edges, and a leader attached to said body; characterized by
  - a dye donor web take-up spool having first and second alignment lines and being positioned to receive said donor web leader with said parallel edges aligned with the alignment lines.
6. A thermal printer, as set forth in claim 5, further characterized by said leader has an adhesive surface for adhering to said take-up spool.
7. A thermal printer, as set forth in claim 6, further characterized by a cover on said adhesive surface.
8. A thermal printer, as set forth in claim 5, further characterized by said leader wherein said leader being stiffer than said body.
9. A thermal printer, as set forth in claim 5, wherein said take-up and supply spools are different lengths.
10. A thermal printer having
  - a base,

a door hingedly moveable between a closed position at which said door abuts said base and an open position at which said door is swung away from said base,

a dye donor web supply spool, and

a dye donor web wound upon said supply spool and having a body with top and bottom surfaces and first and second parallel longitudinal edges and a leader attached to said body; characterized by

a first and second spaced apart guiding support members attached to said door and acting in concert to load said supply spool therebetween;

a dye donor web take-up spool having first and second alignment lines; and

a third and fourth spaced apart guiding support members attached to said door and acting in concert to load said take-up spool therebetween, said take-up spool being positioned to receive said donor web leader with said parallel edges aligned with said alignment lines.

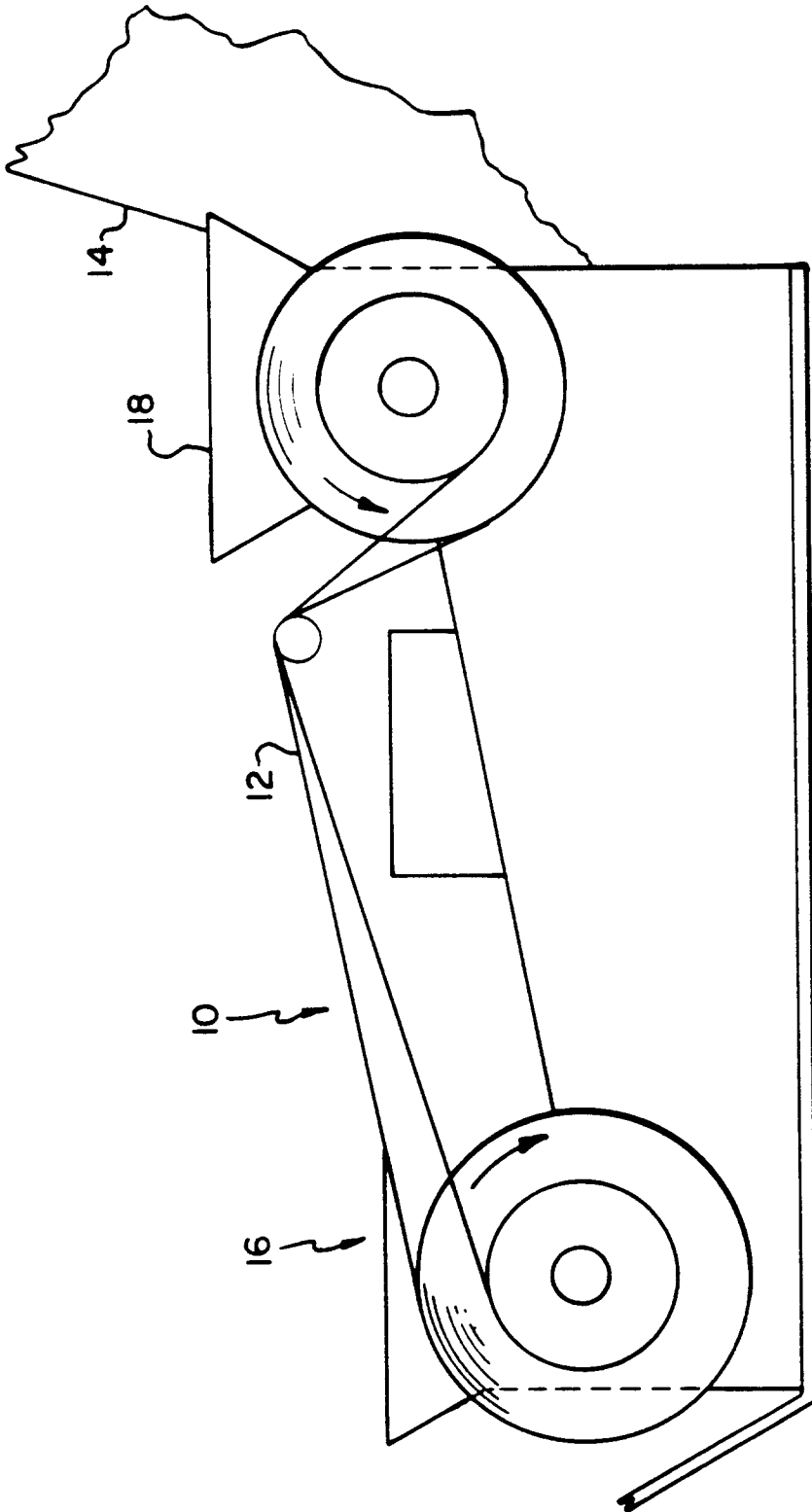


FIG. 1

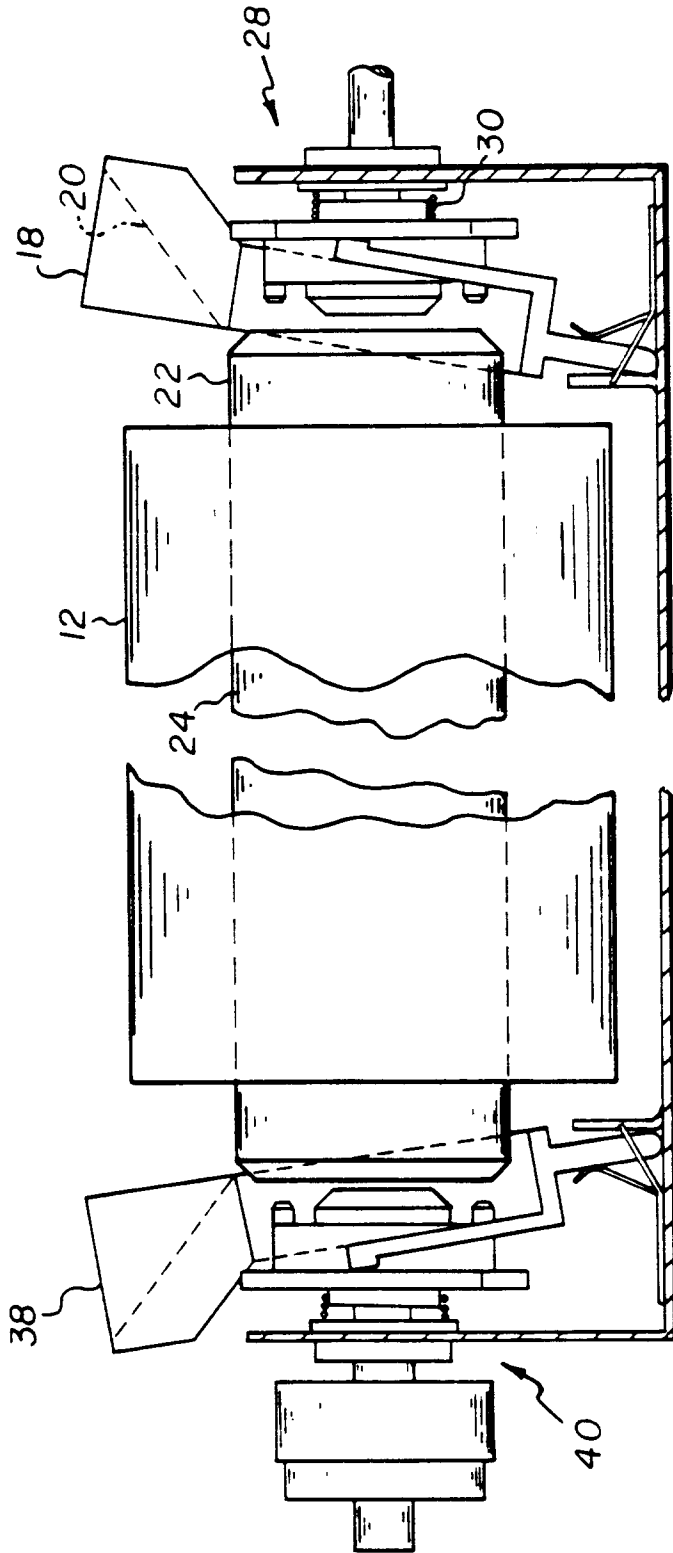
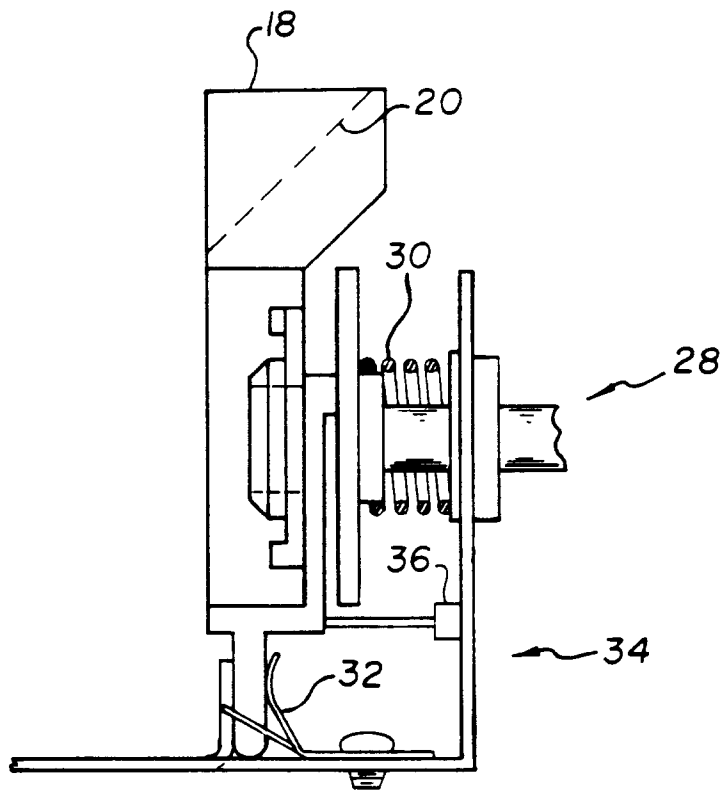
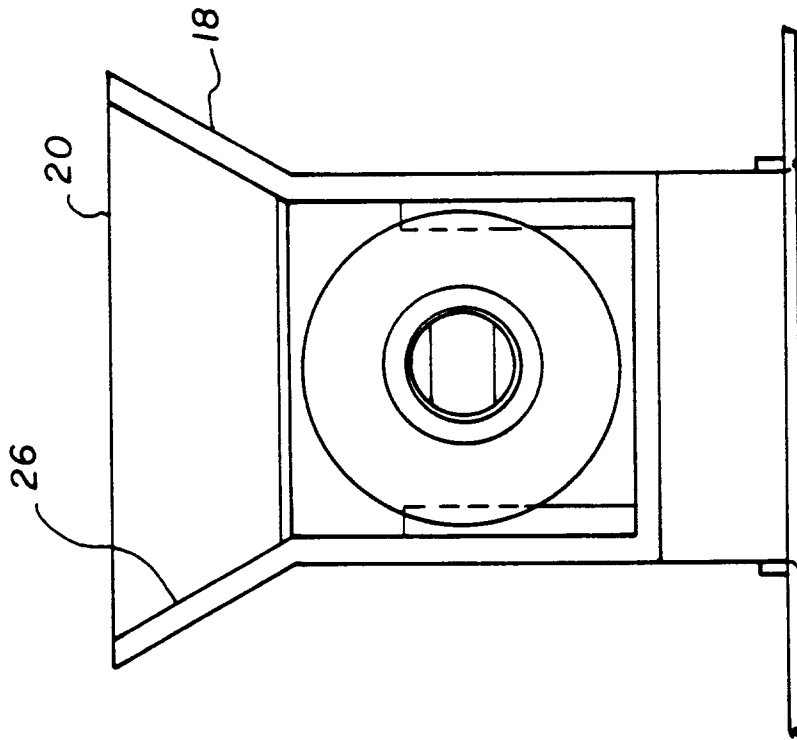


FIG. 2

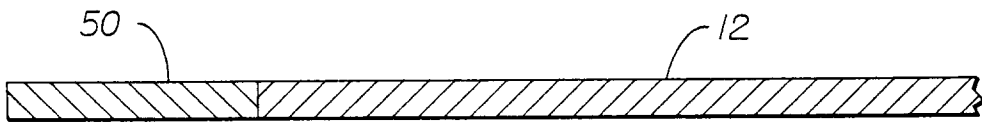


**FIG. 3**

FIG. 4



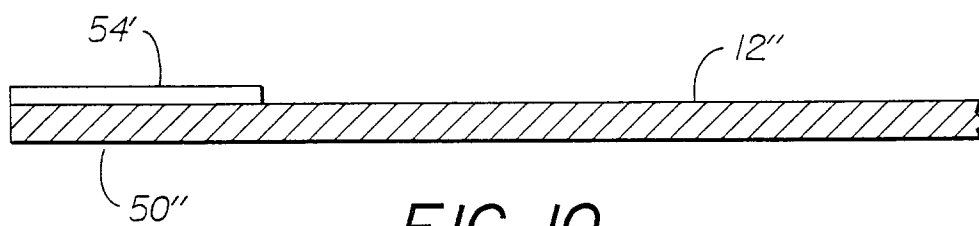




*FIG. 8*



*FIG. 9*



*FIG. 10*