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(54) **Printer with improved antiskew mechanisms.**

(57) The invented printer (20) includes a paper drive and mechanisms which hold paper in proper alignment in the drive. Specifically, it includes a pressure plate (27) capable of bringing a sheet of paper into contact with a drive roller (26a, 26b, 26c) so that the paper is properly aligned, a wrapper (29) which

keeps paper in proper contact with the drive roller (26b), a media edge contactor (28) that presses against paper, a carriage guide support (30) which helps to insure proper alignment of the paper during printing, and a back-out restraint (24) to prevent paper from backing out of the printer (20).

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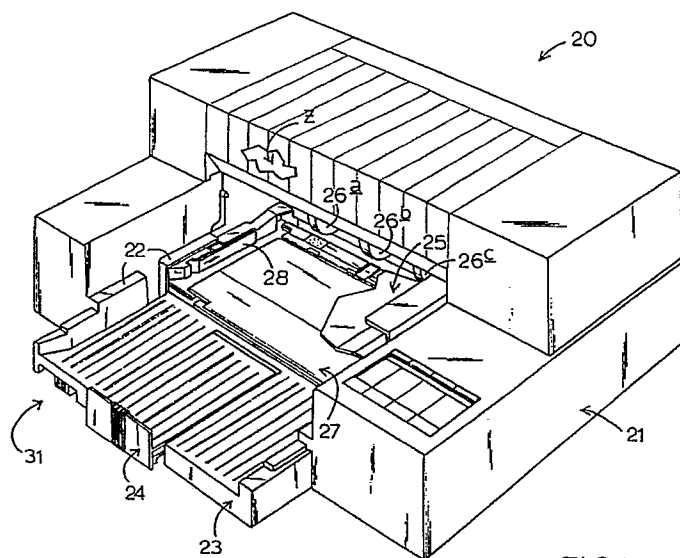


FIG.1

PRINTER WITH IMPROVED ANTI-SKEW MECHANISMS

Technical Field

This invention relates to a printer with improved anti-skew performance and, more particularly, to a printer which reduces paper skew by insuring alignment while paper is fed through the printer both before and during printing.

Background Art

Printers mark images on a medium. To achieve acceptable quality in output, the printed image must be properly aligned on the medium, and as a consequence, printers are designed with anti-skew mechanisms to insure such alignment.

Skew is an oblique course or a deviation from a predetermined straight line. For example, as paper is fed through a printer, it may buckle or twist. If an image is then printed, it will be skewed.

Skew can be caused by many factors. For instance, a printer may feed paper irregularly-driving one side more than the other, with the outcome that different lines of the printed image will not be parallel. Additionally, when paper is initially fed into a printer, it may not be properly aligned. If so, the image will be incorrectly positioned on the page. Often, as paper is fed through a printer, the paper is forced to make a significant turn. Because the paper resists turns, it may move away from the drive mechanism and cause a skewed print image. Variations in parts, media and product handling may also cause skew.

To prevent skew, printers are usually equipped with special paper guides and intricate drive mechanisms. Hewlett-Packard's DeskJet® printer, as disclosed in United States Patent No. 4,728,963, is an example of a printer with effective anti-skew features.

Nevertheless, even the best presently existing printers often print skewed images. This invention offers a printer featuring significantly improved anti-skew design.

Disclosure of the Invention

The invented "Printer with Improved Anti-skew Mechanisms" includes a paper drive with drive rollers, and unique mechanisms which hold paper in proper alignment while it is handled by the drive. Specifically, the printer of the present invention includes a pressure plate that initially brings paper into contact with the drive rollers so that the former is properly aligned, a wrapper which keeps paper in proper contact with the rollers, a media edge contactor that presses against paper, a carriage

guide support which helps to insure proper alignment during printing, and a back-out restraint to prevent paper from backing out of the printer.

5 Brief Description of the Drawings

Figure 1 is a top perspective view of a printer constructed according to the present invention.

10 Figure 2 is a top view of a pressure plate, wrapper, media edge contactor, and back-out restraint constructed according to the invention, and included in the printer of Figure 1.

Figure 3 is an exploded, top perspective view of the pressure plate shown in Figure 2.

15 Figure 4 is an exploded perspective view of the pressure plate shown in Figure 2, showing the top of a platen and the bottom of a moveable member that make up the plate.

20 Figure 5 is a bottom view of the pressure plate shown in Figure 2.

Figure 6 is a simplified cross-sectional view of the printer of Figure 1, taken generally along line 6-6 in Fig. 2, and rotated 90° clockwise.

25 Figure 7 is similar to Figure 6, differing in that it shows the beginning of a paper feed cycle.

Figure 8, similar to Figure 6, shows the path the paper follows in the printer.

30 Figure 9 is a perspective view of a wrapper (isolated from other structure) constructed according to the invention.

Figure 10 is a perspective view of the wrapper in a mount.

35 Figure 11 is a simplified, side cross-sectional view of the wrapper shown in Figure 10, taken generally in the plane which exposes drive roller 26b in Fig. 6.

Figures 12-14, inclusive, show different views of a media edge contactor constructed according to the invention.

40 Figure 15 is a view like that presented in Figure 1, with a portion of the printer's housing shifted to expose a carriage guide included in the printer.

45 Figure 16 is a simplified and enlarged cross-sectional view of the carriage guide, taken generally in the region, and direction, of the arrow in Fig. 15, disclosing support mounts provided for the guide.

Figure 17 is a bottom view of a back-out restraint.

50 Detailed Description and Best Mode for Carrying Out the Invention

The invented anti-skew mechanisms may be incorporated in a printer, such as the one shown in

Figure 1 at 20. Printer 20 includes a housing 21 having, among other things, flanges such as those shown at 22, a lower paper tray 23, and a paper back-out restraint 24. A stack of sheet print media (not shown) on which printer 20 will print (typically paper) is loaded into tray 23. After printing, the paper is collected in an upper paper tray 25 (shown fragmentally in Fig. 1) resting on flanges 22 and located immediately above tray 23.

The specific printing mechanism, or means, paper-drive mechanism, or drive means, circuitry, and other elements necessary for printer 20 to operate may be those used in presently existing printers. United States Patent No. 4,728,963 discloses such elements.

The paper-drive mechanism incorporated in printer 20 includes drive rollers 26a, 26b, 26c. These rollers contact the top sheet of paper in tray 23 and drive it through a print zone Z, located generally inside the upper portion of housing 21 as seen in Fig. 1, and into upper tray 25. The drive rollers are driven by any known method.

Figure 1 also shows components of several of the invented anti-skew mechanisms and their positions within the printer. Included are a pressure plate 27, a media edge contactor 28, and back-out restraint 24. These mechanisms also include a wrapper 29 (see Figs. 9 and 10) and a carriage guide support, or support means, 30 (see Fig. 16). Each of these structures will be discussed in turn. Plate 27, edge contactor 28, and wrapper 29 together form what is referred to herein as media alignment means. The media edge contactor, along with back-out restraint 24 and lower tray 23 together make up a supply means generally pointed to in Fig. 1 by arrow 31.

The structure of plate 27 is shown in Figs. 2-5, inclusive. Plate 27 includes a platen 32 connected to printer 20 by hinges 33, and taking the form generally of a rectangular piece of aluminum. The top surface of platen 32 includes a recessed area 34.

A relatively moveable member 35 is attached to platen 32 and includes two, laterally spaced projections 36 and 37. These projections may be made of cork. Additionally, member 35 includes a sloped, lead-in surface 38. The attachment between platen 32 and member 35 is what might be thought of as a limited wobble attachment which allows the moveable member to rock slightly relative to the plate about an axis shown generally at 39.

During use, paper in tray 23 rests on plate 27 and recessed area 34 ensures that the paper rests on projections 36 and 37. Surface 38 allows paper to be inserted into tray 23 and onto projections 36 and 37. The just-referred to wobble connection which exists between the platen and the moveable

member functions, during normal paper handling, to promote, as near as possible, simultaneous gripping of a sheet of paper on its opposite lateral sides.

Jumping ahead for a moment and looking at Fig. 6-8, inclusive, these three figures illustrate three time-successive stages in a typical paper pick/feed cycle of operation. In particular, Fig. 6 illustrates the waiting-to-be-picked situation with a stack of paper residing in proper position in lower tray 23 with the downstream or lead edges of the stack resting on projections 36, 37 beneath rollers 26a, 26b, 26c, which are rotating in the direction of the curved arrow in Fig. 6.

In Fig. 7, though operation of a cam shown generally at 40 (which cam is omitted from Figs. 6-8), plate 27 is rocked to place the downstream edge of the top sheet of paper in the stack in contact with the drive rollers. As was suggested earlier, the wobble connection which exists between the platen and moveable member 35 tends to insure that opposite sides of this sheet contact the outer drive rollers 26a, 26b in near time simultaneity and with substantially equal force.

Finally, Fig. 8 illustrates a subsequent stage wherein the pressure plate has been re-lowered, and the paper which was picked in Fig. 7, is on its way into the paper path, toward and through the printing zone in the printer.

Turning attention now to another one of the important anti-skew structures incorporated according to the present invention, and directing particular attention to Figs. 9-11, previously mentioned wrapper 29 is illustrated. Wrapper 29, illustrated in freestanding form in Fig. 9, is formed preferably of a thin sheet of specially bent springy metal having the nominal configuration illustrated in this figure. As may be noted by looking back and referring to Fig. 2, the wrapper is a singular unit employed centrally (in a lateral sense) in the printer. It occupies a location immediately adjacent central drive roller 26b.

In Fig. 10 wrapper 29 is shown snap-seated in a suitable socket provided in a structural mount 42 which is formed in any suitable manner in the usual chassis structure which forms part of printer 20. Wrapper 29 includes a curved arm 29a which is intended to curl adjacent drive roller 26b, as seen in Fig. 11, and to urge and hold paper against the drive roller. Considering another way in which the wrapper, and more particularly the wrapper's arm functions, the same tends to direct paper precisely into the nip region which exists, as shown in Fig. 11, between drive roller 26b and a pinch roller 44.

Referring to Figs. 12-14, inclusive, along with Fig. 2, details of previously mentioned media edge contactor 28 are illustrated. In the particular embodiment shown in the drawings, the edge con-

tacter takes the form of an elongate structure which is long in the direction that it extends along the side of a stack of paper contained in lower tray 23. As can be seen in Fig. 2, this edge contactor lies substantially along the length of the side of pressure plate 27.

Edge contactor 28, which may preferably be a molded plastic part, includes an elongate pad face 28a, which provides for surface/edge contact with paper in a stack, joining with a flange lead-in surface 28b.

Edge contactor 28 sits in a relatively moveable but captured condition in a mount 46 which allows for limited angulation and reciprocation of the contactor relative to the mount, as indicated generally by the overhead pair of double-ended arrows. Biasing the edge contactor away from mount 46, the condition in which it is shown in Fig. 12, is a biasing spring 48 which acts between the mount and the contactor, located toward the lead end of the contactor (which condition is apparent from the opened-up top view illustrated in Fig. 13).

Considering the action contribution of contactor 28 in the handling of paper, lead-in surface 28b facilitates feeding in of a stack of paper, and pad face 28a functions, as now will be more particularly explained, to urge the stack of paper laterally toward an appropriate held condition against opposing support guide walls, shown at 50, 52 on the right side of Fig. 2. With specific reference to this kind of performance, and referring especially to Fig. 14, pad face 28a has an almost imperceptible incline, sloping upwardly and to the right in the figure, at an angle of around 87° to the normal. This results in assuring that those sheets of paper which are at the top of the stack in tray 23 are pre-aligned against the guide walls, in a proper position for guidance into the feed path following picking by the rollers.

The location of biasing spring 48 along the length of the contactor, and more specifically toward the infeed end of the contactor, vis-a-vis the way in which paper is inserted into the tray, assures good control over what might be thought of as rear end fishtailing of a sheet of paper as the same as pulled into the paper feed path. Thus, the edge contactor plays a multi-functional role in dealing with the problem of skew, which role is enhanced by the relative positions and sizes of its active faces 28a 28b, the inclination, in a vertical sense, of face 28a and the near endo biasing position for action of spring 48.

Looking now at Fig. 15, here in this perspective view of printer 20, print zone Z is again illustrated. Included within this zone are a printhead cartridge 54, a printhead carriage 56 and a carriage guide 58. Cartridge 54 moves back and forth in carriage 56, along guide 58, and prints on paper traveling

through the print zone.

Looking at Fig. 16 along with Fig. 15, cooperating with the carriage guide, as the same as seeing adjacent the left end of the print zone in Fig. 15, is previously mentioned carriage guide support, or support means, 30, which includes three cooperating components illustrated at 30a, 30b, 30c. Component 30a takes the form of a horizontal support pad which defines a fixed vertical support datum plane for the left free end of the carriage guide as seen in Fig. 16--allowing the guide to slide from left to right in Fig. 16, but not to change, in a lowering sense, its elevation. Component 30b takes the form of a molded boss with a threaded screw hole underlying the carriage guide, in alignment with a clearance hole in the guide through which a securing screw, such as that shown in upwardly exploded condition at 60, is fastened. Component 30b includes a step in its upper surface which serves to force the carriage guide against component 30a when screw 60 secures the carriage guide. Component 30c acts as a stabilizing key, by fitting into a lateral notch 62 formed in the carriage guide. This cooperative interaction prevents the carriage guide in its entirety from shifting to the left or the right in Fig. 16. The upper horizontal surface of support component 30a functions herein as a first horizontal support surface. Component 30c acts herein as a second support. Similar support means may be included at the right end, as seen in Fig. 15, of guide 58.

The support means 30, functions to reduce printhead carriage rocking and to provide tolerance for imperfections or warping in the carriage guide. As the printhead carriage moves back and forth on the guide, the printhead is held a certain distance from the paper. Support means 30 helps maintain the position of the printhead relative to the paper.

Completing now a description of the present invention, Fig. 17 shows a bottom side perspective view of previously mentioned back-out restraint 24. With a stack of paper stored in tray 23, the repeated raising and lowering action of plate 27 prompts gravity to cause sheets in the stack to tend to back out of the tray. Restraint 24 is intended to counter this tendency, and yet not to be a hinderance to the insertion of paper into the tray when loading is necessary. Enabling this all to occur in a very simple structure is a leaf spring shown at 64 mounted on the underside of the restraint (the upper side in Fig. 17). Spring 64 allows for frictional sliding contact with tray 23. Thus, when one desires to insert paper into the tray the restraint is slid back, paper is inserted, and the restraint slid back into the position in which it is shown in Figs. 1 and 15 snugly maintaining paper in proper location. Obviously this cooperates with the other anti-skew mechanisms in assuring that, at

the beginning of each feed cycle, and certainly after repetition of feed cycles each newly presented top sheet of paper is in the appropriate position vis-a-vis its front/back location in the tray.

From the description which has been given above with respect with the several improvement mechanisms which deal with the problem of skew, the concerns outlined earlier herein are clearly dealt with in a simple and effective manner.

Industrial Applicability

The invented printer with improved anti-skew performance is applicable to many printing systems. It provides a low-cost manner of preventing skew. While the best mode and preferred embodiment of the invention have been described, variations and changes may be made without departing from the spirit of the invention.

Claims

1. A printer (20) with improved anti-skew performance comprising:
 - drive means including a drive roller (26a, 26b, 26c) for feeding print media into the printer (20); and
 - media alignment means operatively associated with said drive means for properly positioning such media, including a pressure plate (27) having a platen (32) and a relatively moveable member (35) mounted on said platen, for bringing such media into contact with said roller (26a, 26b, 26c).
2. A printer (20) according to claim 1, wherein said platen (32) has a recessed area (34) and said moveable member (35) includes two raised projections (36,37) laterally-spaced on said member (35).
3. A printer (20) according to claim 1 or 2 wherein said media alignment means further includes a wrapper (29) curved around a portion of said roller (26b).
4. A printer (20) according to any of claims 1 to 3 wherein said media alignment means further includes a media edge contactor (28) having a pad (28a) that presses against such media, a mount (46), and a spring (48) attached between said mount (46) and said pad (28a), for biasing said pad (28a) toward said media, wherein said spring (48) is connected to said pad (28a) in such a manner that said pad (28a) resists lateral shifting of such media with more force at one point than at a second point.
5. A printer (20) with improved anti-skew performance comprising:
 - drive means including a drive roller (26a, 26b, 26c) for feeding print media into the printer; and
 - media alignment means, operatively associated with said drive means, for properly positioning such media, including a wrapper (29) curving around a portion of said roller (26b).
6. A printer (20) according to claim 5 wherein said wrapper (29) contacts said roller (26b) at one point.
7. A printer (20) according to claim 5 or 6 wherein said wrapper (29) is spring biased to push against said roller (26b) at one point.
8. A printer (20) according to any of claims 5 to 7 wherein said wrapper (29) includes an arm (29a) that is mounted on a base (42) and that curves toward said roller (26b) and touches said roller (26b) at one point.
9. A printer (20) according to any of claims 5 to 8 wherein said media alignment means further includes a media edge contactor (28) having a pad (28a) that presses against such media, a mount (46), and a spring (48) attached between said mount (46) and said pad (28a), for biasing said pad (28a) toward said media, wherein said spring (48) is connected to said pad (28a) in such a manner that said pad (28a) resists lateral shifting of such media with more force at one point than at a second point.

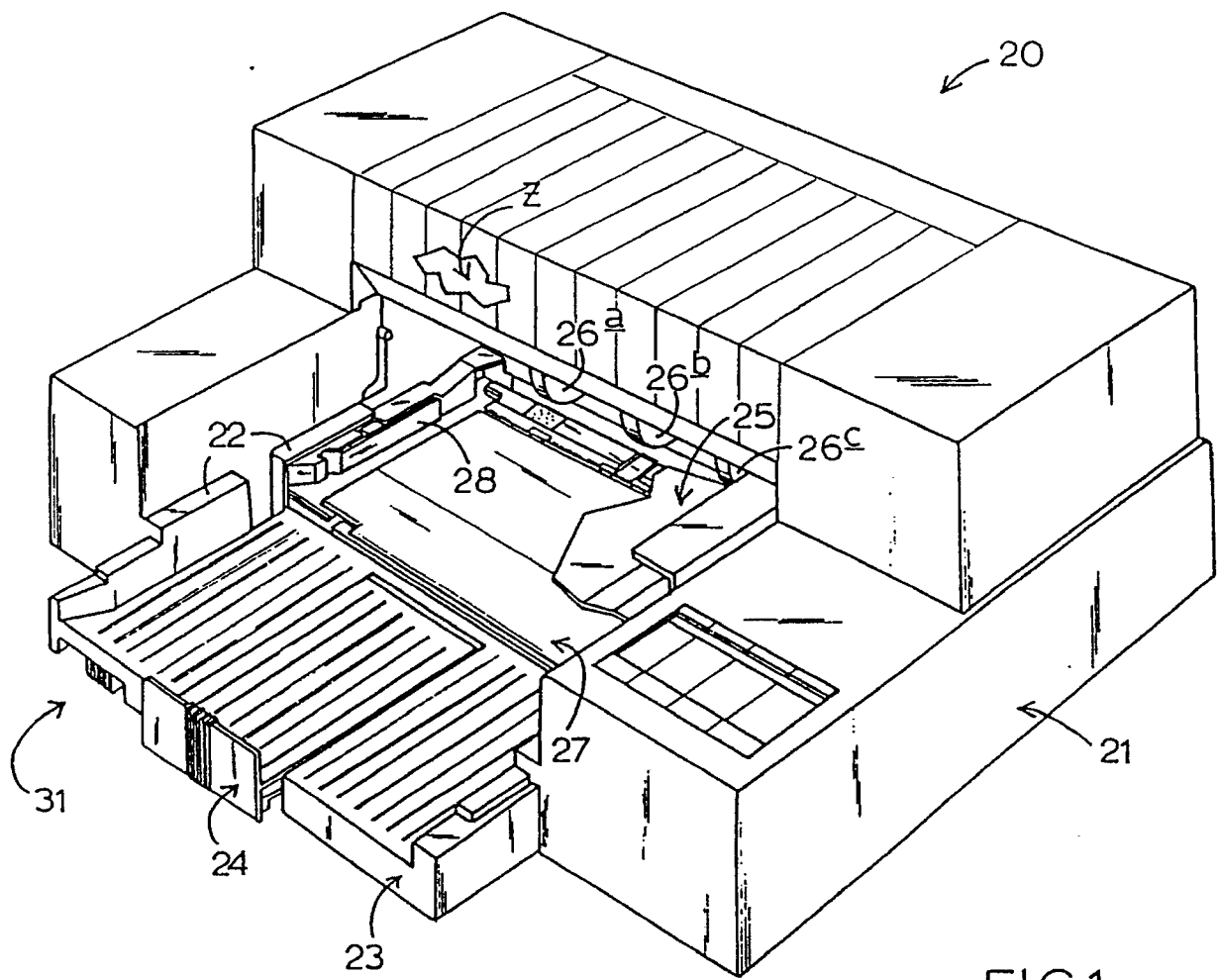


FIG.1

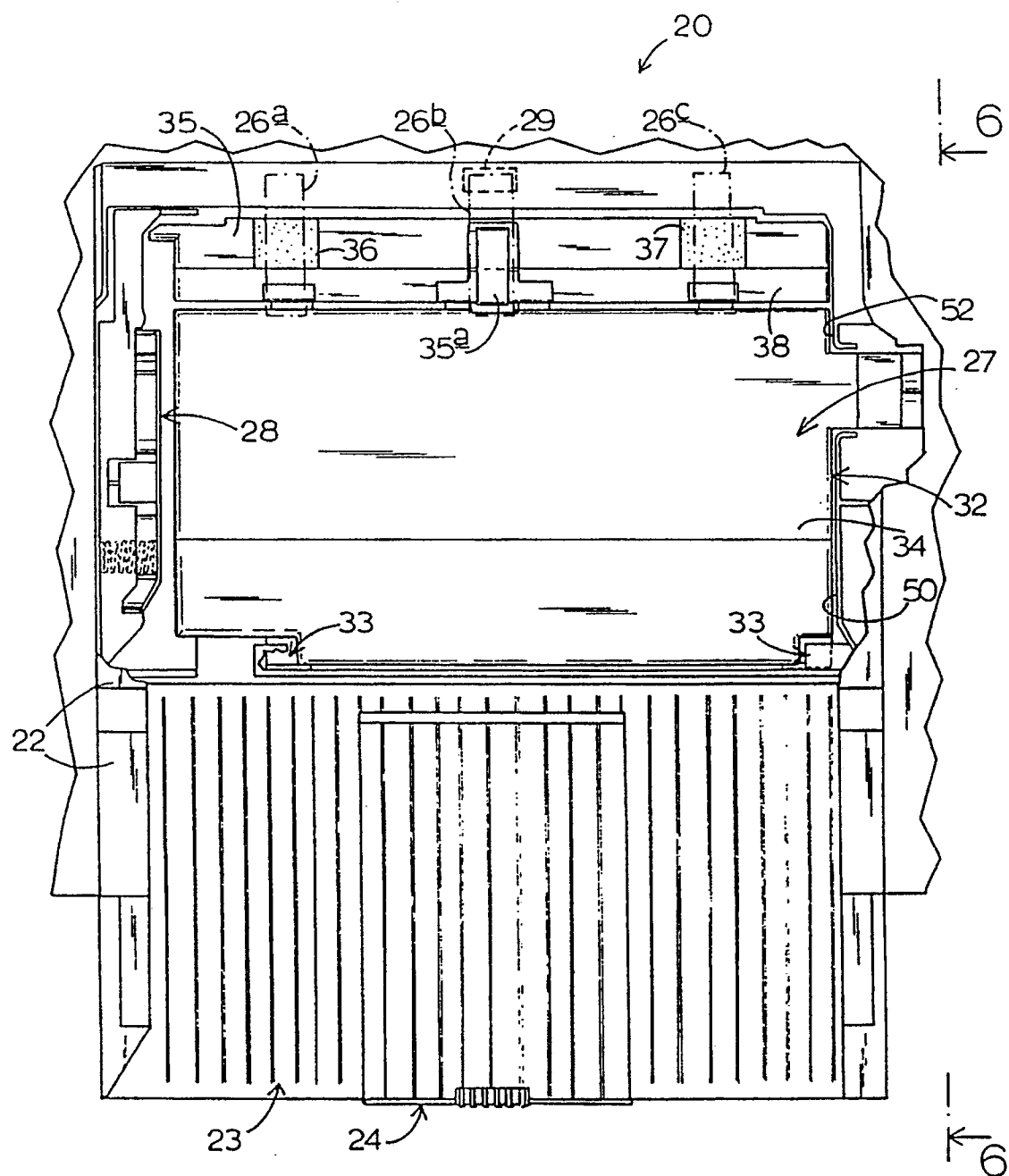
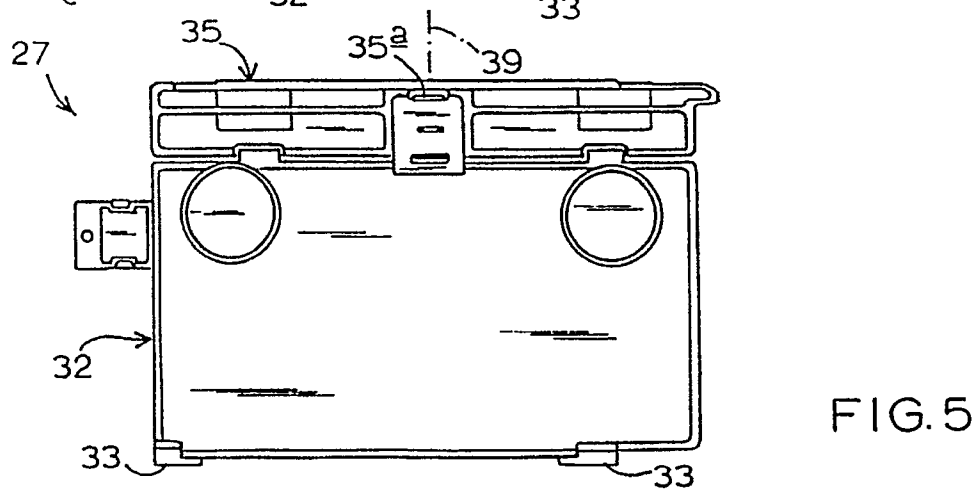
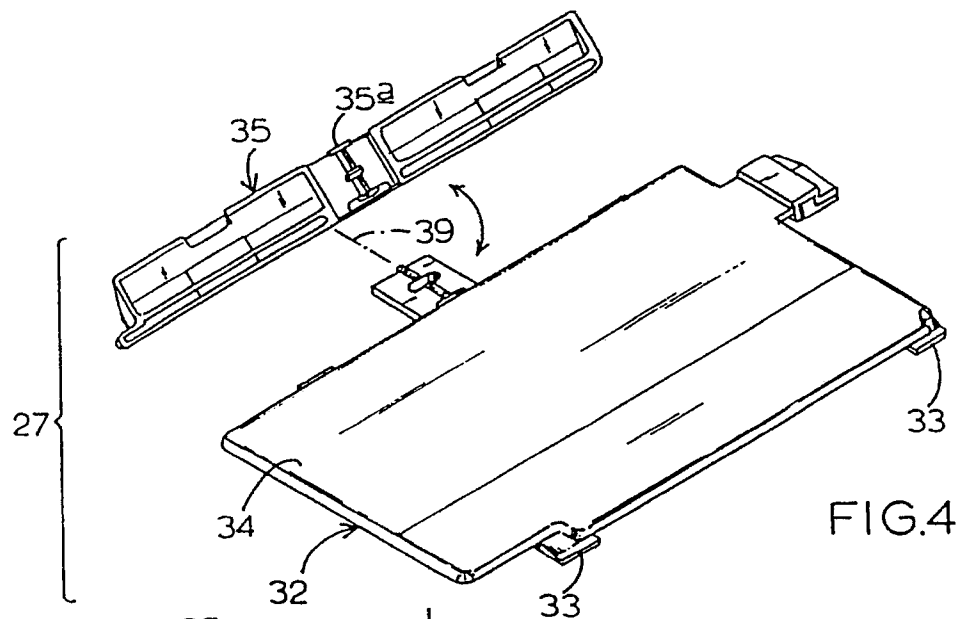
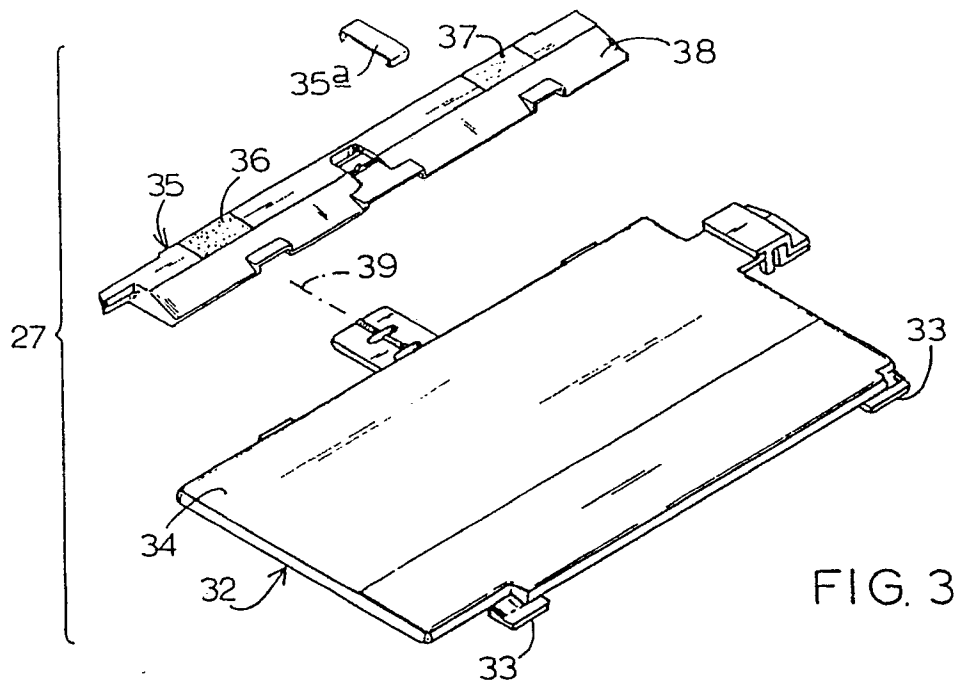


FIG. 2



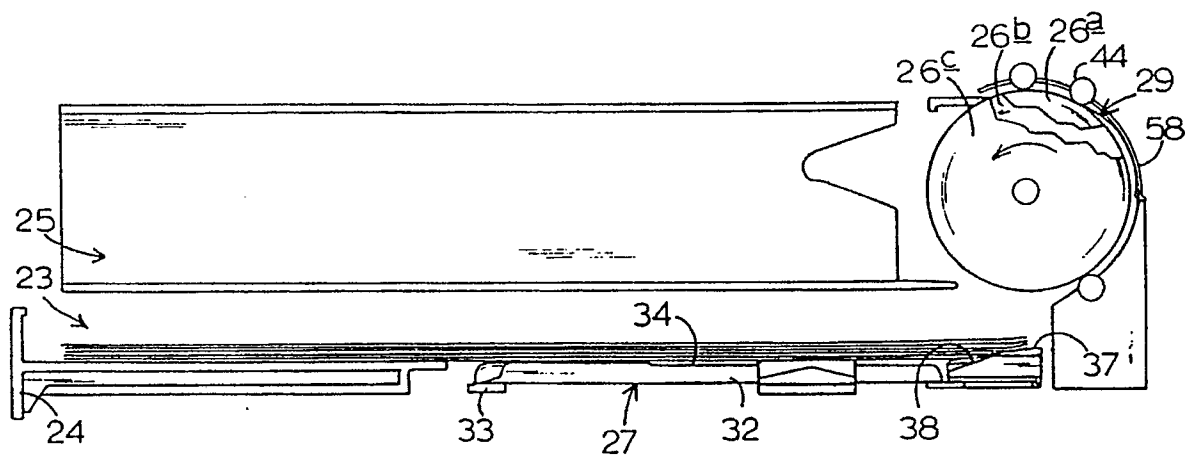


FIG. 6

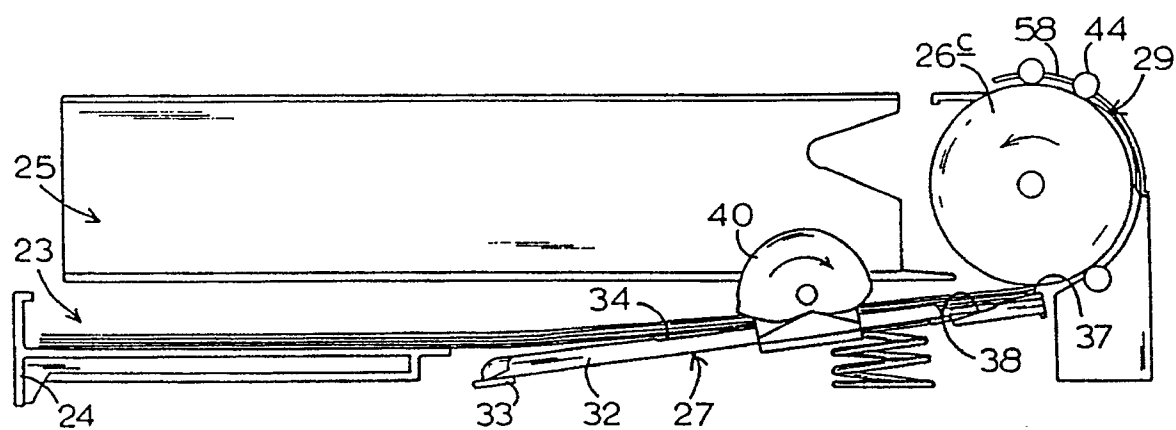


FIG. 7

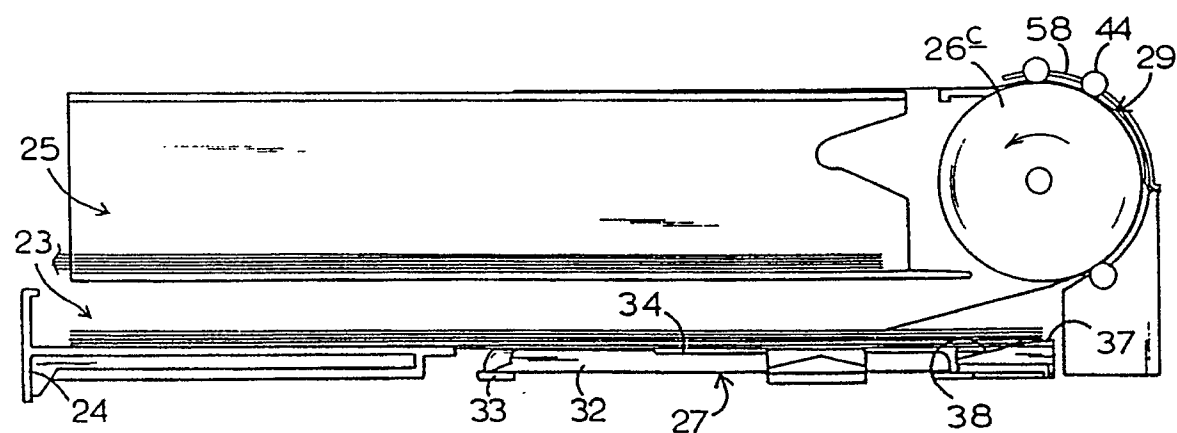
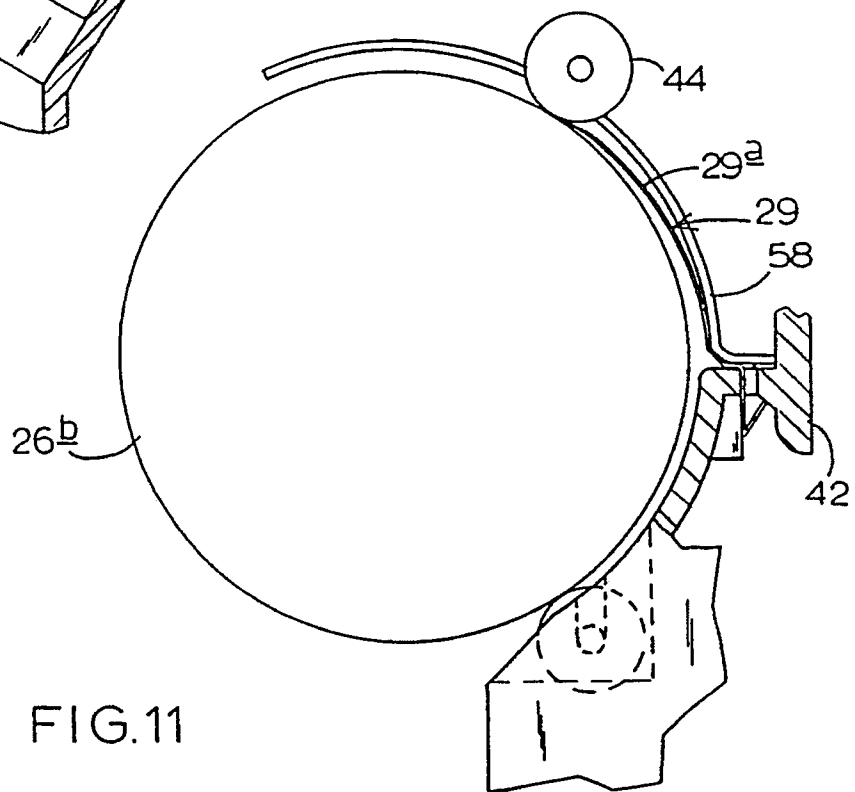
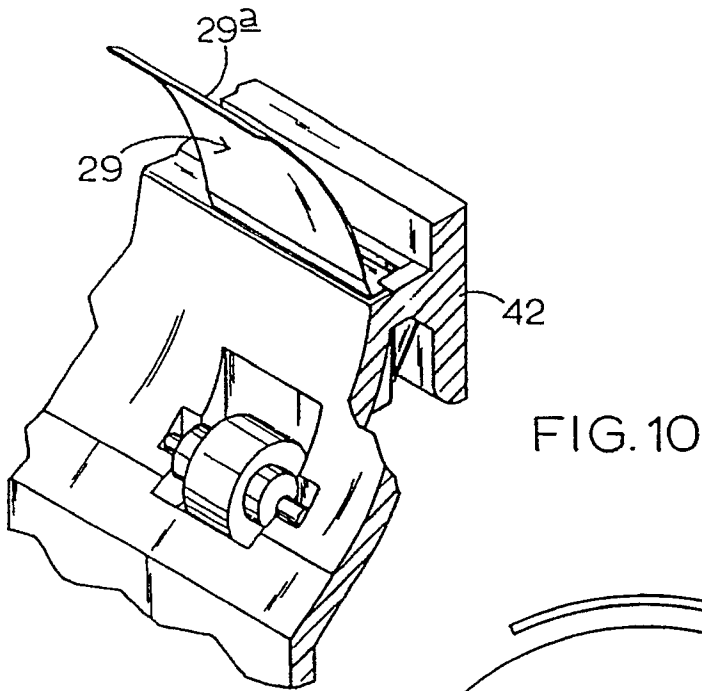
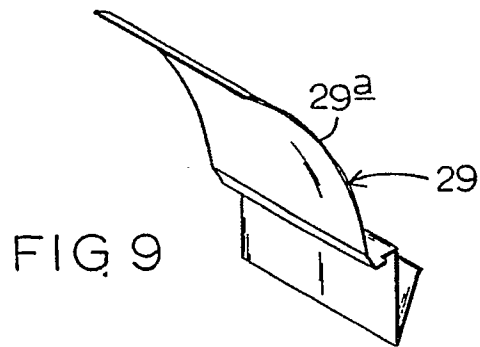
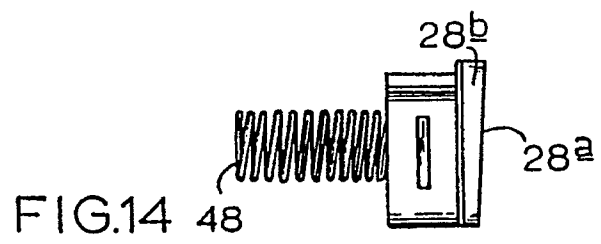
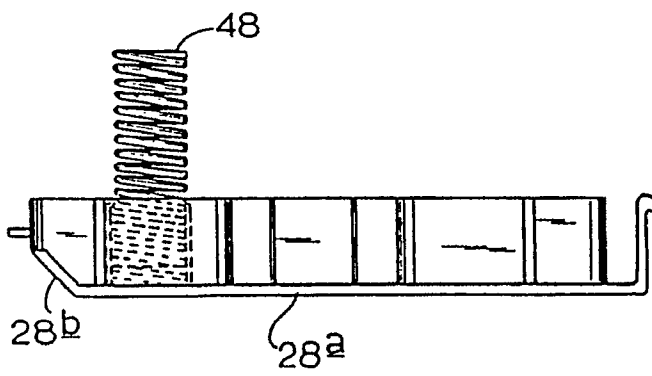
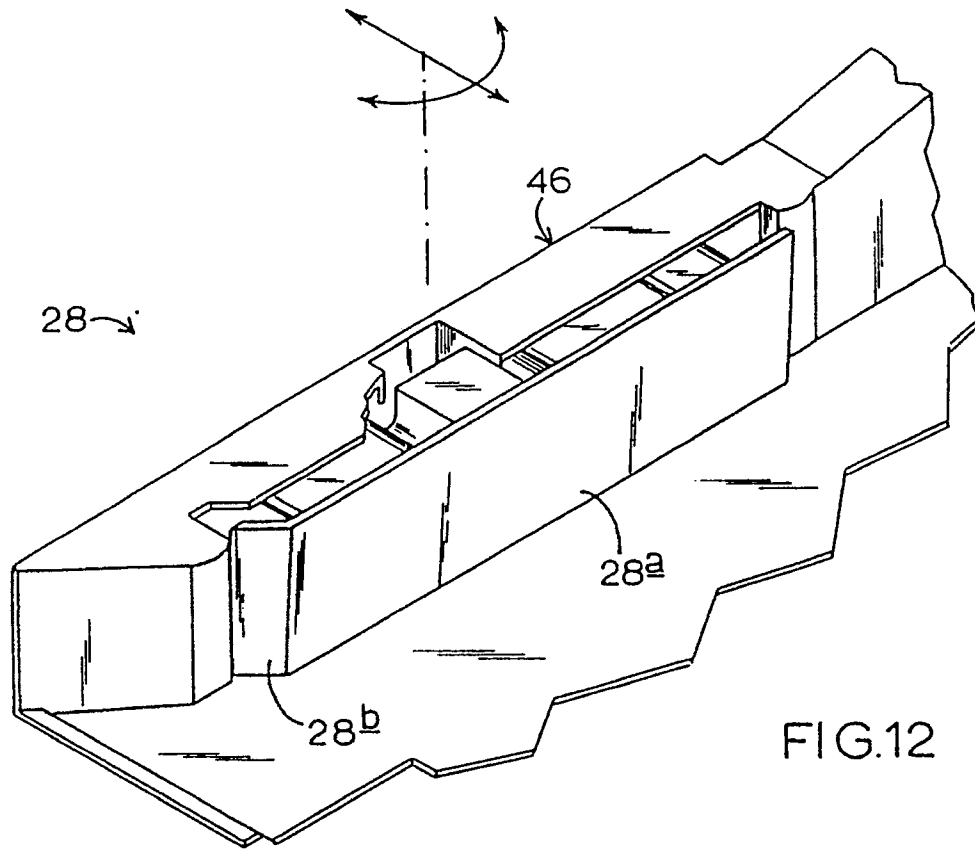


FIG. 8





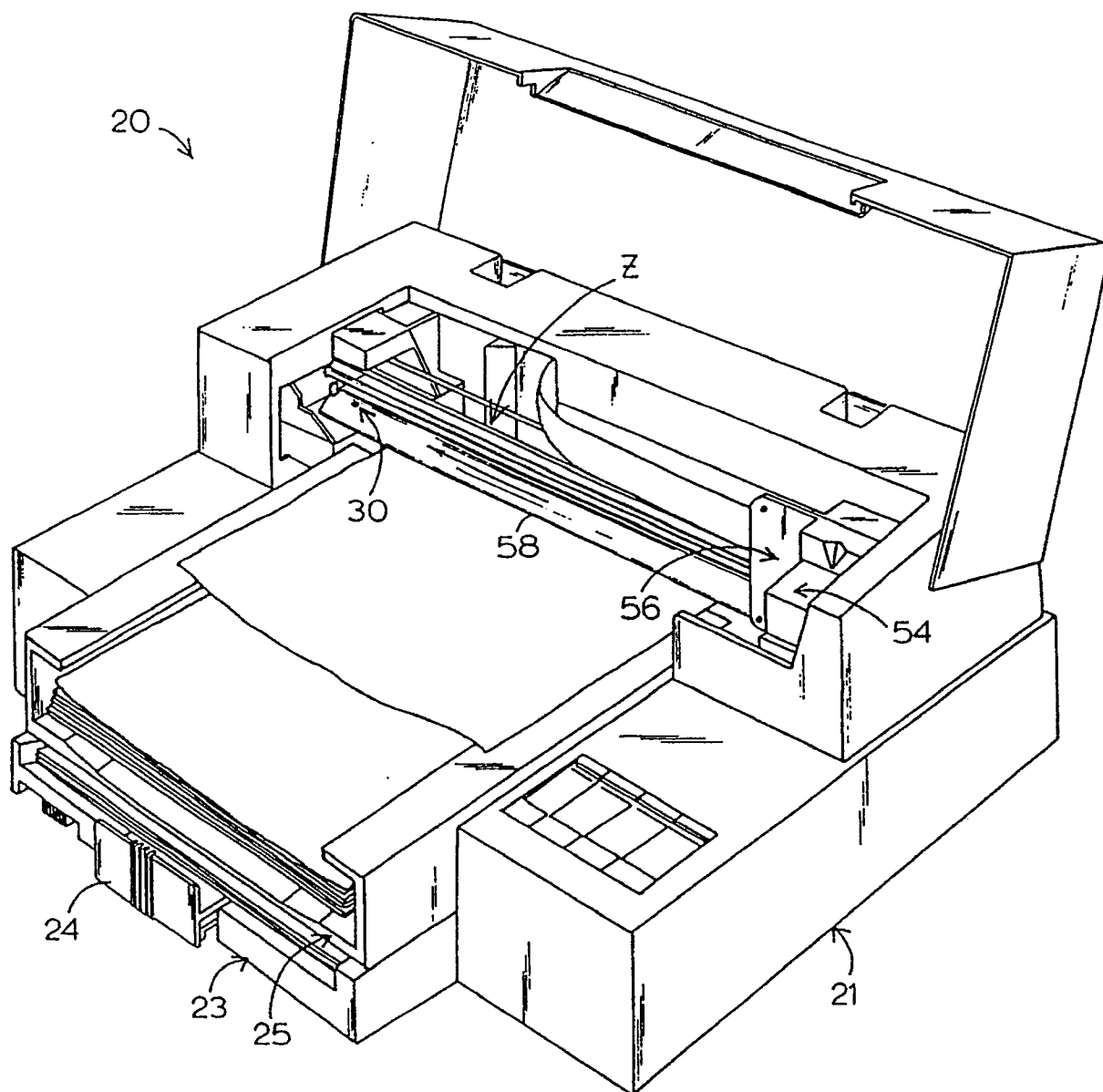


FIG.15

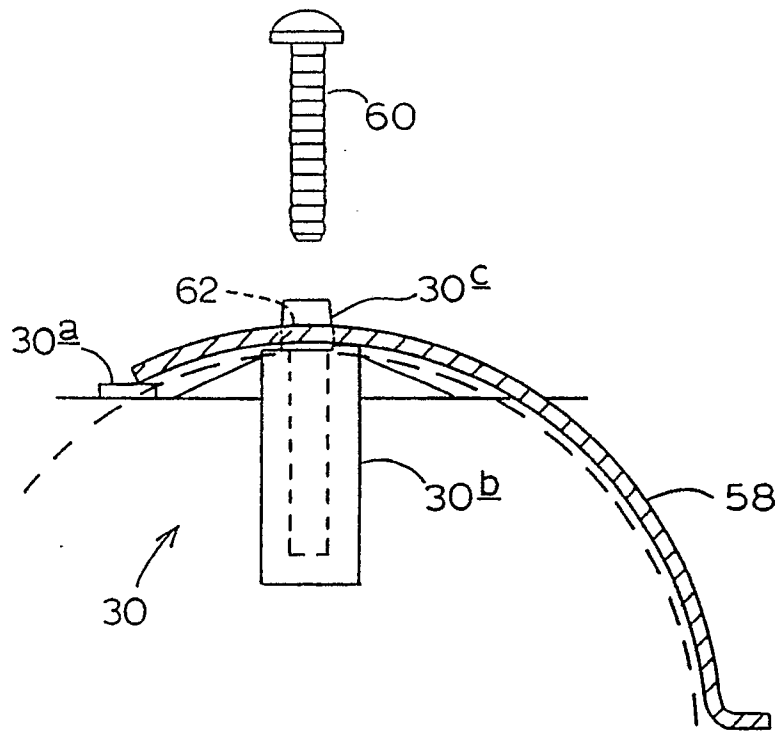


FIG. 16

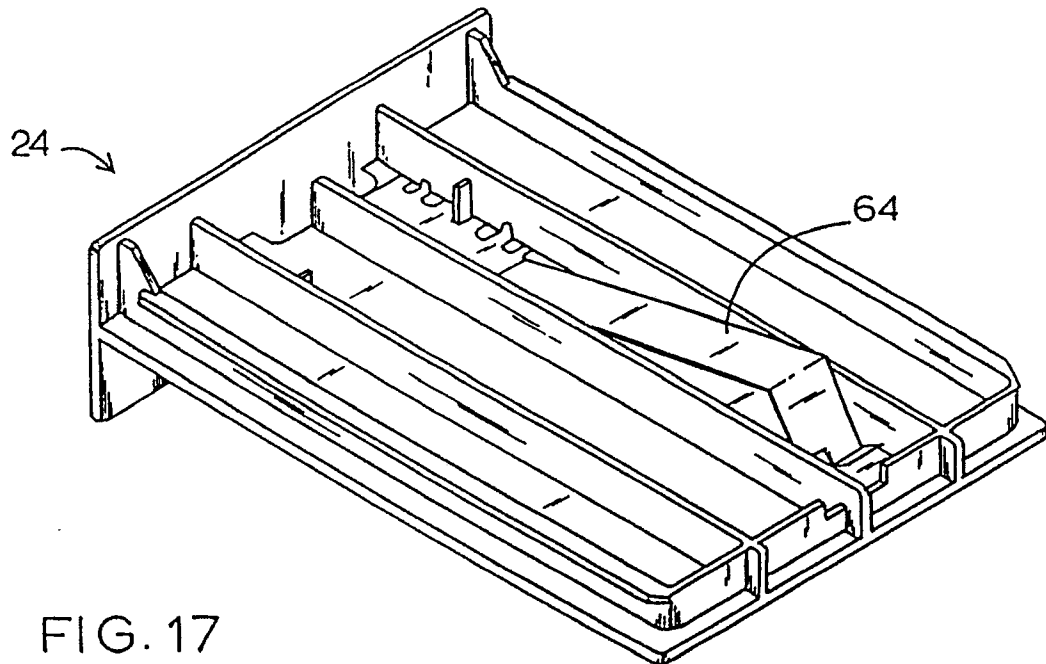


FIG. 17



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 90313455.9

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	<u>GB - A - 2 195 614</u> (RICOH) * Totality * --	1,5	B 41 J 13/00 B 65 H 3/06
A	<u>US - A - 4 294 556</u> (RIX) * Fig. 1; abstract * --	3,5,7, 8	
A	<u>EP - A - 0 029 200</u> (SIEMENS) * Fig. 1; abstract * --	3,5,7, 8	
A	<u>US - A - 2 808 262</u> (KEIL) * Fig. 2; column 3, lines 38-56 * ----	4,9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 41 J B 65 H
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 04-03-1991	Examiner MEISTERLE
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		I : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	