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EUROPEAN PATENT APPLICATION

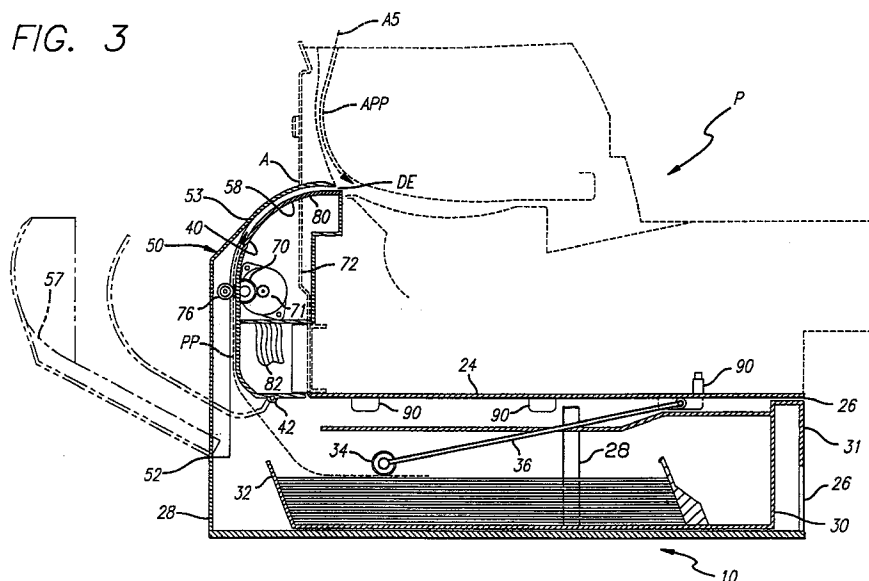
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direction for feeding paper to the single sheet paper path in the printer through an access aperture (160) in the rear wall of the printer. Paper drive rollers (70) and an electrical resistance paper pre-heater (80) are mounted in the apparatus proximate the discharge end of the paper path such that pre-heated paper can be immediately fed at the appropriate location of the paper path in the printer, preferably an inkjet printer.

FIG. 3



Description

Background of the Invention and Prior Art

The present invention relates to computer driven printers and, more particularly, to an accessory unit which holds a high volume of paper or other print media for increasing the capacity of print media supply for an inkjet printer. For ease of reference, instead of the term print media, the term paper will be used herein and is intended to encompass all forms of print media including paper, transparencies, vellum, etc. One example of prior art printer with which the present invention is useful is the Hewlett Packard inkjet color printer Model 1600C which has standard vertically spaced paper input and output trays on the front of the printer as shown and claimed in co-pending application Serial No. 08/055,650 filed April 30, 1993 and assigned to the assignee of the present invention.

The standard paper input tray shipped with the printer has a capacity of about 180 sheets of paper resulting in frequent print stoppage for replenishment of the paper supply in the input tray during high volume printing. It is desired to reduce the amount of printer downtime due to reloading of the input tray.

Ordinary paper trays comprise rectangular bins having vertical walls with multiple springs and pressure plates to urge the stack of paper upwardly against drive rollers to permit reliable paper feeding. Another type of tray, particularly useful with the present invention, has a slanted wall at the paper output end which is designed to permit the surface tension of the paper in the tray to be broken with the paper being physically stacked in the tray at an angle as disclosed in United States Patent No. 5,377,969 dated January 3, 1995 to Steinhilber. Trays of this type employ an articulated paper pusher arm mounted in either the paper tray or the printer housing which urges the top sheet of paper in the tray toward the printer paper feed mechanism.

Also, as is well known, inkjet printers apply wet ink to the paper or other print medium which is preheated before application of the ink to prevent or at least minimize shrink banding of the paper. Accordingly, the HP 1600C color inkjet printer referred to above incorporates a paper pre-heater in the path of movement of the paper from the standard input tray, the pre-heater being located immediately before the paper reaches the print zone.

A primary objective of the present invention is to provide an accessory unit which holds a high volume of paper and a method of supplying paper from the high volume supply unit to the paper transport path in a printer such as an inkjet printer.

A further objective of the present invention is to efficiently guide and transport paper from a relatively large capacity (as compared with the standard input tray) auxiliary paper input tray to the print zone of known printers without substantial modification of the printer design.

Another objective of the present invention is to use a portion of the known printer's paper transport and guide means in the paper transport path which extends from an existing manual single sheet paper feed input slot to the print zone to guide the paper to the print zone.

Summary of the Invention

In its broadest aspects, the present invention provides a high volume auxiliary media input unit for introducing media sheets into an inkjet printer which has a primary input tray on one side of the inkjet printer and a secondary single sheet media input slot, comprising:

- a) a tray cabinet having an upper surface for supporting a printer thereon and having a receptacle in said cabinet for receiving a print media tray;
- b) a print media tray moveable into and out of said cabinet; and
- c) means in said cabinet for guiding and moving individual print media sheets from the top of a stack of sheets in said tray to introduce said sheets into a media transport path which extends in an inkjet printer from said secondary input slot to a print zone in said printer.

The present invention further provides an inkjet printer system comprising:

- a) a printer unit having a media transport path extending from a media feed slot to a print zone; a primary media feeder on a front side of said printer unit including a first tray for holding a stack of media sheets to be moved along said transport path; and a secondary media feed slot in said printer unit which secondary feed slot is separate and apart from said primary media feeder; and
- b) a high volume auxiliary media input unit for introducing media sheets into said printer unit comprising a tray cabinet having an upper surface engaging a bottom of said printer unit and supporting said printer unit thereon; a receptacle in said cabinet for receiving a print media tray; a high volume print media tray moveable into and out of said receptacle; and means in said cabinet for guiding and moving individual print media sheets from the top of a stack of sheets in said high volume media tray to introduce said sheets into said transport path between said secondary feed slot and said print zone.

The present invention also provides a method of supplying paper to a paper transport path of a printer comprising the steps of:

- a) providing a printer having a cover, a single sheet media supply slot, and a printer media input tray accessible from a front side of the printer cover, said media transport path extending from both the

- media input tray and the media input slot to a print zone in said cover;
- b) providing a high capacity media supply unit having a top surface and a high capacity media supply tray;
- c) positioning said printer on said high capacity media supply unit; and
- d) moving individual sheets of media from said high capacity media supply tray into said transport path between said single sheet media supply slot and said print zone.

Brief Description of the Drawing

Figure 1 is an exploded perspective view of a high volume paper supply unit which includes paper transport apparatus for feeding print media to the transport path in an ink jet printer which extends from an individual sheet reception slot and in which the printer is supportable on the apparatus.

Figure 2 is a rear perspective view showing pivotally mounted housing and convex media guides which define a paper path therebetween shown in their open or inoperative positions.

Figure 3 is a cross-sectional side elevation view of the apparatus.

Figure 4 is a front perspective view of an inkjet printer positioned on and aligned with a high volume auxiliary paper supply unit having its high volume tray accessible from the front side of the printer.

Figure 5 is a rear perspective view of the printer cover showing a conventional rear cover panel being removed.

Figure 6 is similar to Fig. 2 and shows a rear perspective view of the printer positioned on the paper supply unit with a new rear cover panel installed and engagement of an alignment stop on the paper supply unit with edges of a rear side printer cover opening.

Description of the Preferred Embodiment

As seen in Figure 1 the paper supply unit of the present invention comprises a generally rectangular tray cabinet 10 having forwardly and rearwardly extending narrow sections 12, 14. Cabinet 10 also has vertically extending front, rear and side walls 16, 18, 20a, 20b, 20c and a substantially flat upper wall 24 which provides a flat surface for supporting a printer P (shown in phantom) thereon. The front side of the cabinet has an opening 26 which receives a print media tray 30 moveable into and out of the cabinet along a path which extends generally from the front or first side of the cabinet toward the rear or second side of the cabinet as shown. Apertures 27, one of which is seen in Fig. 1, are provided in each of the walls 20c of cabinet 10 and are aligned with similarly sized paper viewing apertures 28 (Fig. 3) in the vertically upstanding sidewalls of paper tray 30, described below, when the tray is in its operative position in cabinet 10.

Although the paper tray 30 itself forms no part of the present invention, the tray has a handle 31 and an upwardly inclined rear wall 32 against which the uppermost sheet of paper is pushed by a power-driven roller 34 mounted on the end of an articulating arm 36 which is in turn pivotally attached to the underside of the upper wall 24 of the cabinet. Powered rotation of the roller 34 urges the uppermost sheet of paper against the angularly disposed rear wall 32 of the tray such that the paper enters a paper path PP, indicated by the dashed line and to be described below, for transport to the printer. The articulating arm 36 is designed such that angular passive sheet separation is achieved when the roller drive force on the top sheet of the paper is greater than the frictional resistance force imposed by the angular wall 32. Trays of this type reliably can hold various paper weights in quantities ranging from 500 to 1000 sheets or more depending on configuration.

Contained within the tray cabinet 10 and pivotally affixed thereto at either side wall 20a of the rearwardly extending narrow section 14 is a convex print media guide 40 moveable between an operative position shown in solid lines in Figures 2 and 3 and an open or access position shown in solid lines in Figure 1 in which the convex guide 40 is pivotally moved to a position in which it extends generally horizontally, i.e., generally in the direction of movement of the print media tray 30. The pivot connections of the guide 40 to the cabinet side walls 20a afford movement of the guide about a first axis 42 proximate the second or rear side of the cabinet.

Also shown in the open or access inoperative position in Figures 1 and 2 is a print media guide housing 50 which is also pivotally affixed to the side walls 20a of the narrow section 14 at the rear of the cabinet 20 for movement about a second pivot axis 52 between the open position shown in Figures 1 and 2 to the closed position seen in Figure 3. The print media guide housing 50 is a molded plastic member having a rear wall 53, a pair of side walls 54, 56 and a plurality of spaced paper guide rails 57 which together provide a concave print media guide surface 58 thereon which, in operative position, is spaced from the convex print media guide 40 such that the convex print media guide and concave housing surface when in operative position, together define the curved print media path PP therebetween. Paper or other print media moving through the paper path is PP discharged in a generally horizontal direction at the discharge end DE of the print path. The housing 50 when in closed position, substantially encloses the print media guide 40 which is nested therein.

A power-driven paper pickup roller 70 or series of rollers aligned on a common axis as well as a roller drive motor 71, is mounted in an enclosure 72 on the interior side of the convex print media guide 40 in the location best seen in Figure 3. Enclosure 72 is also provided with an access door, not shown, for accessing the motor and drive roller(s) 70 when guide 40 is in its open or inoperative position. In opposed relationship to the

powered roller(s) 70 are one or more spring biased pinch rollers 76 mounted for rotation about a common axis on the print media guide housing 50 such that the leading edge of a sheet of paper moved from the stack is acquired by the opposed pickup drive and pinch rollers 70, 76 for continuation of its movement along the paper path PP.

Due to the fact that the invention is particularly suitable for use with inkjet printers wherein paper curling is a problem due to the application of liquid ink, an electrical resistance pre-heater 80 is mounted near the discharge end DE of the paper path, preferably on the convex print media guide 40 adjacent the motor and drive roller enclosure 72 as shown. Alternatively, the pre-heater 80 could be mounted on the concave inner wall of the print media guide housing 50.

Although the configuration of the cabinet 20 including the size and shape of its upper printer support surface and the dimensions and position of the discharge end DE of the paper path and its orientation relative to the upper surface of the cabinet will vary depending upon the specific printer P with which the cabinet is to be used, indexing means 90 are provided on the cabinet upper surface which may take the form of upwardly extending posts received in positioning holes in the bottom of the printer or indentations in the top surface of the paper supply unit at the locations at which the support feet of the printer are to be located. In the embodiment shown which is intended for use with a Hewlett-Packard 1600C color inkjet printer, the apparatus is dimensioned to discharge paper or other print media horizontally into the lower portion of auxiliary sheet paper path APP of the printer indicated by a dashed line through an aperture A in the rear wall of the printer specially provided for this purpose. Ordinarily, the printer receives a continuous supply of paper from a paper tray mounted on the front of the printer but the printer also has an auxiliary input slot AS at the top of the printer for receiving individual sheets hand-fed to the printer downwardly in a generally vertical direction. When the auxiliary paper slot AS is used, the sheets automatically move downwardly through the printer auxiliary paper path APP which changes direction to a generally horizontal orientation at the location shown. The discharge end DE of the paper path of the print media transport apparatus of the present invention introduces paper into the auxiliary paper path APP at the location shown in the transition from its vertical to generally horizontal direction. This additionally presents paper for same side printing from either paper tray to avoid confusing the user in loading paper. Additional indexing means 90 in the form of vertically oriented pins extending upwardly from the upper wall support surface 22 of the cabinet into receptacles in the underside of the printer may also be provided for proper orientation of the printer relative to the print media transport apparatus.

The type and configuration of the electrical resistance paper pre-heater 80 can vary but, in general, the pre-heater will comprise a serpentine electrically con-

ductive strip bonded to a flexible plastic substrate which, together with electrical connection leads 82 for the motor 71 and heater 80, can be easily mounted on the convex print media guide 40.

An upstanding rigid flange 100 is rigidly affixed in the location best seen in Fig. 1 to the cabinet 20 to provide side-to-side alignment between the printer chassis and the sheet feeder. Flange 100 also constitutes a stop against which the convex print media guide 40 and motor housing abuts when in its operative position. A horizontally extending tab or tabs 102 on the flange 100 also provide a stop surface against which the print media guide housing 50 side walls abut when in operative position.

In its broadest method aspects as described with reference to Figs. 4-6, the invention involves a method of supplying paper from the high volume supply unit to a paper transport path of a printer which has the usual cover having a rear section 110, a single sheet paper supply slot 120, and a printer paper tray 130 accessible from a front side of the printer. The printer is positioned on the high capacity paper supply unit with its conventional paper supply tray 130 and the high capacity unit's supply tray 30 each accessible from the same direction, namely from the front side of the printer P. Individual sheets of paper are then moved from a stack of paper in the high capacity paper supply tray generally horizontally beneath the printer toward the rear side and the sheets of paper are then introduced into the paper transport path in the printer below the single sheet paper supply slot 120 and upstream of the print mechanism.

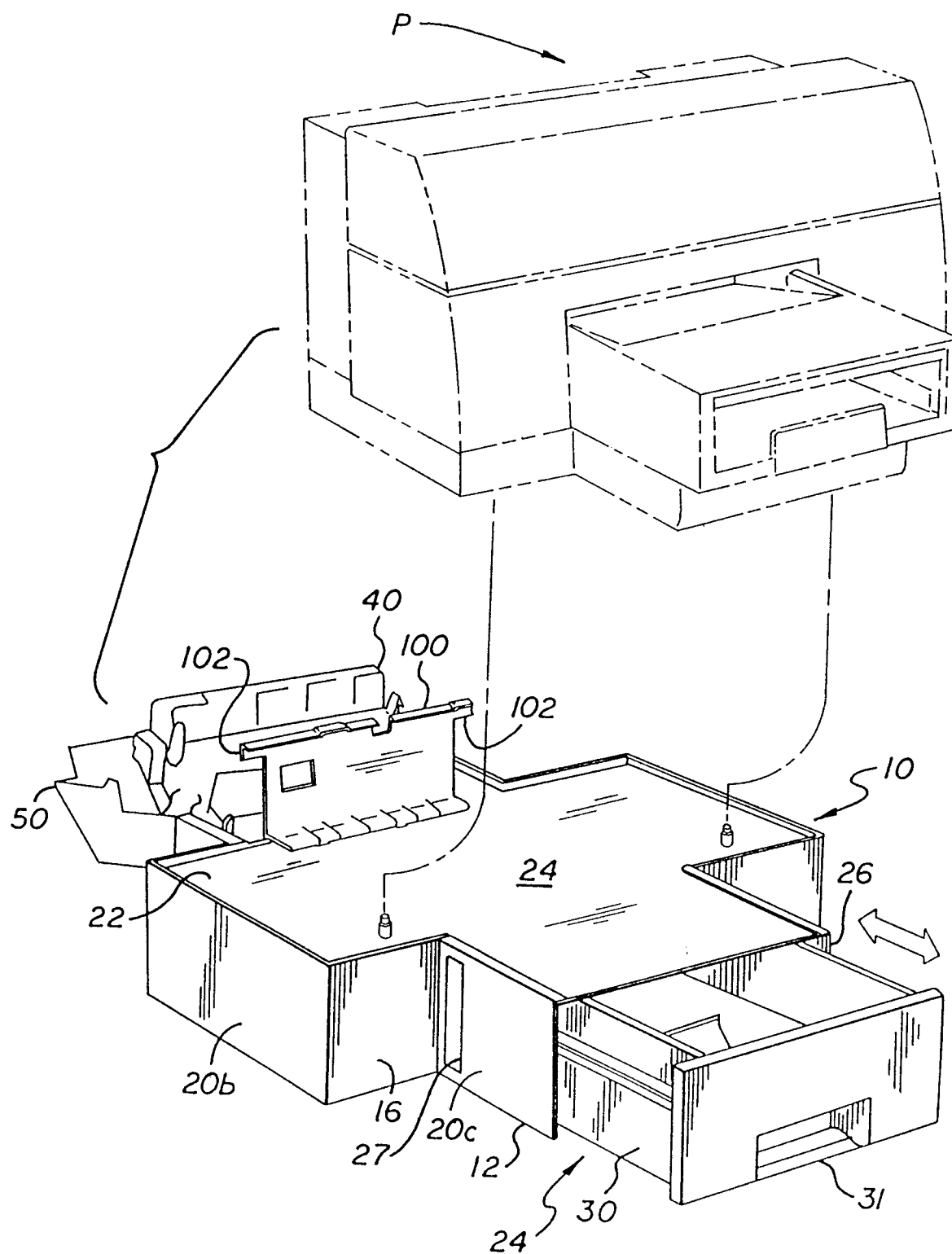
Figure 5 shows a printer having a rear cover section 110 and a removable rear panel 140 which forms the single sheet feeder slot 120 at the top and which provides maintenance access to the paper transport path. This conventional panel 140 is removed and replaced with a new rear panel 150 (Fig. 6) which also forms the single sheet feeder slot 120 at the top thereof and which is shorter in vertical length to leave an uncovered aperture 160 in the rear printer cover section 110 which receives the paper guide 40 and guide housing 50 of the high capacity paper supply unit. The printer P is manually and accurately positioned on the high capacity paper supply unit by aligning the front corners of the printer with those of the supply unit and engaging an edge of the uncovered aperture with the stop flange 100 on the paper supply unit as the indexing means 90 are simultaneously positioned. This macro positioning is easily achieved by the user while enabling micro adjustment built into the transport mechanism to accurately align paper from the supply unit in the printer paper path to avoid paper skew in the printer.

Persons skilled in the art will readily appreciate that various modifications can be made from the preferred embodiment thus the scope of protection is intended to be defined only by the limitations of the appended claims.

Claims

1. A high volume auxiliary media input unit for introducing media sheets into an inkjet printer (P) which has a primary input tray (130) on one side of the inkjet printer and a secondary single sheet media input slot (120), characterized by comprising:
 - a) a tray cabinet (10) having an upper surface (24) for supporting a printer thereon and having a receptacle in said cabinet for receiving a print media tray;
 - b) a print media tray (30) moveable into and out of said cabinet; and
 - c) means (40, 50, 70) in said cabinet for guiding and moving individual print media sheets from the top of a stack of sheets in said tray to introduce said sheets into a media transport path (APP) which extends in an inkjet printer from said secondary input slot to a print zone in said printer.
2. The auxiliary media input unit of claim 1, characterized in that said print media tray (30) is accessible from a front side of said unit, and wherein said means (40, 50, 70) for guiding and moving said sheets is accessible from a back side of said auxiliary media input unit.
3. The auxiliary media input unit of claim 2, characterized in that said upper surface (24) of said cabinet is substantially horizontal and includes indexing means (90) for positioning and supporting a printer thereon.
4. The apparatus of claim 3, characterized in that said means for moving and guiding said media is oriented to discharge print media generally horizontally into said path toward said front side of said cabinet.
5. An inkjet printer system comprising:
 - a) a printer unit (P) having a media transport path extending from a media feed slot to a print zone; a primary media feeder on a front side of said printer unit including a first tray (130) for holding a stack of media sheets to be moved along said transport path; and a secondary media feed slot (120) in said printer unit which secondary feed slot is separate and apart from said primary media feeder; and
 - b) a high volume auxiliary media input unit for introducing media sheets into said printer unit comprising a tray cabinet (10) having an upper surface (24) engaging a bottom of said printer unit and supporting said printer unit thereon; a receptacle (26) in said cabinet for receiving a print media tray; a high volume print media tray (30) moveable into and out of said receptacle; and means (40, 50, 70) in said cabinet for guiding and moving individual print media sheets from the top of a stack of sheets in said tray to introduce said sheets into said transport path (APP) between said secondary feed slot (120) and said print zone.
6. The inkjet printer system of claim 5, characterized in that said primary media feeder (130) and said high volume media tray (30) are each accessible from a front side of the system and wherein said means (40, 50, 70) for guiding and moving are accessible from a back side of said system.
7. A method of supplying paper to a paper transport path of a printer comprising the steps of:
 - a) providing a printer (P) having a cover, a single sheet media supply slot (120), and a printer media input tray (130) accessible from a front side of the printer cover, said media transport path extending from both the media input tray and the media input slot to a print zone in said cover;
 - b) providing a high capacity media supply unit (10) having a top surface (24) and a high capacity media supply tray (30);
 - c) positioning said printer on said high capacity media supply unit; and
 - d) moving individual sheets of media from said high capacity media supply tray into said transport path between said single sheet media supply slot (120) and said print zone.
8. The method of claim 7, characterized in that said media is introduced into said transport path from a rear side of said printer generally opposite said front side.
9. The method of claim 8, characterized in that said high capacity media supply tray (30) is accessed from a front side of the media supply unit.
10. The method of claim 9, characterized in that said printer cover has a removable rear panel (140) providing access to said transport path, and comprising the further steps of removing said rear panel (140) and replacing said removable panel with a new rear panel (150) which leaves an uncovered aperture (160) in said printer cover for reception of media guides of said high capacity media supply unit.

FIG. 1



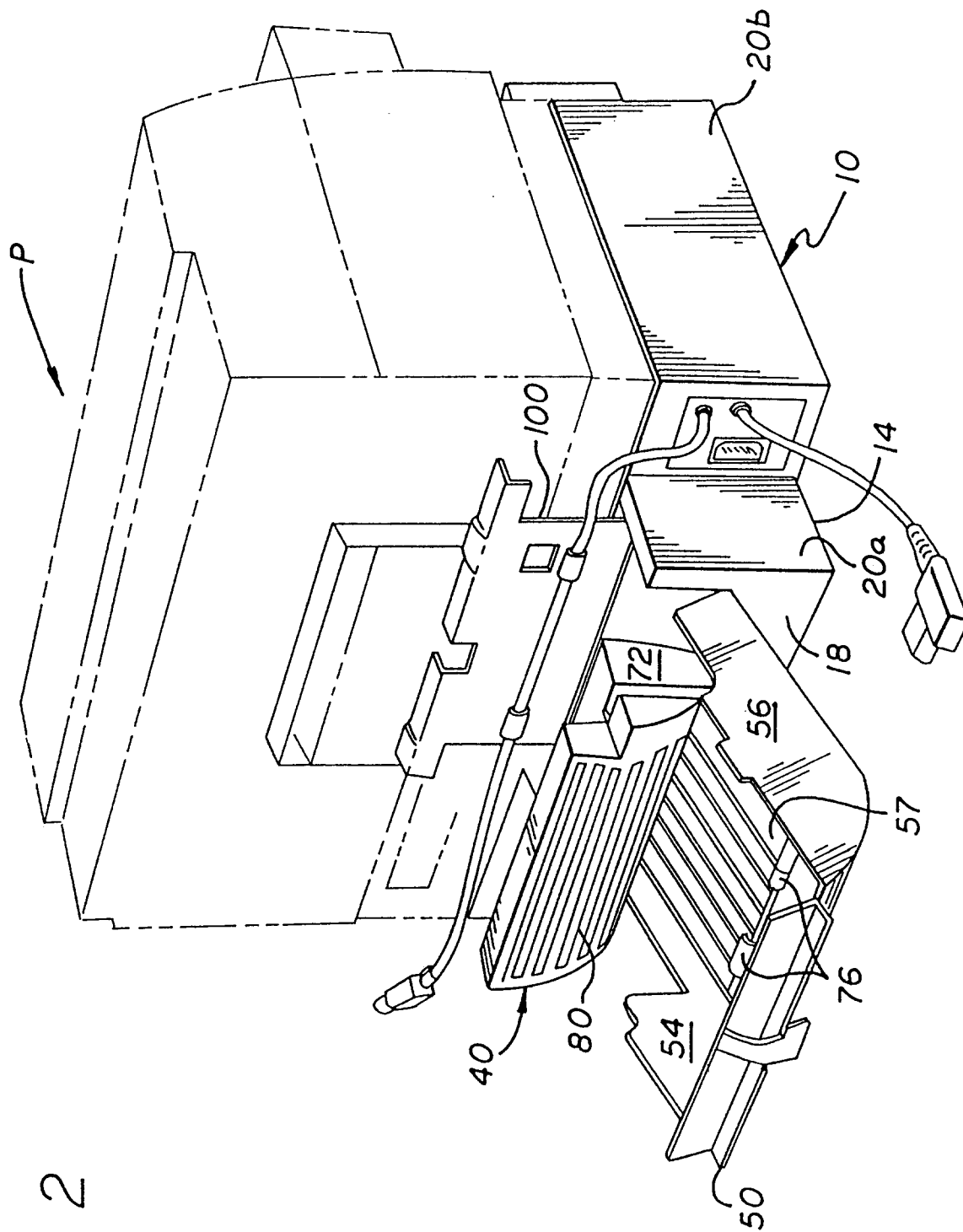


FIG. 2

FIG. 3

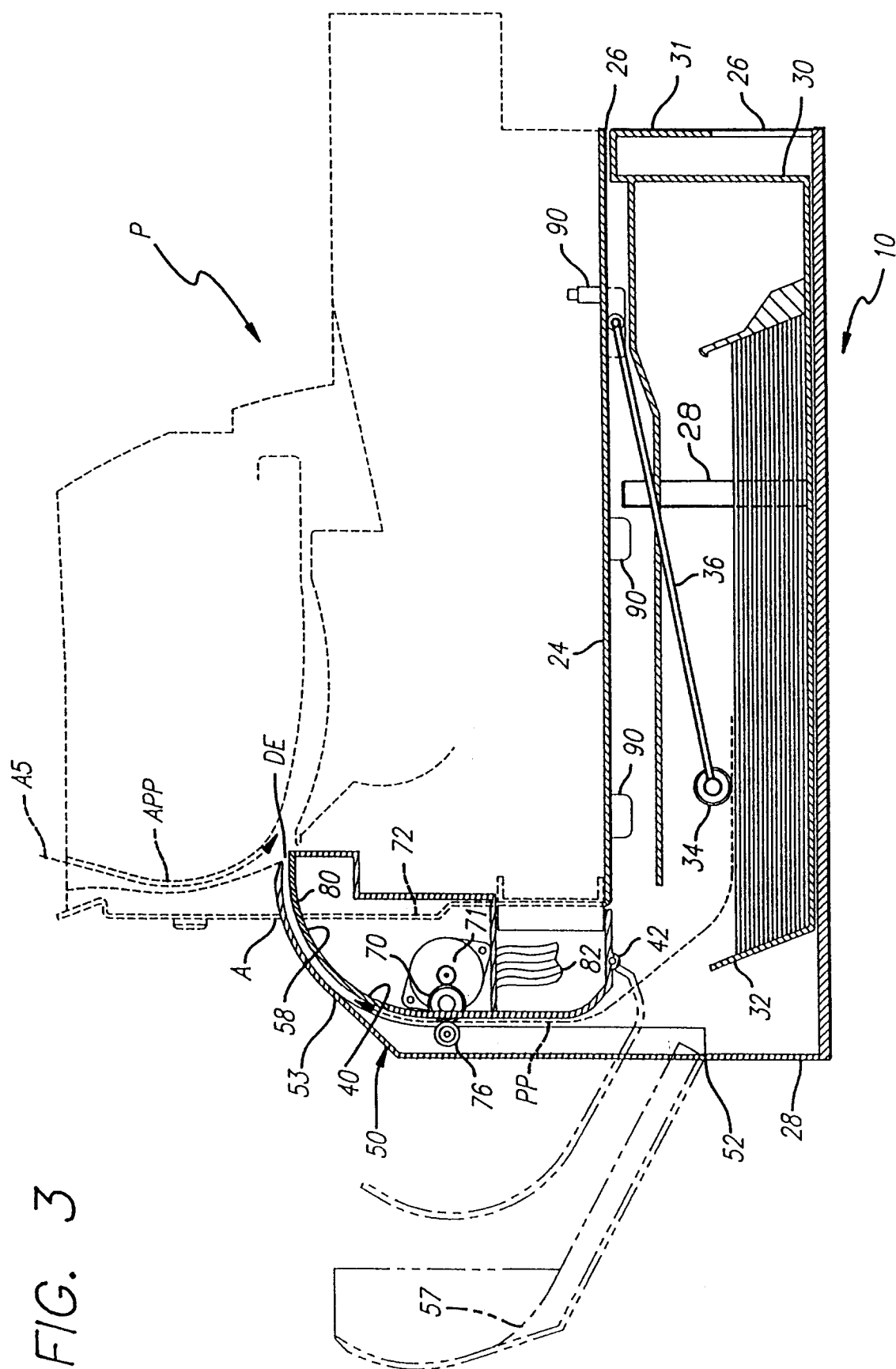


FIG. 4

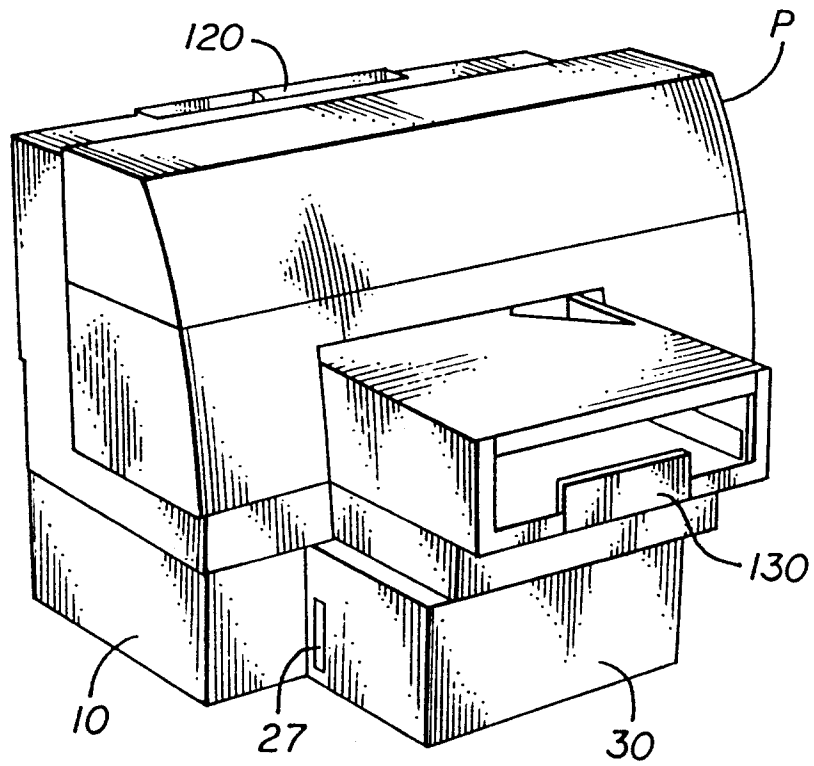
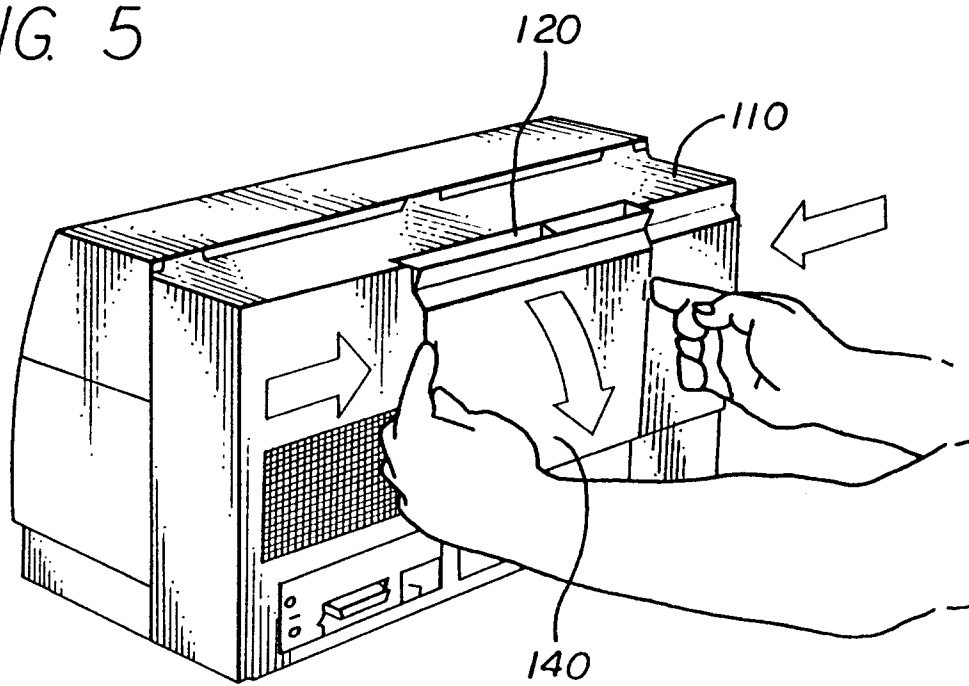


FIG. 5



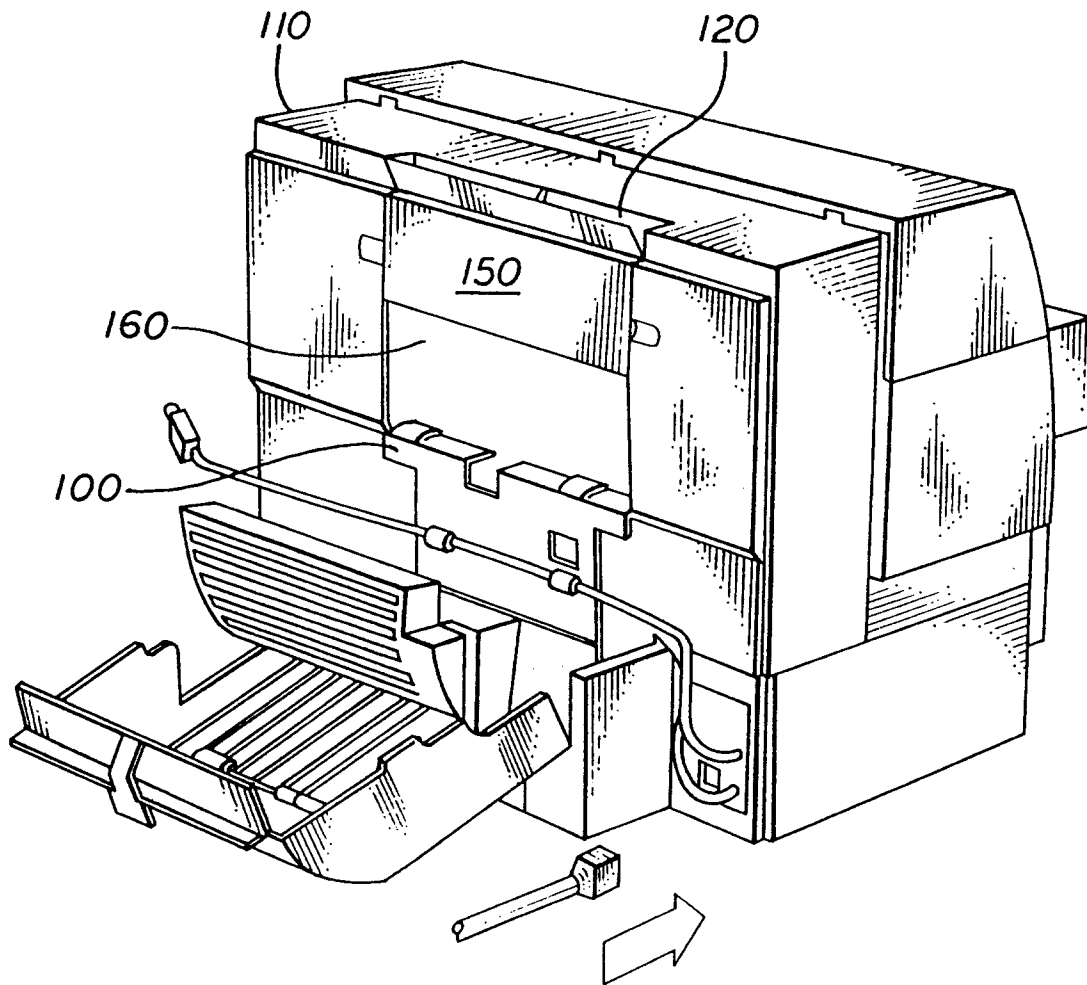


FIG. 6