(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 947 329 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.10.1999 Bulletin 1999/40

(51) Int Cl.[6]: **B41J 2/175**

(21) Application number: **99302527.9**

(22) Date of filing: **31.03.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **06.04.1998 US 55417**

(71) Applicant: **Xerox Corporation**
Rochester, New York 14644 (US)

(72) Inventors:
- **Binnert, Thomas R.**
  Hammondsport, NY 14840 (US)
- **Kupchik, Vladimir M.**
  Pittsford, NY 14534 (US)

(74) Representative:
Walker, Antony James Alexander
W.P. Thomson & Co.,
Coopers Building,
Church Street
Liverpool L1 3AB (GB)

(54) Ink supply container for an ink jet printhead

(57) An ink container for an ink printer is disclosed of the type wherein a foam member (48) is seated within a compartment (62) of the ink container in which ink is drawn by capillary action through an ink outlet port (18) in the container. The compartment (62) also has an air vent from which contact with ink is prevented either by mounting a pair of ribs beneath the air vent (32) to create an air space adjacent the vent (32) or by shaping a portion of a foam member which would otherwise contact the vent.

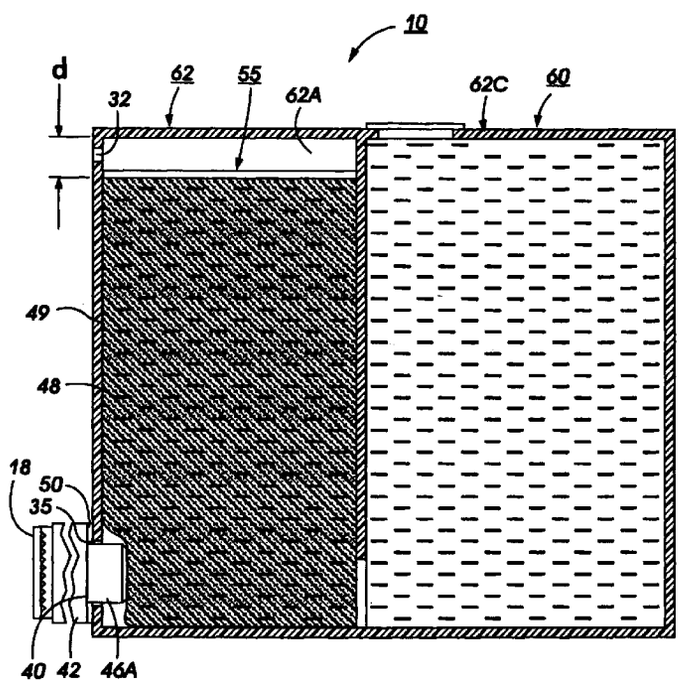

FIG. 2

EP 0 947 329 A2

Description

[0001] The present invention relates to ink recording devices and, more particularly, to an improved ink supply container of the type that delivers ink to a printhead from an ink impregnated foam member stored within a compartment of the container.

[0002] Ink jet recording devices include one or more printheads which eject ink onto a print medium such as paper in controlled patterns of closely spaced dots. To form color images, multiple printheads are used, with each printhead being supplied with ink of a different color from an associated ink container. Thermal ink jet printing systems use thermal energy selectively produced by resistors located in capillary filled ink channels near channel terminating nozzles or orifices to vaporize momentarily the ink and form bubbles on demand. Each temporary bubble expels an ink droplet and propels it toward a recording medium. The printing system is generally incorporated in a carriage type printer. A carriage type printer generally has a relatively small printhead containing the ink channels and nozzles. The printhead is usually sealingly attached to an ink supply container and the combined printhead and container form a cartridge assembly which is reciprocated to print one swath of information at a time on a stationarily held recording medium, such as paper. After the swath is printed, the paper is stepped a distance equal to the height of the printed swath, so that the next printed swath will be contiguous therewith. The procedure is repeated until the entire page is printed.

[0003] Ink from the ink supply container is drawn by capillary action through an outlet port in the container and into a manifold fluidly connecting ink to the printhead. The manifold supplies ink to the ink channels replenishing the ink after each ink ejection or firing from the associated nozzle.

[0004] It is important that the ink at the nozzle be maintained at a negative pressure (sub-atmospheric pressure) so that the ink is prevented from dripping onto the recording medium unless a droplet is expelled by thermal energy. A negative pressure also advantageously ensures that the size of the ink droplets ejected from the nozzle remain constant as ink is depleted from the reservoir. The negative pressure is usually in the range of -0.5 to -2.0 inches. One known method of supplying ink at a negative pressure is to place within an ink container an open cell foam in which ink is suspended by capillary action. The foam is generally a partially saturated, reticulated urethane foam. The absorption of the foam member maintains the ink at a negative pressure at the printhead. Ink tanks which contain ink-holding foam are disclosed, for example, in U.S. Patent 5,185,614, 4,771,295, 5,486,855.

[0005] A problem with this type of foam-delivery ink container is that the foam is inserted into the container so that it contacts all of the internal walls. This results in a portion of ink-impregnated foam contacting the ink tank vent required to maintain the required negative pressure. Typically, the ink builds up a concentration of ink adjacent the vent hole. The vent hole is sealed following initial fill of the container and during shipping, but upon removal of the seal, the ink can "squirt" from the vent hole. Ink can also leak from the vent hole during normal installation of the container.

[0006] According to the present invention there is provided an ink supply container comprising a compartment having a vent hole therein, and a foam member located in the said compartment, wherein the container further comprises means for creating an air space between the foam member and the vent hole thereby to prevent the foam member from coming contact with vent hole.

[0007] According to a first embodiment of the invention, an air space is created adjacent the vent hole of a container by adding a barrier internal to the container and adjacent the vent hole to prevent the foam from coming into contact with the vent.

[0008] Preferably, said barrier assembly comprises a pair of ribs mounted, respectively, to opposed walls of said compartment, the ribs being separated by a gap therebetween.

[0009] According to a second embodiment ofthe invention, a portion of the foam is embossed in the area adjacent to the ink tank vent hole thereby providing an air space between the foam and the vent.

[0010] Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

[0011] FIG. 1 illustrates a perspective view of a full color ink jet printer which incorporates the ink supply container of the present invention.

[0012] FIG. 2 is a cross-sectional view through one of the printhead cartridges shown in FIG. 1.

[0013] FIG. 3 is an exploded view of the manifold to ink tank arrangement of FIG. 1.

[0014] FIG. 4 is an exploded view of the ink tank prior to the foam insertion and ink filling steps showing the structure of a barrier member located adjacent the air vent.

[0015] FIG. 5 shows a foam member which has been embossed to create an air space in an area adjacent the air vent.

[0016] FIG. 1 illustrates a perspective view of a full color thermal ink jet printer 6 which incorporates a preferred embodiment of the foam retention ink container of the present invention. Printer 6 is exemplary only. The invention can be practiced in other types of thermal ink jet printers as well as other reproduction devices such as piezoelectric printers, dot matrix printers and ink jet printers driven by signals from a document Raster Input Scanner. Printer 6 includes four ink containers 10, 12, 14, 16 fluidly connected to a segmented printhead 18. Printhead 18 has groups or segments of nozzles, each group associated with a different ink color. The cartridge is mounted on a carriage 19 supported by carriage rails

20. The carriage rails are supported by a frame 21 of the ink jet printer 6. Each printhead cartridge comprises an ink container containing ink for supply to a ink jet printhead 18 which selectively expels droplets of ink under control of electrical signals received from a controller (not shown) of the printer 6 through an electrical cable (not shown). In a preferred embodiment, the ink container is polypropylene.

[0017] When printing, the carriage 19 reciprocates back and forth along the carriage rails 20 in the direction of the arrow 21, the entire width traverse constitutes a scanning path. The actual printing zone is contained within the scanning path. As the carriage reciprocates back and forth along a print path and past a recording medium 34, such as a sheet of paper or a transparency, droplets of ink are expelled from selected ones of the printhead nozzles towards the sheet of paper. Typically, during each pass of the carriage 19, the recording medium 34 is held stationary. At the end of each pass, the recording medium 34 is stepped in the direction of the arrow 36. For a more detailed explanation of the operation of printer 8, reference is hereby made to U.S. Patent No. 4,571,599, 4,833,491, and U.S. Patent No. Reissue 32,572, which are incorporated herein by reference.

[0018] FIG. 2 shows a cross-sectional view of a portion of ink container 10 having an outlet port 40 and an air vent 32. Manifold member 42, shown in a perspective exploded view of FIG. 3, comprises a plate 44 with ink pipes 46A-46D. The end of ink pipe 46A is engaged in compressive contact (by means not shown) with an ink impregnated foam member 48 in container 22. Another foam member 50 has a plurality of apertures 52A-52D therethrough and is seated on manifold 42 so as to fit snugly over the ink pipes 46A-46D. When the manifold is in the operative position shown in FIG. 2, foam member 48 is compressed against the foam cover 49 of container 10, except for an area around vent 32 as described below.

[0019] FIG. 4 shows the ink tank 60 prior to installation of foam member 48 and the ink. As shown in FIGS. 2, 3 and 4, each ink container, represented by container 10, contains two compartments. For container 10, a first compartment 60 has ink stored therein. Ink is introduced through ink inlet 61 in top wall 62C. A second compartment 62 has open cell foam member 48 inserted therein. Compartment 62 has side walls 62A, 62B. Ink from compartment 60 moves through port 68 to contact foam member 48 and saturate the member with ink. Referring to FIGS. 2 and 4, and according to a first embodiment of the invention, a barrier assembly 55 creates an air space 56 to prevent any part of foam member 48 from being compressed against the portion of cover 49 containing vent 32. Assembly 55 consists of two ribs 55A, 55B (FIG. 4) mounted to walls 62A, 62B, respectively, and located a distance *d* below the top wall 62C, *d* being about 3 mm in a preferred embodiment. The ribs are aligned so as to leave a gap 63 therebetween. The gap permits air and a small amount of ink to enter into the air space, the ink dropping down into the underlying foam. FIG. 4 shows an empty container 22 to illustrate the location of barrier assembly 55. When foam member 48 is inserted into compartment 62, an air space 56 (FIG. 2) is created. When ink is introduced into compartment 60, the foam member 48 will become impregnated with ink but no ink will contact the vent 32. Following typical shipping procedures, vent 32 will be sealed during transit or storage, typically with a sealing tape. Upon removal of the tape and installation of the container, no ink can be ejected through vent 32 solving the prior art problem.

[0020] A second embodiment of the invention is shown in FIG. 5. For this embodiment, foam member 48 has been embossed along an area 48A which would otherwise contact vent 32, resulting in removal of a foam section 48A.

[0021] Referring to FIG. 4, container 10 has an open face 70 into which the foam 48 is to be inserted. Polypropylene foam cover 49 is welded into place following foam insertion. In order to insert the foam into the internal cavity 62 of the polypropylene ink tank, a fixture is used to compress the foam to 27% of its original size and then push the compressed foam into the cavity until the foam is fully bottomed. During the insertion operation, Teflon-coated fingers are used to compress the foam so that it does not physically contact the walls of the ink tank. This results in no static or dynamic load opposing the insertion motion Once the foam is fully bottomed, a pusher bar protrudes through the compression fingers to hold the foam in place within the cavity as the fingers are retracted. Once the foam is seated, the embossed section 48A results in an air space separating the body of foam member 48 from vent 32 providing the same benefits obtained from use of the barrier member described above.

[0022] While the invention has been described in the context of a thermal ink jet printer, it can also be used in other types of printers where ink is to be supplied to a printhead. Examples are piezoelectric printers, acoustic ink printers and ink jet plotters.

Claims

1. An ink supply container (10) comprising a compartment (62) having a vent hole (32) therein, and a foam member (48) located in the said compartment (62), wherein the container (10) further comprises means for creating an air space between the foam member (48) and the vent hole (32) thereby to prevent the foam member (48) from coming contact with vent hole (32).

2. A container according to claim 1 for holding a foam member (48) in at least one compartment (62) of said container, the compartment (62) having a bar-

rier assembly (55) located internal to said compartment (62) and positioned so as to create an air space adjacent said air vent hole (32).

3. A container according to claim 2 wherein said barrier assembly (55) comprises a pair of ribs (55A, 55B) mounted, respectively, to opposed walls (62A, 62B) of said compartment (62), the ribs (55A, 55B) being separated by a gap therebetween.

4. A container according to claim 1 wherein a body of said foam member (48) has been shaped so as to create said air space when said foam is seated.

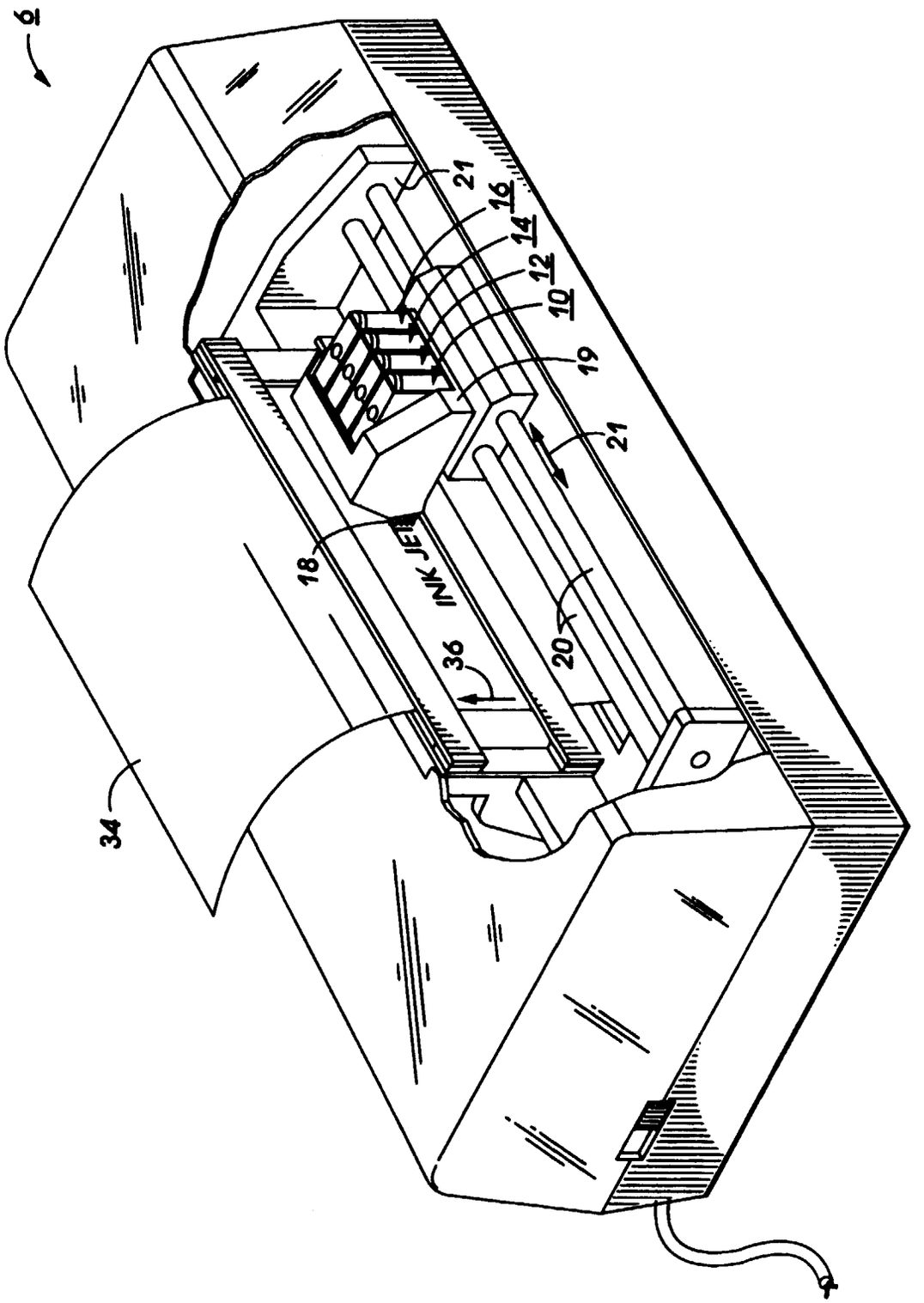

FIG. 1

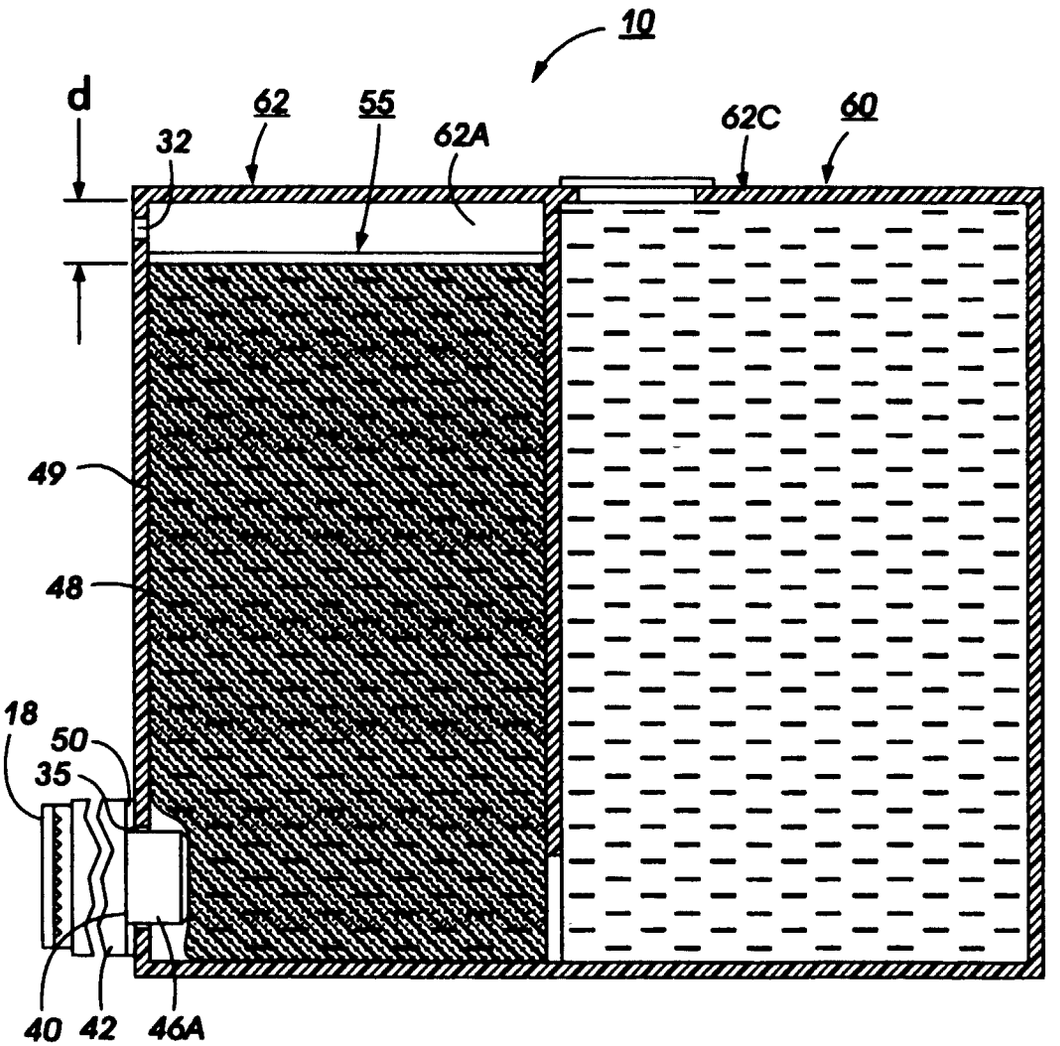

FIG. 2

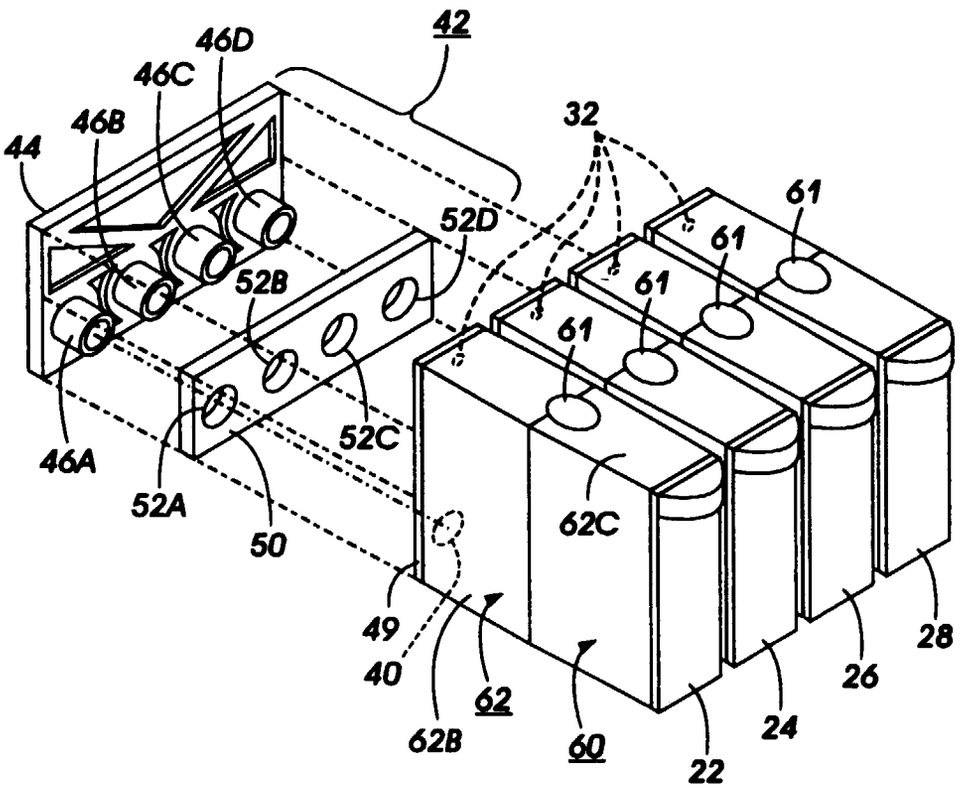
42
46D
46C
46B
44
32
61
52D
52B
46A
52C
52A
50
62C
49
40
62
62B
60
22
24
26
28

FIG. 3

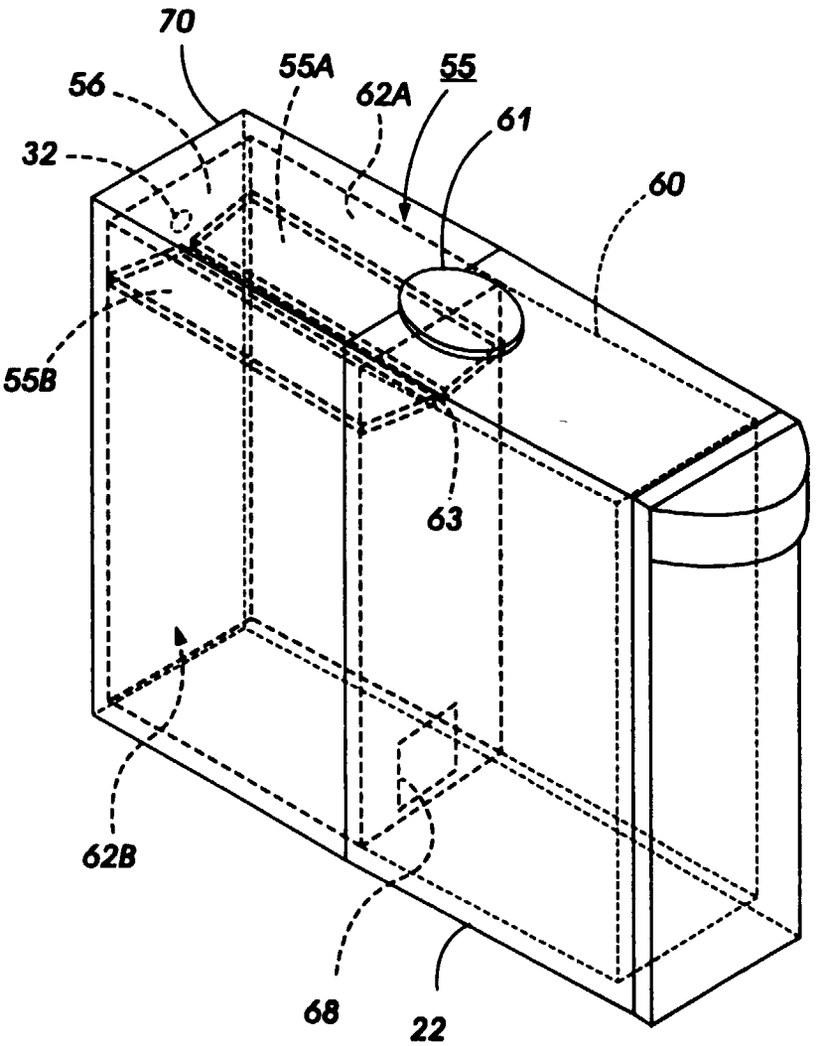

FIG. 4

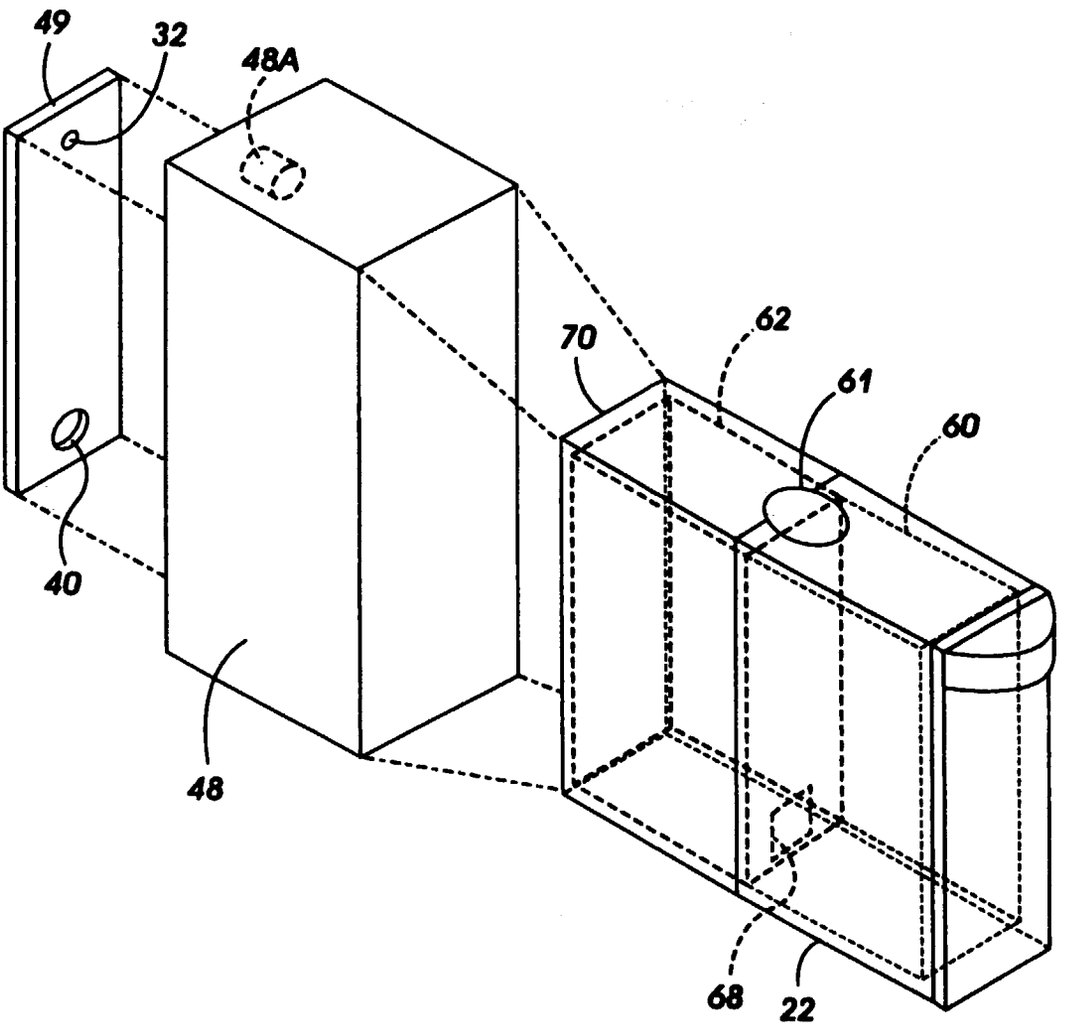

FIG. 5