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(54) **An ink cartridge**

(57) An ink cartridge 10 comprises an ink tank 12 defined by a plurality of surfaces 20, 22, 24, 28, 30. A group of ink outlet apertures 38 is defined in the floor 28 of the ink tank 12. The ink tank floor 28 is flat in the vicinity of the ink outlet apertures 38. The cartridge 10 includes an ink supply port 16 to receive the end of an ink withdrawal needle 82 so that ink can be withdrawn from the tank 12. A seal 44;90 is provided in the ink supply port 16, the seal 44;90 defining an aperture 48;92 to receive an ink withdrawal needle 82 to enable the seal 44;90 to seal around the ink withdrawal needle 82. A cover 50;96 is provided to cover the said aperture 48;92 in the seal 44;90 and to be pierced by the ink withdrawal needle 82. A protective guide 52 may be provided to align the ink withdrawal needle 82 with the aperture 48 and to guide the ink withdrawal needle 82 into the aperture 48.

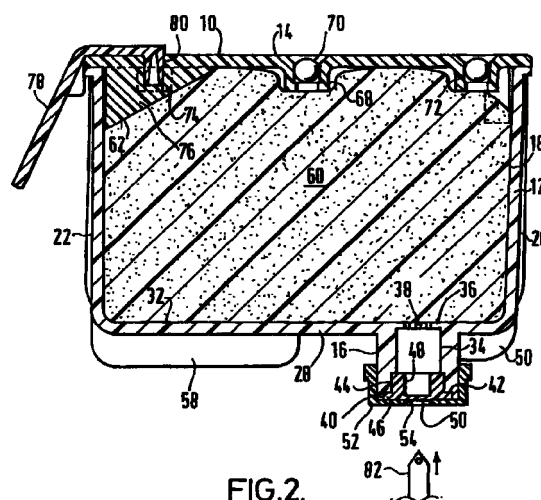


FIG. 2.

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Description

[0001] The invention relates to an ink cartridge.

[0002] A known ink cartridge comprises an ink tank and an ink outlet port in the form of a hollow tube intersecting the floor of the ink tank so as to protrude into the ink tank. The ink tank is generally rectangular and has a lid. The ink tank is filled with a porous member in the form of a sponge. The porous member is inserted into the ink tank with the lid removed. Before insertion, the porous member is generally rectangular. Thus, when inserted, the porous member is deformed and compressed by the ink supply port, which protrudes into the tank. A metal mesh filter is affixed to the inner end of the ink supply port. There is a porous member in the outlet port which acts as a wick so that, when the cartridge is inserted into a printer, and the ink withdrawal needle of the printer enters the ink supply port, the porous member in the ink supply port will deform around the ink withdrawal member and wick ink towards it.

[0003] According to one aspect of the invention there is provided an ink cartridge comprising an ink tank defined by a plurality of surfaces, an ink outlet aperture or group of outlet apertures defined in one of said surfaces, the surface defining the said ink outlet aperture or apertures being flat in the vicinity of the outlet aperture or apertures.

[0004] Preferably a porous member is provided in the ink tank adjacent the ink outlet aperture or apertures.

[0005] By means of the invention, the porous member will fit snugly against the flat area of the surface in which the ink outlet aperture or apertures are defined to ensure a good and uninterrupted flow of ink stored in the porous member in the tank through the ink outlet aperture or apertures.

[0006] Preferably, the flat area is substantially centred on the outlet aperture or group of outlet apertures.

[0007] The surface defining the ink outlet aperture or apertures is preferably flat to where it reaches at least one other surface and may be flat to where it reaches two or preferably three other surfaces or most preferably four other surfaces. Indeed, preferably the entire surface defining the ink outlet aperture or groups of ink outlet apertures is flat.

[0008] The surface defining the ink outlet aperture or group of ink outlet apertures may be any suitable surface defining the ink tank but conveniently may be the floor. Preferably then the flat area is horizontal.

[0009] According to a further aspect of the invention there is provided an ink cartridge having an ink outlet aperture or group of ink outlet apertures defined therein, the inner end of the or each ink outlet aperture being flush with an internal surface of the cartridge.

[0010] According to another aspect of the invention there is provided an ink cartridge including an ink tank and an ink supply port to receive the end of an ink withdrawal needle so that ink can be withdrawn from the

tank, the cartridge defining at least one aperture to restrict the flow rate of ink from the ink tank through the ink supply port to the ink withdrawal needle.

[0011] In this way, a steady flow rate of ink is achieved which results in good quality printing.

[0012] Preferably, there is more than one aperture, and preferably not more than twelve apertures, most preferably not more than eight apertures. In a preferred embodiment there are six apertures. Preferably the apertures are in a regular arrangement. The or each aperture is preferably in a single septum spanning the outlet port. The septum may be in any convenient position in the outlet port but conveniently is towards the inner end of the outlet port so as to avoid the possibility of interference with the ink withdrawal needle. The septum also serves the purpose of preventing the ink withdrawal needle from entering the tank through the outlet port. Most preferably the septum is across the very end of the outlet port. In a preferred embodiment, the ink supply port depends from the ink tank and the septum is flush with the surface of the ink tank intercepted by the ink supply port. Thus the surface defining the said ink outlet aperture or apertures is flat in the vicinity of the outlet aperture or apertures. Preferably the septum is integral with the ink supply port and/or the ink tank.

[0013] According to another aspect of the invention there is provided an ink cartridge including an ink tank and an ink supply port leading therefrom, a seal in the ink supply port the seal including an aperture to receive and seal around an ink supply needle, a cover to cover the said aperture and to be pierced by the ink supply needle, and a guide to guide the ink supply needle to align the ink supply needle with the aperture.

[0014] In this way the seal is not damaged if the cartridge is misaligned on the needle as the guide will protect the seal and ensure alignment.

[0015] Preferably the guide defines an aperture through which the ink withdrawal needle can pass in use. The guide may take any suitable form and may comprise a cup shaped member to be received on the end of the outlet port.

[0016] An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a side elevation of the cartridge of the first embodiment of the invention;

Fig. 2 is a side elevation of the cartridge of the first embodiment in cross section;

Fig. 3 is an underneath plan view of the lid of the cartridge of the first embodiment of the invention;

Fig. 4 is a plan view of the interior of the cartridge of the embodiment; and,

Fig. 5 is a side elevation of the cartridge of the sec-

ond embodiment of the invention.

[0017] The cartridge 10 of the first embodiment of the invention comprises an ink tank 12 having a lid 14 and an outlet port 16 depending from the ink tank 12. The cartridge 10 is intended for an ink jet printer.

[0018] The ink tank 12 defines a generally rectangular cavity 18 between the inner surfaces of opposed end walls 20, 22 opposed side walls 24 and floor 28. The top surface of the cavity 20 is delimited by the underside 30 of the lid 14. The inwardly facing surface 32 of the floor 28 of the tank 12 is entirely flat.

[0019] The outlet port 16 is generally cylindrical and depends from the floor of the tank 12 midway between the side walls 24 and spaced from the front end wall 20 by substantially the same distance as the spacing from the side walls 24, 26. A coaxial bore 34 in the outlet port terminates at a septum 36 which is flush with the inwardly facing surface 32 of the floor 28. The septum 36 is pierced by six round apertures 38, arranged one in the centre of the septum 36, and the others in a ring around the central one at equal circumferential spacing as shown in Fig 5. The outlet port 16 includes a part bore 40 in its lower end which forms a shoulder 42. A top hat shaped insert 44 made of elastomeric material is received in the bore 34 with the brim part 46 of the insert 44 being received in the part bore 40 and located by the shoulder 42. The insert 44 defines a blind coaxial bore 48 from the top thereof which terminates in a thin web 50 at the lower end of the insert 44. A cap 52 of rigid plastics material is generally cup shaped and receives and is secured over the lower end of the outlet port 16. The cap 52 has a coaxial aperture 54 of the same diameter as the blind coaxial bore 48.

[0020] An upright rib 56 extends forwardly along the underside of the tank 12 from the outlet port 16. Two upright ribs 58 extend rearwardly along the underside of the tank 12 from substantially midway along the tank 12 to the rear of the tank 12 the ribs 58 extending as continuations of the side walls of the tank 12.

[0021] A porous member 60 in the form of a sponge is provided in the ink tank 12. The porous member is generally rectangular and of substantially the same dimensions as the cavity of the tank 12 but includes a notch 62 at one upper edge. Thus the rear edge of the porous member 60 is cut away at a slant.

[0022] The lid 14 is in the form of a generally flat rectangular plate 66 which is slightly wider and longer than the top of the tank 12. The lid 14 includes four short depending pillars 64 one at each corner of the plate 66. The pillars 64 are positioned to locate in the corners of the open top of the tank 12 to locate the lid on the tank 12. Centrally of the lid 14 there is a depending hollow boss 68 with a ball bearing 70 therein. The ball bearing 70 seals the bore in the boss 68 through which ink is filled into the ink tank 12. A second identical hollow boss 72 is provided towards the front of the lid 14.

[0023] To the rear of the lid 14 midway between the

sides there is a breather hole 74. A rib 76 depends from the rectangular plate 66 the lid 14 and is triangular so as to lie in the notch 62 spaced from or just touching the porous member 60.

[0024] A tab 78 has a hollow projection 80 depending therefrom which is received in the breather hole 74 so that the tab 78 blocks the breather hole 74. When the cartridge 10 is to be used the tab 78 is broken off to leave the hollow projection 80 in the breather hole 74 and allow air into the cartridge therethrough.

[0025] In use then the tab 78 is broken off the cartridge 10 so that air can enter through the breather hole 74. The cartridge 10 is located in the printer and the upstanding ink withdrawal needle 82 of the printer is received in the ink supply port 16. The aperture in the cap 52 serves to guide the ink withdrawal needle so that it is aligned with the thin web 50 which it then accurately pierces to enter the bore 48. The sides of the bore 48 seal against the ink withdrawal needle. The ink in the porous member 60 passes through the apertures in the septum 36 to enter the outlet port 16 and hence reach the ink withdrawal needle. As the inwardly facing surface of the floor of the tank 12 is flat the porous member 60 is a good fit against it and effective supply of ink through the septum apertures into the outlet port is ensured. The apertures in the septum 36 are so sized as to control or moderate the flow of ink within desired limits.

[0026] The second embodiment is similar to the first and only the differences from the first embodiment will be described. The same reference numerals will be used for equivalent features. In the second embodiment the cap and top hat shaped insert are not provided. Instead there is a straight sided insert 90 which is received in the bore in the outlet port 16. The part bore is not provided and the insert 90 abuts the septum 36. The insert 90 includes a bore 92. A triangular rib 94 extends inwardly and circumferentially around the interior of the insert 90 midway therealong to narrow the bore 92 there. A cover 96 in the form of a sheet of flexible plastics material is fuse bonded onto the end of the outlet port 16 and the end of the insert 90.

[0027] In use the cover 96 prevents ink at the outlet port 16 drying until the cartridge 10 is ready for use. Then the ink withdrawal needle will pierce the cover 96 and enter the bore 92 in the insert 90. The rib 94 will seal against sides of the ink withdrawal member to prevent ink leakage and ink can be withdrawn through the needle from the cartridge 10.

Claims

1. An ink cartridge comprising an ink tank defined by a plurality of surfaces, an ink outlet aperture or group of outlet apertures defined in one of said surfaces, the surface defining the said ink outlet aperture or apertures being flat in the vicinity of the outlet aperture or apertures.

2. An ink cartridge as claimed in claim 1, wherein the flat area is substantially centred on the outlet aperture or group of outlet apertures.
3. An ink cartridge as claimed in claim 1 or claim 2, wherein the surface defining the ink outlet aperture or apertures is flat to where it reaches at least one of the other said surfaces. 5
4. An ink cartridge as claimed in claim 3, wherein the surface defining the ink outlet aperture or apertures is flat to where it reaches at least two of the other said surfaces. 10
5. An ink cartridge as claimed in claim 3, wherein the surface defining the ink outlet aperture or apertures is flat to where it reaches at least three of the other said surfaces. 15
6. An ink cartridge as claimed in any preceding claim, wherein the entire surface defining the ink outlet aperture or group of ink outlet apertures is flat. 20
7. An ink cartridge having an ink outlet aperture or group of ink outlet apertures defined therein, the inner end of the or each ink outlet aperture being flush with an internal surface of the cartridge. 25
8. An ink cartridge as claimed in any preceding claim, wherein the surface defining the ink outlet aperture or group of ink outlet apertures is the floor of the cartridge. 30
9. An ink cartridge as claimed in any preceding claim, wherein the cartridge includes a porous member adjacent the ink outlet aperture or apertures. 35
10. An ink cartridge including an ink tank and an ink supply port to receive the end of an ink withdrawal needle so that ink can be withdrawn from the tank, the cartridge defining at least one aperture to restrict the flow rate of ink from the ink tank through the ink supply port to the ink withdrawal needle. 40
11. An ink cartridge as claimed in claim 10, wherein the or each aperture is in a single septum spanning the outlet port. 45
12. An ink cartridge as claimed in claim 11, wherein the septum is towards the inner end of the outlet port. 50
13. An ink cartridge as claimed in claim 12, wherein the septum is across the very end of the outlet port.
14. An ink cartridge as claimed in claim 13, wherein the ink supply port depends from the ink tank and the septum is flush with the surface of the ink tank intercepted by the ink supply port. 55
15. An ink cartridge as claimed in any of claims 11 to 14, wherein the septum is integral with one or both of the ink supply port and the ink tank.
16. An ink cartridge as claimed in any of claims 10 to 15, wherein the cartridge defines more than one aperture.
17. An ink cartridge as claimed in any of claims 10 to 16, wherein the cartridge defines not more than twelve apertures, preferably not more than eight apertures.
18. An ink cartridge as claimed in claim 16 or claim 17, wherein the apertures are in a regular arrangement.
19. An ink cartridge including an ink tank and an ink supply port to receive the end of an ink withdrawal needle so that ink can be withdrawn from the tank, a seal in the ink supply port, the seal defining an aperture to receive an ink withdrawal needle to enable the seal to seal around the ink withdrawal needle, a cover to cover the said aperture in the seal and to be pierced by the ink withdrawal needle, and a protective guide to align the ink withdrawal needle with the aperture and to guide the ink withdrawal needle into the aperture.
20. An ink cartridge as claimed in claim 19, wherein the guide defines an aperture through which the ink withdrawal needle can pass in use.
21. An ink cartridge as claimed in claim 20, wherein the protective guide comprises a cup shaped member to be received on the end of the outlet port.

FIG.1.

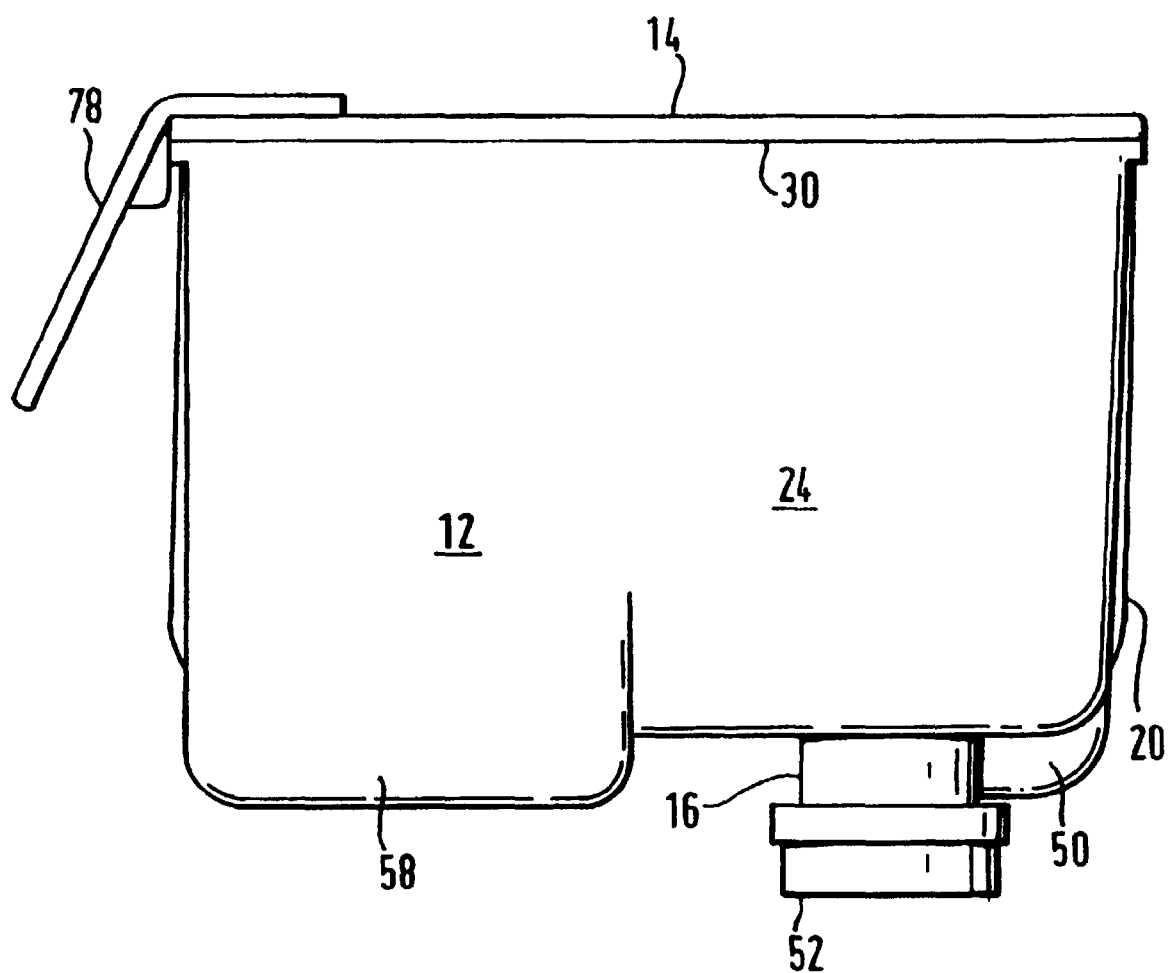
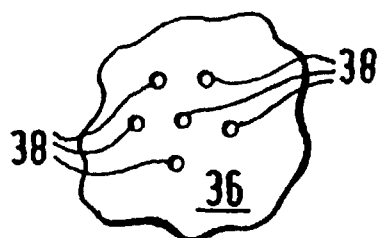


FIG.4.



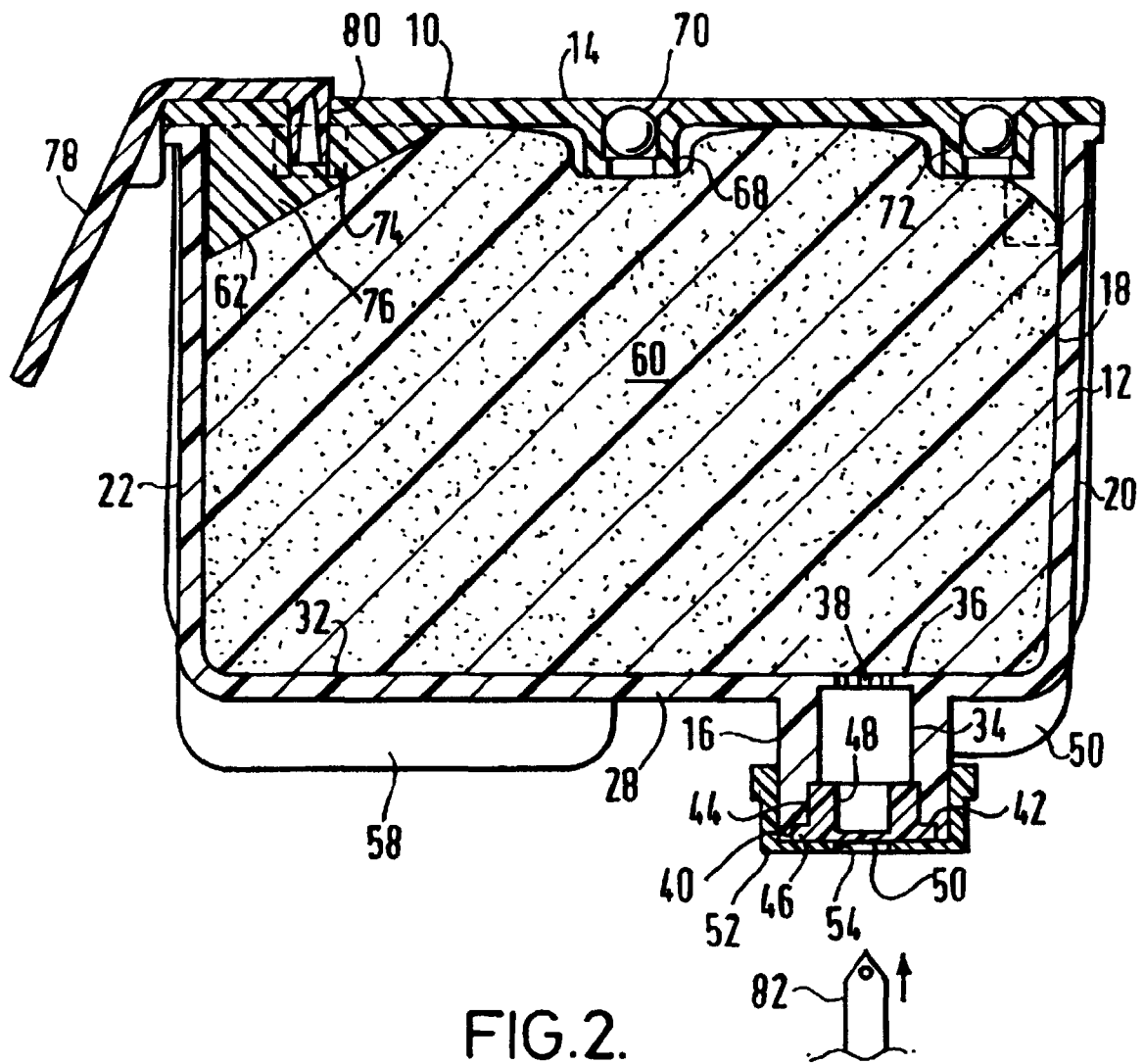


FIG.2.

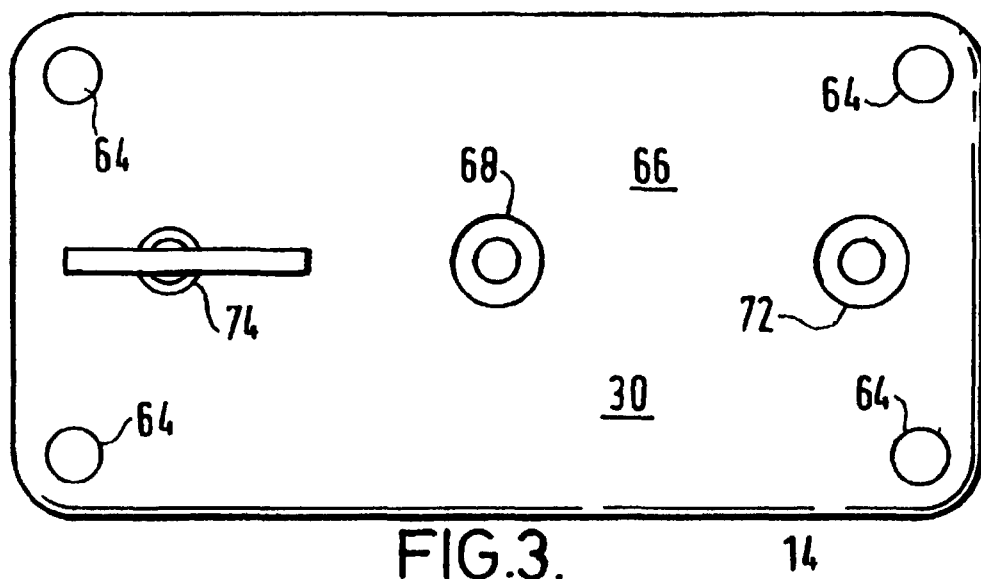


FIG.3.

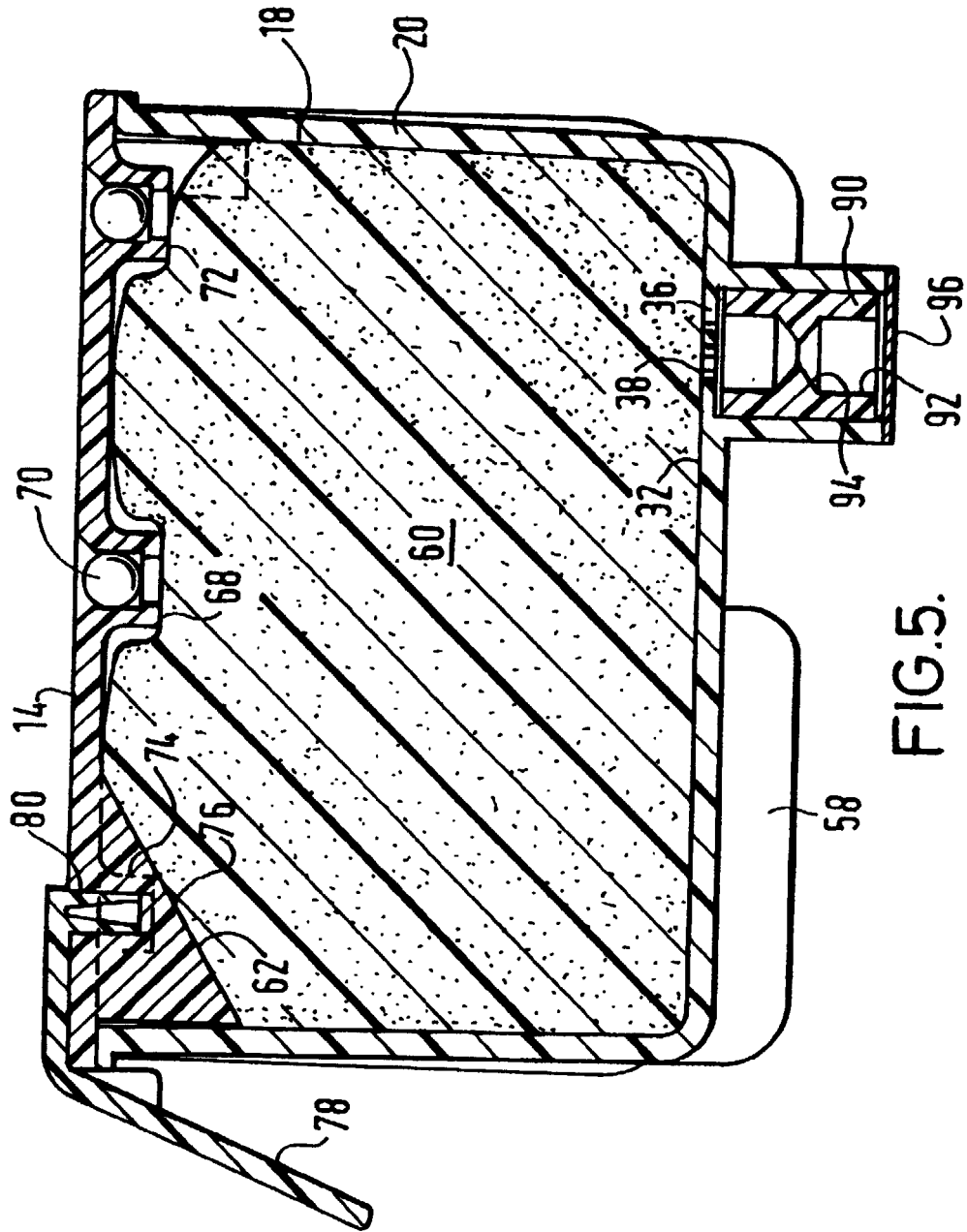


FIG.5.