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

(11) Publication number: **0 194 412**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **86100438.0**

(51) Int. Cl.⁴: **F 16 K 21/00**

(22) Date of filing: **15.01.86**

(30) Priority: **16.01.85 US 692357**

(43) Date of publication of application:
17.09.86 Bulletin 86/38

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

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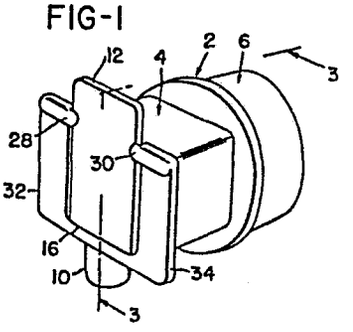
(54) **Unitary spigot valve.**

(57) A unitary spigot valve for dispensing liquid, as from a container, includes a body defining a dispensing opening, a rigid valve lever having an inner end portion connected with the body at a rectilinear pivot hinge for movement between dispensing and sealing positions, a spigot on the valve lever inner end portion adjacent to the hinge and configurated and arranged as to plug the dispensing opening upon movement of the valve lever into sealing position, a flexible diaphragm connected to interior walls of the body and with the spigot at hinge lines, the diaphragm allowing liquid flow to the valve only via the dispensing opening, and first snap-fitting means on the body and the second snap-fitting means connected with the valve lever, these snap-fitting means means being configurated and sized for engagement to retain the spigot in sealing position and prevent disengagement from such position. The spigot may extend from a rigid base portion of the valve lever. The second snap-fitting means may be the outer end portion of the lever, and the first snap-fitting means may comprise detent projections on the body adjacent the valve lever when in its sealing position, the projections being resiliently deformed momentarily upon movement of the valve lever into sealing position, then engaging the lever to retain it in such position. The second snap-fitting means may be a radially extending annular portion of the spigot, the first snap-fitting means may be a radially inwardly extending portion of the opening wall, so that these annular portions interfere when a spigot is moved into the dispensing opening and are resiliently deformed, then engaged to retain the spigot in sealing position. The wall defining the dispensing opening and the spigot exterior configuration may be tapered radially inwardly in the direction of the insertion of the spigot for force-fitting sealing relation upon urging the spigot into the opening.

FIG-1



BACKGROUND OF THE INVENTION

Prior spigot valves of unitary construction for selectively allowing and prevention of liquid flow, as from a container, have been characterized by various shortcomings and defects. Such prior art, as known to applicant, includes U.S. Patent No. 4,386,720 to Speedie, U.S. Patent No. 4,211,348 to Scholle, U.S. Patent No. 3,972,454 to Welsh, and U.S. Patent No. 4,169,548 to Bond. The spigot valve devices of these patents generally rely upon the materials utilized in forming the devices, typically elastomeric thermoplastic materials, to exert force or pressure to maintain fluid sealing to retain liquid. With most such devices, the liquid to be dispensed can fairly often overcome the sealing pressure and cause a diaphragm to change configuration and cause unsealing. They are often impractical for use, because when subjected to a jarring impact, bumping, etc., as during transport, handling, etc., the liquid seal can fairly readily disengage. If a membrane is provided across an outlet passageway as a precaution against such leakage, additional manufacturing operations and expense are required to fabricate the same. Certain prior devices rely upon the strength of the material, typically an elastomeric material, to maintain liquid sealing, and pressure in the liquid to be dispensed can often overcome the sealing pressure with resultant leakage.

Most such spigot valves of the prior art have the disadvantage that they can only be maintained in an open position for dispensing of liquid by the operator manually holding a component in position.

Many devices of the prior art involve multiple components, multiple operations to fabricate and assemble, and resultant high expense.

It is therefore an object of the present invention to provide a unitary spigot valve which provides positive reliable liquid sealing.

An object of the invention is the provision of such a spigot valve which provides liquid sealing without reliance upon its material or the memory of such material to return to or maintain a sealing configuration.

An object of the invention is to provide a unitary spigot valve wherein the components are positively maintained in sealing configuration despite liquid pressure thereon, impacts, etc.

An object of the invention is to provide a spigot valve which may be molded and fabricated in a single operation.

An object of the invention is the provision of a unitary spigot valve adopted for fabrication by established mass production techniques.

It is an object of the invention to provide a unitary spigot valve which is economical to manufacture.

An object of the invention is to provide a unitary spigot valve which is self-cleaning to prevent clogging of the dispensing opening by solidification of material being dispensed.

SUMMARY OF THE INVENTION

The foregoing objects, as well as other objects and advantages which will become apparent in the detailed description of the preferred embodiments, are attained in a unitary spigot valve which includes a body having interior walls and defining a dispensing opening, a rigid valve lever having its inner end portion connected with the body at a rectinilear pivot hinge for accurate, controlled movement between dispensing and sealing positions, a spigot on the inner end portion of the valve lever and adjacent to the hinge, the spigot being configurated and arranged so that it is urged into and plugs the dispensing opening when the valve is moved into sealing position, a flexible diaphragm connected to the body interior walls and with the spigot, the diaphragm being configurated and arranged to allow flow from the container to the valve only via the dispensing opening, and first snap-fitting means on the body and second snap-fitting means on the valve lever, these snap fitting means being configurated and sized to engage to retain the spigot in sealing position and to prevent disengagement from such position. The valve lever preferably has a rigid base portion from which the spigot extends, and the diaphragm is preferably connected to this base portion. The diaphragm is invertible, being in a convexed configuration when the lever is in its dispensing position and in concaved configuration when the valve is in sealing position. The outer end portion of the valve lever is adapted for manual engagement or grasping for movement between dispensing and sealing positions. Flange means may be provided on the body for manual engagement in order to facilitate operation of the lever.

The second snap-fitting means may be the outer end portion of the valve lever, which cooperates with first snap-fitting means in the form of detent projections on the body adjacent to the valve lever when the lever is in sealing position. These projections may preferably have lead-in surfaces so that the projections are resiliently deformed momentarily when the lever is moved in its sealing position, then engage the lever to retain it in sealing position.

The first snap-fitting means may be a radially extending annular portion of the spigot, and the second snap-fitting means may be a radially inwardly portion of the wall defining the dispensing opening, so that upon movement of the spigot into the dispensing opening, the spigot and wall annular portions are resiliently deformed, then are mutually engaged to retain the spigot in sealing position. The spigot may have the configuration of a hollow dome to facilitate resilient compression of the spigot upon movement into the dispensing opening.

In certain forms of the spigot valve, the body wall defining the dispensing opening may be tapered radially inwardly in the direction of insertion of the spigot, and the spigot may have its exterior tapered radially inwardly in the same direction, whereby the spigot is urged into force-fitting sealing relation with the wall when urged into the opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of the preferred embodiment of the spigot valve of the invention;

FIGURE 2 is a perspective view of the spigot valve of FIGURE 1, showing the valve in its dispensing configuration;

FIGURE 3 is a sectional view taken at line 3-3 in FIGURE 1;

FIGURE 4 is a sectional view taken at line 4-4 in FIGURE 2;

FIGURE 5 is a sectional view, similar to the view of FIGURE 3, showing a modified form of spigot valve according to the invention;

FIGURE 6 is a cutaway perspective view showing the spigot valve of FIGURE 5 in its dispensing configuration;

FIGURE 7 is a cutaway perspective view, similar to the view of FIGURE 6, showing a modified form of spigot valve utilizing a faceted diaphragm; and

FIGURE 8 is a cutaway perspective view showing another form of spigot valve according to the invention wherein a cylindrical valve body and a generally conical diaphragm are utilized.

Description of the Prefered Embodiment

Refering to the drawings, and particularly to Figures 1 to 4, a prefered embodiment of the spigot valve of the invention is shown as comprising a body 2 having a generally rectangular valve portion 4 and a tubular mounting portion 6 adapted for engagement with an associated container (not shown) from which liquid is to be dispensed. A dispensing opening 8 extends through a spout 10 which extends from a bottom wall portion of rectangular valve portion 4. A rigid valve lever 12 having an outer end portion 14 is connected to valve portion 4 at an integrally formed rectilinear pivot hinge 16.

A flexible diaphragm 18 is attached to the interior walls of portion 4 by integral hinges 20, as shown, and is connected to valve lever end portions 14 by integral hinges 22. The rectilinear hinge 16 and diaphragm hinges 20, 22 are interconnected to form a continuous hinge, as shown. A spigot 24 of generally cylindrical configuration is connected to an inner end portion 26 of the valve lever and is formed integrally therewith.

Valve portion 4 of the body 2 has wall portions defining detent projections 28, 30 which extend inwardly from these walls which define a recess in which the valve lever outer portion is received. Upon movement of valve lever 12 from its open position to its sealing position, the lever pivots about rectilinear hinge 16, the rectilinear hinge accurately controlling lever movement and the accurate entry of spigot 24 into the dispensing opening 8 to plug the opening and provide a positive fluid seal. From the geometry of the components, as shown, it will be unterstood

that the flexible diaphragm is in a convexed cenfiguration when the valve lever is in its open position and is in a concaved configuration when the valve lever is in its sealing position.

Detend projections 28,30 are defined on body portion 4 adjacent to the position of the valve lever in its sealing position. The detend projections have lead-in surfaces such that, upon the valve lever 12 engaging the detend projections during movement into its sealing position , the detend projections and adjacent body portions are urged apart. As will be unterstood from the geometry of the structure, after movement into its sealing position, the valve lever is secured in its sealing position by the detend projections 28,30, thus to retain spigot 24 firmly in place to provide positive fluid sealing, and to oppose any sealing movement or force exerted by flexible diaphragm 18 because of any tendency of the diaphragm to return to its originally molded configuration.

Outwardly extending flanges 32,34 extend laterally from valve portion 4 to provide manual or digital leverage for an operator during manual manipulation and operation of the valve lever.

Referring to Figures 3 and 4, a dispensing opening 8 extends through outlet spout 10, and annular wall portion 36 extends radially inwardly. The spigot has a radially outwardly extending shoulder or annular portion, as shown. These annular portions of the spigot and the dispensing opening wall are in interfering relation upon movement of the spigot into the dispensing opening, and there is resilient deformation during movement into the opening,

then a mutual engagement of the annular portions to retain the spigot in sealing position. The spigot may preferably have a hollow dome-like configuration, as shown in Figures 2 through 4, so that when the spigot is urged into the dispensing opening, the spigot is resliently compressed to facilitate the snap-fitting of the spigot into its sealing position in the dispensing opening. The spigot provides the annular extending portions of the spigot and the dispensing opening wall by positive fluid sealing, and retains the spigot by disengaging or on sealing movement unter any force exerted by the diaphragm.

Figure 5 illustrates a modified form of the spigot valve wherein a spigot 38 is tapered in exterior configuration, as indicated at 40, and the wall defining dispensing opening 42 is tapered radially inwardly in the direction of insertion of the spigot, thus to provide a force-sealing relation between the opening wall and the spigot when the spigot is urged into the opening.

A modified outlet spout 44 of the embodiment shown in Figure 5 is of reduced length, such that the spigot provides a cleaning action on the dispensing opening wall, thus to prevent blocking or partial blocking of the dispensing opening by removing such materials as thick soap-detegergents, toothpastes, etc., which may tend to harden or solidify and cause blockage.

Figure 6 shows a modified form of the spigot valve of the invention wherein a generally rectangular valve portion is utilized.

Figure 7 shown an embodiment of the invention wherein a multi-faceted diaphragm 48 has hinge lines 50 of reduced thickness in order to accommodate inversion of the diaphragm upon movement of valve lever 12 between its open and sealing positions. Figure 8 illustrates an embodiment of the invention which utilizes a body portion 52 of generally cylindrical configuration, and a flexible diaphragm 54 of generally conical configuration.

Thus there has been shown and described a novel unitary spigot valve which fulfills all the objects and advantages sought therefor. Many changes, modifications, variations and other uses and applications of the subject invention will,however, become apparent to those skilled in the art after considering this specification together with the accompanying drawings and claims. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

THE INVENTOR CLAIMS

1. A unitary spigot valve for use with a liquid container, comprising:

a body having interior walls, a portion defining a dispensing opening, and means for connection with the container,

a rigid valve lever having an inner end portion connected with the body at a rectilinear pivot hinge for controlled movement between a dispensing position and a sealing position,

a spigot on the valve lever inner end portion adjacent to said hinge, said spigot being so configurated and arranged that it is urged into and plugs the dispensing opening to provide positive fluid sealing upon movement of the valve lever into its sealing position,

a flexible diaphragm connected to said interior walls of the body and with the spigot at integral hinge lines, said flexible diaphragm being configurated and arranged to allow liquid flow from the container and through the valve only via said dispensing opening, and

first snap-fitting means on said body and second snap-fitting means connected with said valve lever, the first and second snap-fitting means being configurated and sized for engagement to retain the spigot in sealing position and to prevent disengagement from such position under urging by the flexible diaphragm.

2. A unitary spigot valve according to Claim 1, wherein:

said valve lever inner portion has a rigid base portion from which the spigot extends, and

said flexible diaphragm is connected to said rigid base portion.

3. A unitary spigot valve according to Claim 1, wherein:

said flexible diaphragm is inverted upon movement of the valve lever between its dispensing and sealing positions, the diaphragm being in a generally convexed configuration when the lever is in its dispensing position and in a concaved configuration when the valve is in its sealing position.

4. A unitary spigot valve according to Claim 2, wherein: said flexible diaphragm is inverted upon movement of the valve lever between its dispensing and sealing positions, the diaphragm being in a generally convexed configuration when the lever is in its dispensing position and in a concaved configuration when the valve is in its sealing position.

5. A unitary spigot valve according to Claim 1, wherein: the body has an axis, and
the dispensing opening has an axis generally perpendicular to the body axis.

6. A unitary spigot valve according to Claim 2, wherein: the body has an axis, and
the dispensing opening has an axis generally perpendicular to the body axis.

7. A unitary spigot valve according to Claim 2, wherein: the outer end portion of the valve lever is adapted for manual engagement for movement on the lever between its dispensing and sealing position.

8. A unitary spigot valve according to Claim 5, wherein: the outer end portion of the valve lever is adapted for manual engagement for movement on the lever between its dispensing and sealing position.

9. A unitary spigot valve according to Claim 7, and further including: flange means extending from the body for manual engagement while operating the valve lever in order to facilitate operation of the lever.

10. A unitary spigot valve according to Claim 1, wherein:

said second snap-fitting means comprises the outer end portion of the valve lever, and

said first snap-fitting means comprises at least one detent projection on said body adjacent the valve lever outer end portion when the valve lever is in its sealing position, said at least one detent projection having a lead-in surface such that upon movement of the valve lever into sealing position the projection and adjacent body are resiliently deformed momentarily and then the detent projection then engages the valve lever to retain it in its sealing position.

11. A unitary spigot valve according to Claim 2, wherein:

said second snap-fitting means comprises the outer end portion of the valve lever, and

said first snap-fitting means comprises at least one detent projection on said body adjacent the valve lever outer end portion when the valve lever is in its sealing position, said at least one detent projection having a lead-in surface such that upon movement of the valve lever into sealing position the projection and adjacent body are resiliently deformed momentarily and then the detent projection then engages the valve lever to retain it in its sealing position.

12. A unitary spigot valve according to Claim 7, wherein:

said second snap-fitting means comprises the outer end portion of the valve lever, and

said first snap-fitting means comprises at least one detent projection on said body adjacent the valve lever outer end portion when the valve lever is in its sealing position, said at least one detent projection having a lead-in surface such that upon movement of the valve lever into sealing position the projection and adjacent body are resiliently deformed momentarily and then the detent projection then engages the valve lever to retain it in its sealing position.

13. A unitary spigot valve according to Claim 9, wherein:

said second snap-fitting means comprises the outer end portion of the valve lever, and

said first snap-fitting means comprises at least one detent projection on said body adjacent the valve lever outer end portion when the valve lever is in its sealing position, said at least one detent projection having a lead-in surface such that upon movement of the valve lever into sealing position the projection and adjacent body are resiliently deformed momentarily and then the detent projection then engages the valve lever to retain it in its sealing position.

14. A unitary spigot valve according to Claim 1, wherein:

the second snap-fitting means comprises a radially outwardly extending annular portion of the spigot, and

said first snap-fitting means comprises an annular radially inwardly extending portion of the wall defining the dispensing opening, whereby upon movement of the spigot into the dispensing opening the spigot and wall annular portions interfere and the spigot is resiliently deformed and then mutual engagement of the annular portions retains the spigot in sealing position.

15. A unitary spigot valve according to Claim 2, wherein:

the second snap-fitting means comprises a radially outwardly extending annular portion of the spigot, and

said first snap-fitting means comprises an annular radially inwardly extending portion of the wall defining the dispensing opening, whereby upon movement of the spigot into the dispensing opening the spigot and wall annular portions interfere and the spigot is resiliently deformed and then mutual engagement of the annular portions retains the spigot in sealing position.

16. A unitary spigot valve according to Claim 3, wherein:

the second snap-fitting means comprises a radially outwardly extending annular portion of the spigot, and

said first snap-fitting means comprises an annular radially inwardly extending portion of the wall defining the dispensing opening, whereby upon movement of the spigot into the dispensing opening the spigot and wall annular portions interfere and the spigot is resiliently deformed and then mutual engagement of the annular portions retains the spigot in sealing position.

17. A unitary spigot valve according to Claim 4, wherein:

the second snap-fitting means comprises a radially outwardly extending annular portion of the spigot, and

said first snap-fitting means comprises an annular radially inwardly extending portion of the wall defining the dispensing opening, whereby upon movement of the spigot into the dispensing opening the spigot and wall annular portions interfere and the spigot is resiliently deformed and then mutual engagement of the annular portions retains the spigot in sealing position.

18. A unitary spigot valve according to Claim 1, wherein:
said spigot has the general configuration of a hollow dome for resilient compression of the spigot upon its movement into the dispensing opening.

19. A unitary spigot valve according ot Claim 14, wherein:
said spigot has the general configuration of a hollow dome for resilient compression of the spigot upon its movement into the dispensing opening.

20. A unitary spigot valve according ot Claim 15, wherein:
said spigot has the general configuration of a hollow dome for resilient compression of the spigot upon its movement into the dispensing opening.

21. A unitary spigot valve according to Claim 1, wherein:

said body wall defining the dispensing opening is tapered radially inwardly in the direction of insertion of the spigot, and

the spigot has an exterior configuration tapered radially inwardly toward its outer extremity, whereby the spigot is urged into force-fitting sealing relation with the wall defining the opening upon the urging of the spigot into the opening.

22. A unitary spigot valve according to Claim 2, wherein:

said body wall defining the dispensing opening is tapered radially inwardly in the direction of insertion of the spigot, and

the spigot has an exterior configuration tapered radially inwardly toward its outer extremity, whereby the spigot is urged into force-fitting sealing relation with the wall defining the opening upon the urging of the spigot into the opening.

23. A unitary spigot valve according to Claim 3, wherein:

said body wall defining the dispensing opening is tapered radially inwardly in the direction of insertion of the spigot, and

the spigot has an exterior configuration tapered radially inwardly toward its outer extremity, whereby the spigot is urged into force-fitting sealing relation with the wall defining the opening upon the urging of the spigot into the opening.

24. A unitary spigot valve according to Claim 4, wherein:

said body wall defining the dispensing opening is tapered radially inwardly in the direction of insertion of the spigot, and

the spigot has an exterior configuration tapered radially inwardly toward its outer extremity, whereby the spigot is urged into force-fitting sealing relation with the wall defining the opening upon the urging of the spigot into the opening.

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FIG-1

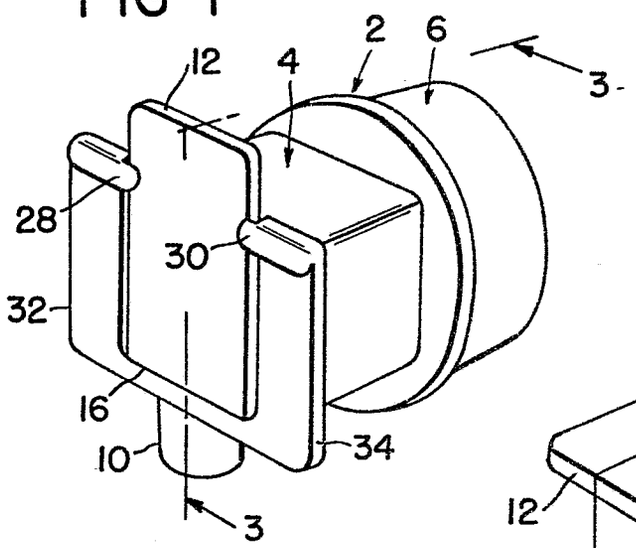

FIG-2

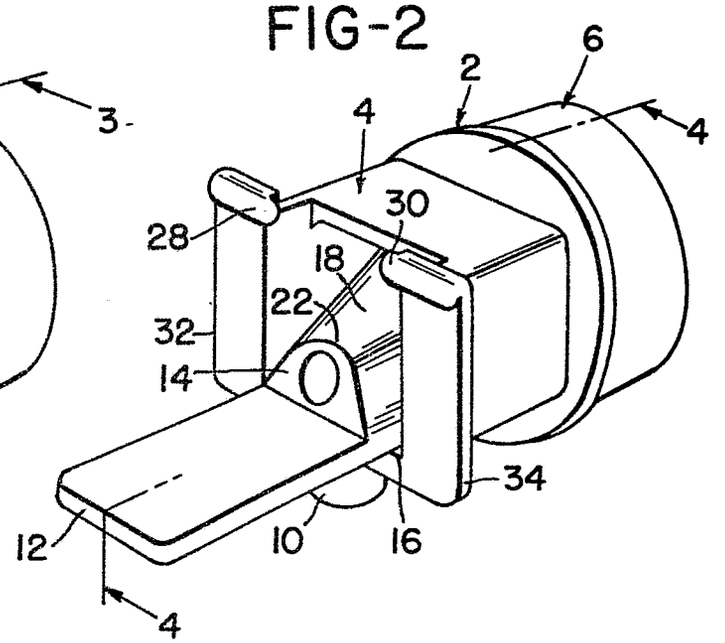

FIG-3

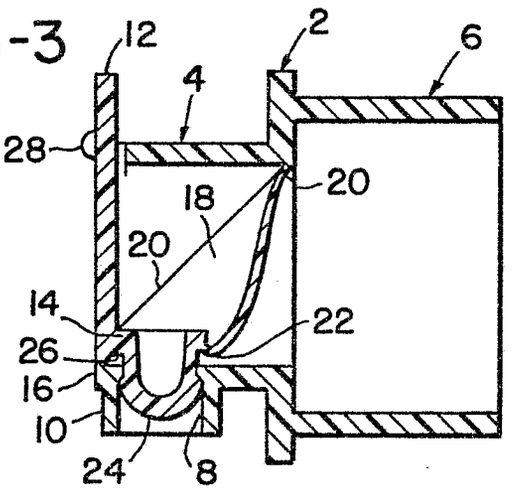

FIG-4

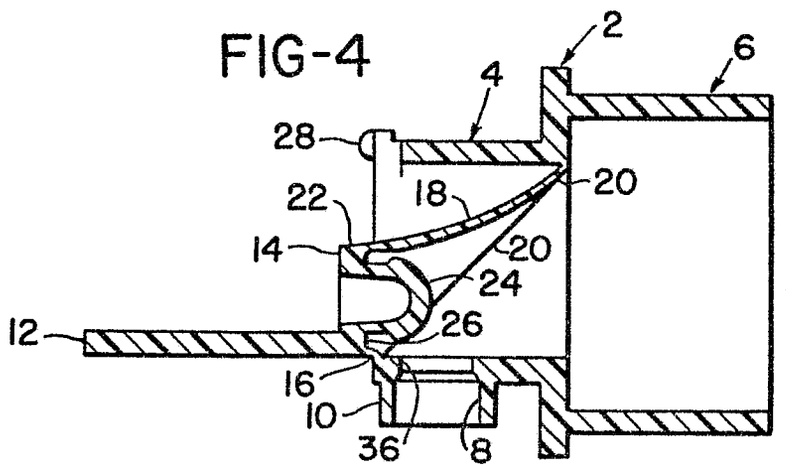

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FIG-5

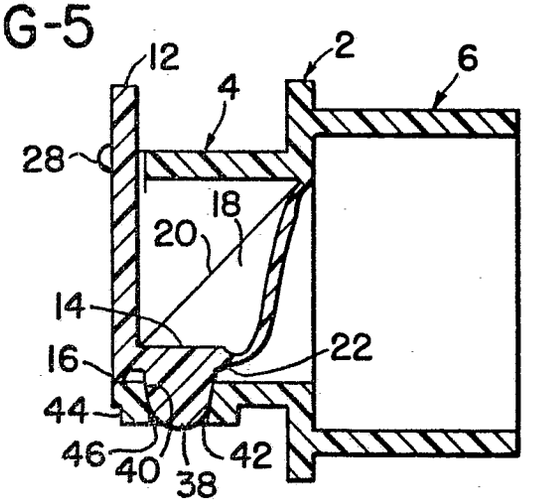

FIG-6

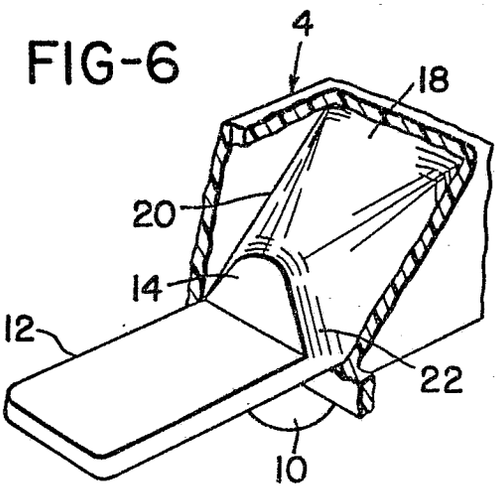

FIG-7

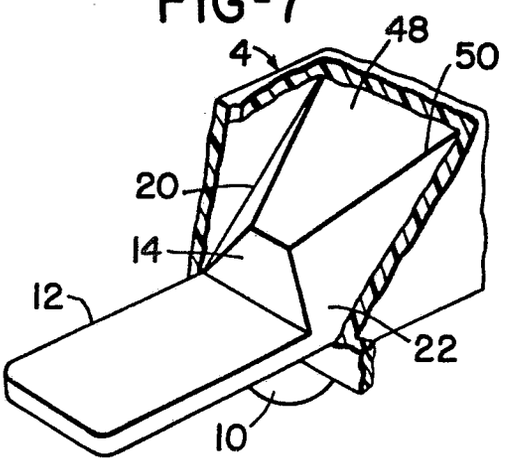

FIG-8