

[54] **SEALING ARRANGEMENT FOR LIQUID DISPENSING NOZZLE HAVING VAPOR RECOVERY**

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[51] Int. Cl. B67c 3/34, B65b 31/06

[58] Field of Search 141/198-229, 141/59, 97, 287, 392, 46; 277/30; 285/226; 403/50, 51

[56] **References Cited**

UNITED STATES PATENTS

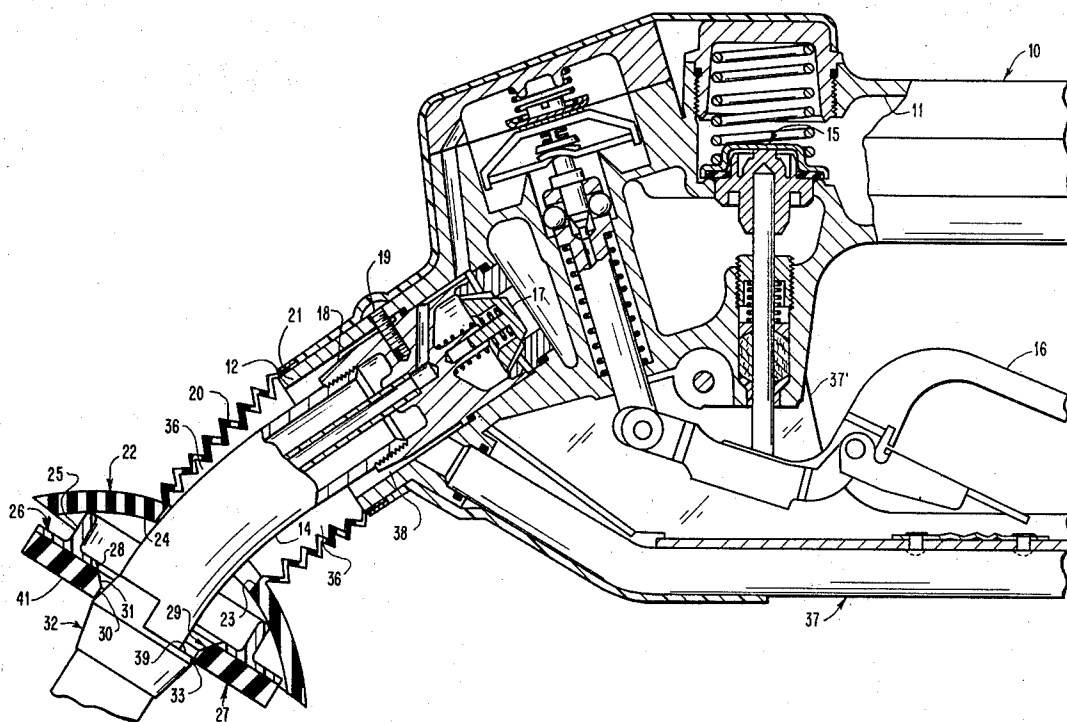
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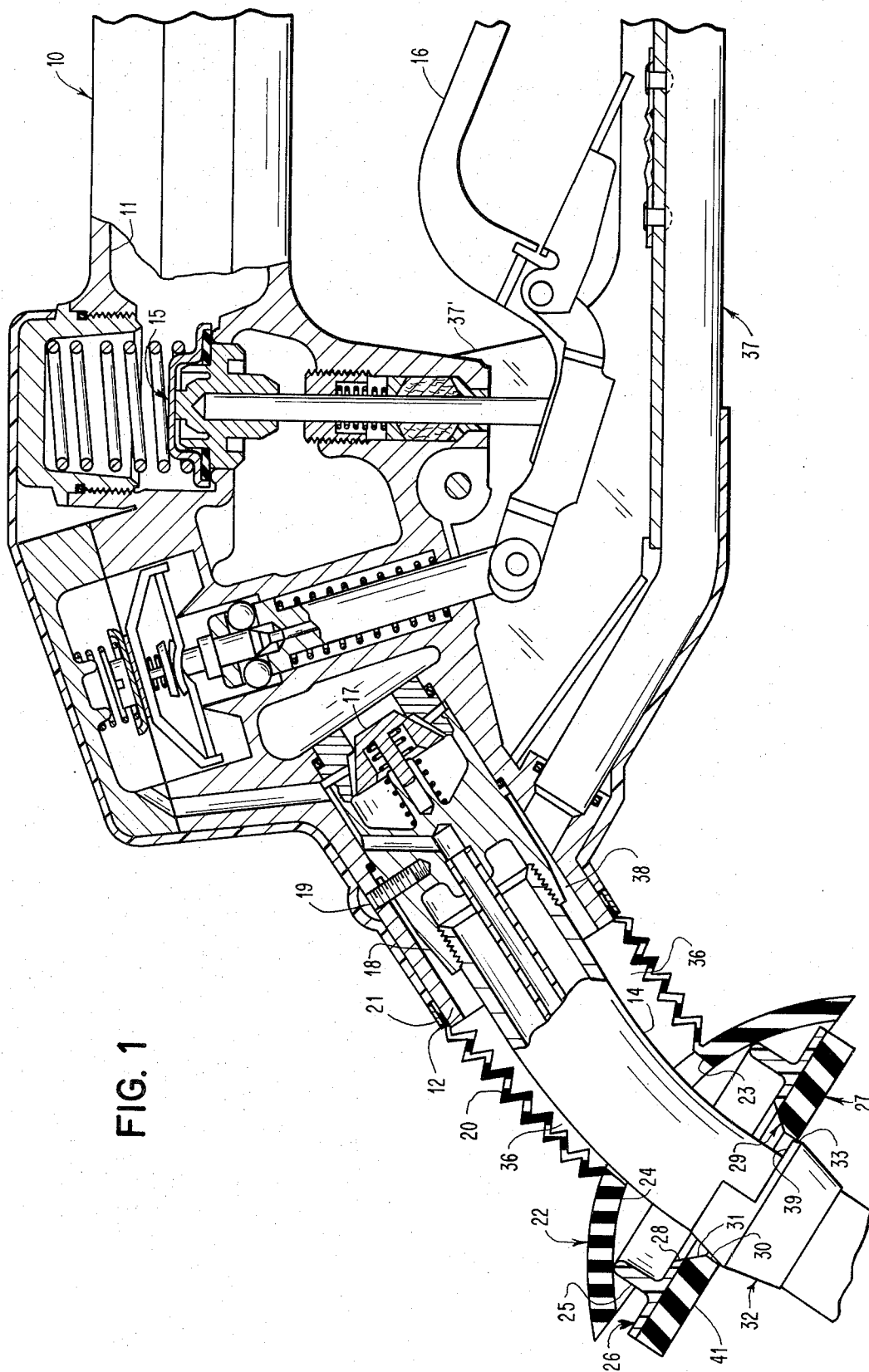
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[57] **ABSTRACT**

A liquid dispensing nozzle has sealing means, which seals the vapor recovery passage when the spout of the nozzle is not disposed in a fill pipe of a vehicle tank to be filled and seals the fill pipe so that the vapors escape from the tank to the vapor recovery passage of the nozzle when the spout is disposed in the tank to be filled. The sealing means includes a member, which is slidably mounted on the spout, having its sealing surface formed as a sector of a sphere so that the sealing means is effective for fill pipes of various angles.

10 Claims, 6 Drawing Figures





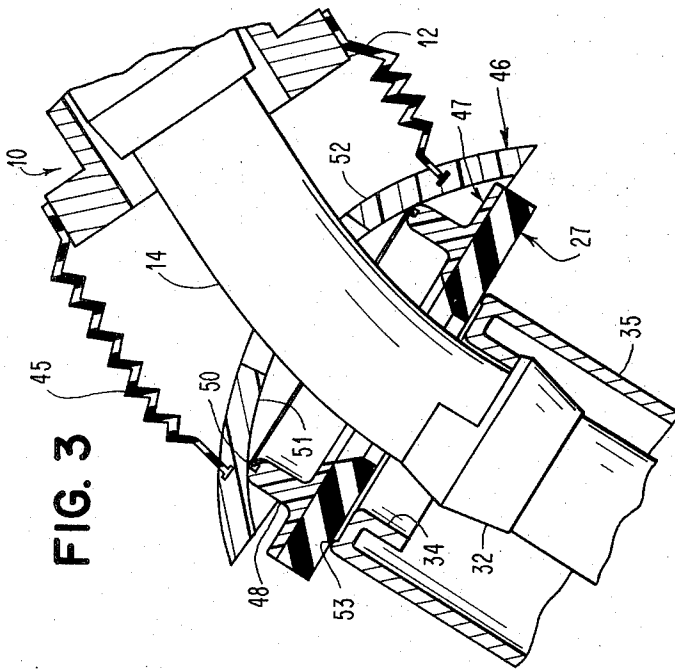


FIG. 3

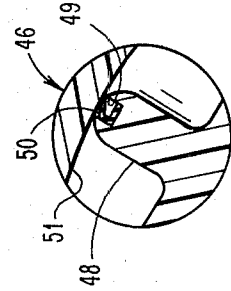


FIG. 4

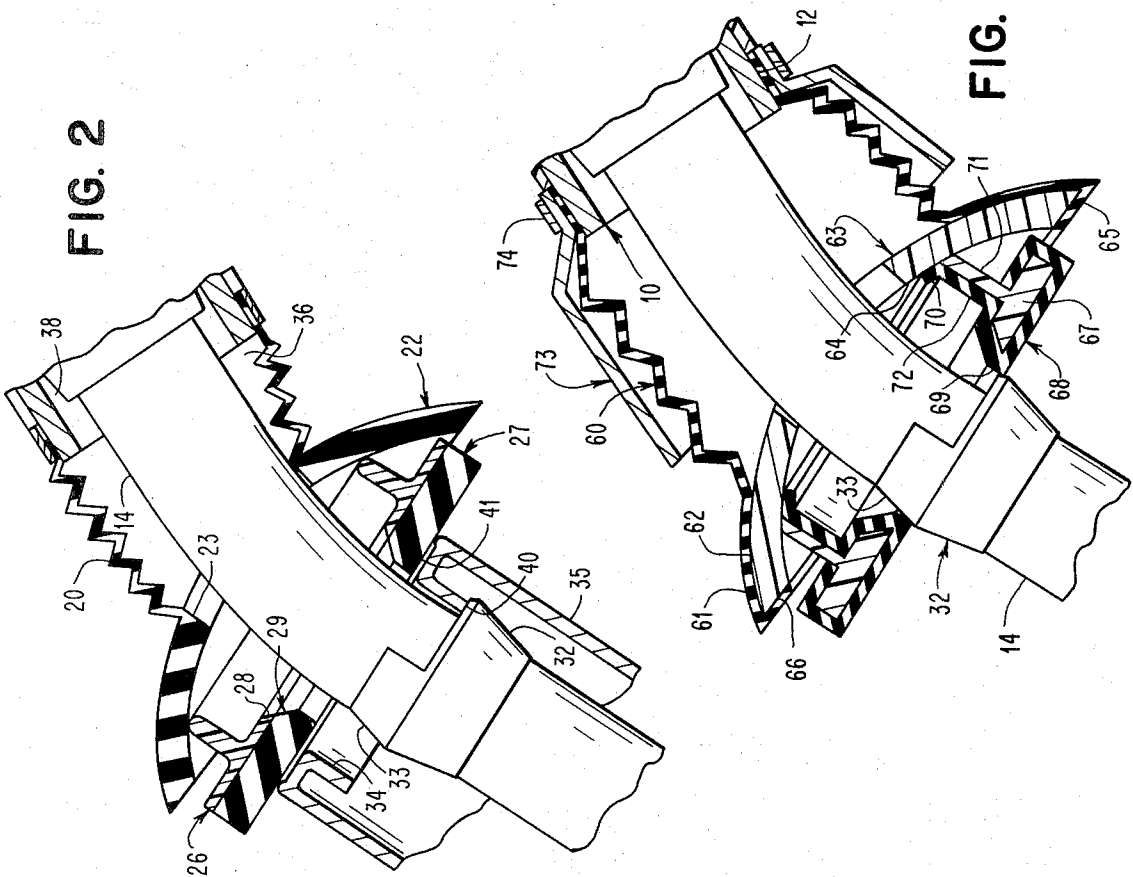
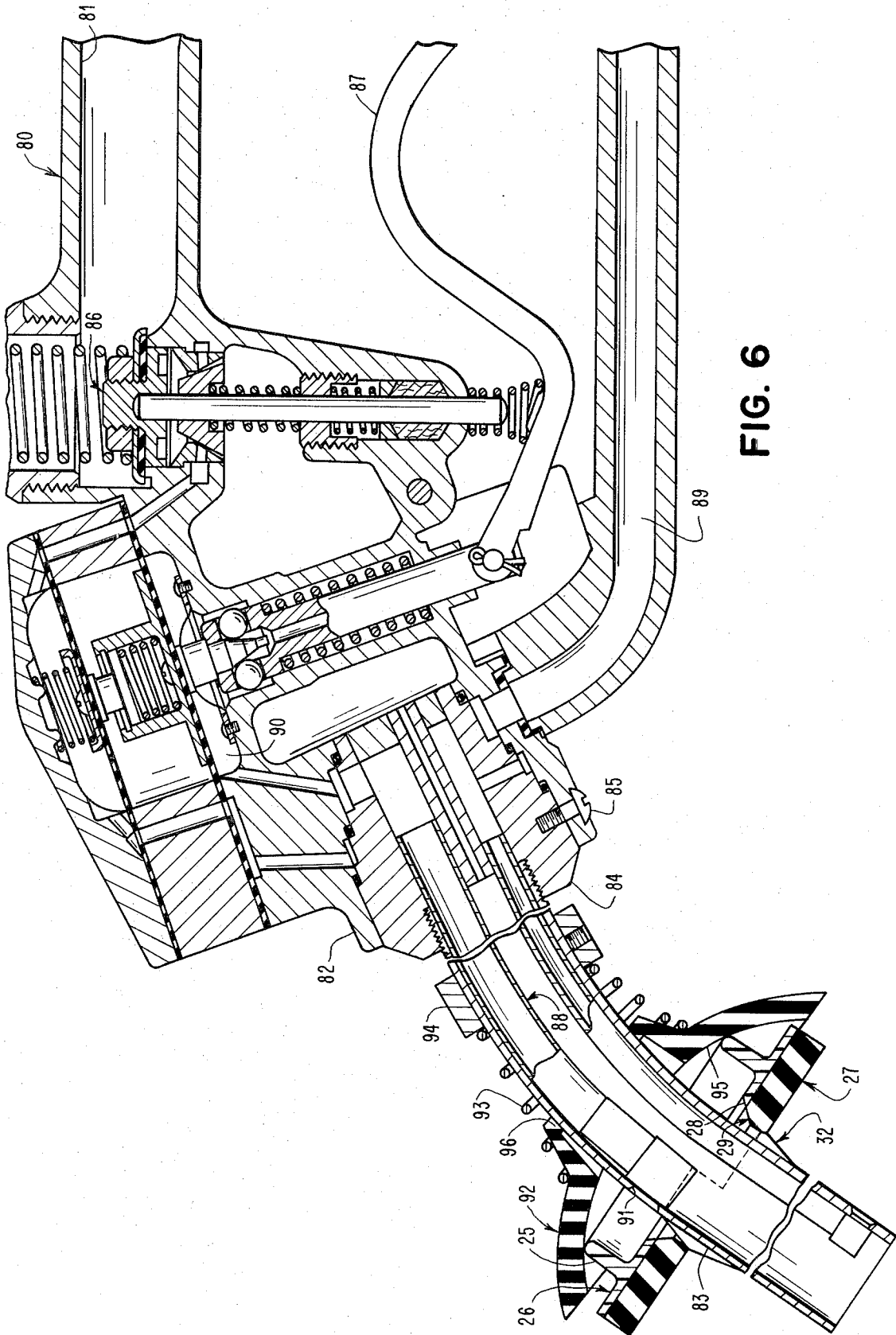


FIG. 2

FIG. 5



SEALING ARRANGEMENT FOR LIQUID DISPENSING NOZZLE HAVING VAPOR RECOVERY

When filling a vehicle tank with gasoline through a dispensing nozzle, vapors from the gasoline within the tank escape therefrom through the opening of the fill pipe in which the spout of the nozzle is inserted. This escape of the vapors into the atmosphere pollutes the air.

It has previously been suggested to provide a gasoline dispensing nozzle with a vapor recovery passage and a sealing arrangement between the fill pipe of the tank being filled and the vapor recovery passage of the nozzle. Because of the large number of different types of automotive vehicles and the various angles of the fill pipes due to the location of the fill pipe in each of the vehicles, the previously suggested sealing arrangements have not always been effective for many types of fill pipe.

The present invention is an improvement of the previously suggested sealing arrangement in that it enables a seal to be maintained between the fill pipe and the vapor recovery passage for most fill pipes irrespective of their angles. The present invention accomplishes this by utilizing a member having a surface, which is formed of a sector of a sphere, cooperating with a rotatable and slidable member on the spout engaging with the fill pipe so that movement of the member, which cooperates with the fill pipe and is rotatably and slidably mounted on the spout, to various angles because of the angle of the fill pipe does not prevent sealing with the member which has the surface formed of the sector of the sphere.

An object of this invention is to provide an improved sealing arrangement for a liquid dispensing nozzle having a vapor recovery system.

Other objects, uses, and advantages of this invention are apparent upon a reading of this description, which proceeds with reference to the drawings forming part thereof and wherein:

FIG. 1 is a sectional view, partly in elevation, of a portion of a nozzle having one form of the sealing arrangement of the present invention.

FIG. 2 is a fragmentary sectional view, partly in elevation, of the sealing arrangement of FIG. 1 with the spout of the nozzle disposed in the fill pipe of a vehicle tank to be filled.

FIG. 3 is a fragmentary sectional view, partly in elevation, of another embodiment of the sealing arrangement of the present invention used with the nozzle of FIG. 1 and showing the spout of the nozzle disposed in the fill pipe.

FIG. 4 is an enlarged fragmentary sectional view of a portion of the sealing arrangement of FIG. 3.

FIG. 5 is a fragmentary sectional view, partly in elevation, of another modification of the sealing arrangement of the present invention utilized with the nozzle of FIG. 1 and showing the relation when the spout of the nozzle is not disposed in the fill pipe.

FIG. 6 is a sectional view, partly in elevation, of still another embodiment of the sealing arrangement of the present invention utilized with a different type of nozzle and showing the relation when the spout of the nozzle is not disposed in the fill pipe.

Referring to the drawings and particularly FIG. 1, there is shown a liquid dispensing nozzle of the type

more particularly shown and described in the copending patent application of Donald A. Lasater and Chester W. Wood for "Liquid Dispensing Nozzle of The Automatic Shut-Off Type," Ser. No. 318,237 filed Dec. 26, 1972, and assigned to the same assignee as the assignee of this invention. The liquid dispensing nozzle includes a nozzle body 10 having an inlet 11 to which a hose is connected to supply a liquid such as gasoline, for example, to the interior of the body 10. The body 10 has an outlet 12 with which a spout 14 communicates to receive liquid from the interior of the body 10.

As specifically described in the aforesaid "Liquid Dispensing Nozzle of The Automatic Shut-Off Type," application, the body 10 has a first or main poppet valve 15, which is controlled by a manually operated lever or handle 16, and a second poppet valve 17 within the body 10. The valves 15 and 17 control the flow to the spout 14.

A spout adapter 18 is fixed to the body 10 by a screw 19. The outlet 12 of the body 10 has one end of a bellows 20, which is preferably formed of gasoline resistant synthetic rubber, secured thereto by being held thereon by an adhesive and a clamp 21.

The other end of the bellows 20 has a member 22, which is preferably formed of a gasoline resistant elastomer such as synthetic rubber, for example, connected thereto. The bellows 20 and the member 22 are preferably formed by being molded as a single piece. The member 22 has an enlarged opening 23 formed in the center thereof to enable the member 22 to slide along the spout 14.

The member 22 has its surface 24 formed as a sector of a sphere so that a cylindrical extension 25 on a plate 26 engages the inner surface 24 irrespective of the position of the plate 26 on the spout 14. The plate 26, which is preferably formed of a suitable plastic such as Delrin, for example, is secured to a disc 27, which is preferably formed of gasoline resistant synthetic rubber, so that the plate 26 and the disc 27 form a sealing member.

The plate 26 has an opening 28, which has its surface inclined, therein. The disc 27 has an opening 29 formed therein with the opening 29 including a first portion 30, which is straight, and a second portion 31, which is inclined. The inclined portion 31 of the opening 29 is aligned with the inclined surface of the opening 28 of the plate 26. The openings 28 and 29 enable the plate 26 and the disc 27 to be both slidably and rotatably mounted on the spout 14.

A collar 32, which functions as a stop, is fixed to the spout 14 by a suitable means such as a set screw or welding, for example, and has the disc 27 abutting an inclined surface 33 thereof to form a seal therewith when the spout 14 is not inserted within an opening 34 (see FIG. 2) of a fill pipe 35 of a vehicle tank such as an automobile fuel tank, for example. Accordingly, when the disc 27 engages the collar 32 and the cylindrical extension 25 of the plate 26 engages the surface 24 of the member 22 as shown in FIG. 1, the space therebetween is sealed from the atmosphere.

This sealed space communicates through the opening 23 in the member 22 with an annular passage 36, which is formed between the bellows 20 and the spout 14 and forms part of the vapor recovery arrangement of the body 10. The annular passage 36 communicates with a vapor recovery tube 37, which is supported on a guard 37' secured to the body 10, as more particularly shown

and described in U.S. Pat. No. 3,653,415 to Boudot et al, through an annular passage 38, which is formed between the spout adapter 18 and the body 10. The vapor recovery tube 37 is connected by a suitable hose to vapor recovery equipment.

Accordingly, when the spout 14 is not inserted in the opening 34 of the fill pipe 35, the vapor recovery equipment is not connected to the atmosphere but is sealed through the cylindrical extension 25 of the plate 26 sealingly engaging the surface 24 of the member 22 and the disc 27 having a sealing contact with the collar 32.

When the spout 14 is inserted in the opening 34 in the fill pipe 35 as shown in FIG. 2, a step 39 (see FIG. 1), which is formed in the collar 32 by a notch, engages a lip 40 (see FIG. 2) of the fill pipe 35 to retain the spout 14 within the fill pipe 35. As the spout 14 is inserted into the opening 34 in the fill pipe 35, end surface 41 of the disc 27 abuts the end of the fill pipe 35 so as to not follow the movement of the spout 14 and the collar 32 into the fill pipe opening 34. This results in the bellows 20, which continuously urges the member 22 toward the free end of the spout 14 so as to always be in engagement with the cylindrical extension 25 of the plate 26, being slightly compressed.

Accordingly, when the spout 14 is in the position of FIG. 2, the vapors within the tank can flow through the opening 34 of the fill pipe 35, the opening 29 of the disc 27, and the opening 28 of the plate 26. The vapors then pass through the opening 23 into the annular passage 36 from which they flow through the annular passage 38 to the vapor recovery tube 37.

Thus, the movement of the spout 14 into the opening 34 of the fill pipe 35 results in the seal between the disc 27 and the collar 32 being broken whereby the vapors can be recovered from the tank being filled. It is not necessary for the collar 32 to have the step 39 engaged by the lip 40 for the device to function since the operator could hold the spout 14 within the opening 34 of the fill pipe 35. It is only necessary that there be sufficient insertion of the spout 14 into the opening 34 of the fill pipe 35 for the seal between the disc 27 and the collar 32 to be broken. However, the locking of the spout 14 within the fill pipe 35 by engagement of the step 39 of the collar 32 with the lip 40 of the fill pipe 35 insures that the seal between the collar 32 and the disc 27 is broken and vapors can flow from the tank to the vapor recovery tube 37.

To disconnect the spout 14 from the fill pipe 35, it is only necessary to slightly move the spout 14 within the fill pipe 35 so that the step 39 of the collar 32 is no longer engaged by the lip 40 of the fill pipe 35. When withdrawal of the collar 32 from the fill pipe 35 is initiated, the collar 32 is engaged by the disc 27 due to the force of the bellows 20 urging the member 22 toward the free end of the spout 14. As a result, the seal again exists between the collar 32 and the disc 27 whereby the vapor recovery system is not exposed to the atmosphere. Because of the surface 24 of the member 22 being formed as a sector of a sphere, the cylindrical extension 25 always engages the surface 24 irrespective of the amount of rotation of the disc 27 about the spout 14 or the amount of tilting of the disc 27 relative to the spout 14. These movements are due to the angle of the fill pipe 35 in the particular vehicle.

Referring to FIG. 3, there is shown another form of the sealing arrangement of the present invention uti-

lized with the nozzle body 10 of FIG. 1. The sealing arrangement includes a bellows 45, which may be formed of the same material as the bellows 20, for example. The bellows 45 is secured to the outlet 12 of the body 10 by adhesive, for example. While the clamp 21 has not been shown, it should be understood that it could be employed if desired.

The bellows 45 has one end connected to a member 46, which has the same shape as the member 22. The member 46 is preferably formed of a plastic such as Delrin, for example. The bellows 45 is connected to the member 46 in any suitable manner such as bonding, for example.

The spout 14 has the collar 32 thereon and cooperating with the disc 27. However, the plate 26 is replaced by a plate 47, which is preferably formed of the same material as the plate 26 and has a cylindrical extension 48 thereon in the same manner as the cylindrical extension 25 of the plate 26. However, the end of the cylindrical extension 48 has a circumferential groove 29 (see FIG. 4) to receive a cup seal 50. The cup seal 50, which is preferably formed of gasoline resistant synthetic rubber, bears against surface 51, which is formed of a sector of a sphere in the same manner as the surface 24 of the member 22, of the member 46.

The cup seal 50 is designed so that any pressure within the vapor recovery passage urges the cup seal 50 into engagement with the surface 51 of the member 46. Furthermore, the seal 50 has a relatively low friction on the surface 51 but is sufficiently flexible to allow the cylindrical extension 48 to engage the surface 51 at all times.

The formation of the bellows 45 with a larger diameter than the cylindrical extension 48 results in the vapor pressure creating a more effective sealing arrangement. That is, a larger area is subjected to pressure on a surface 52 of the member 46 than on the surface 51 so that the pressure differential across the member 46 urges the member 46 into engagement with the flexible seal 50 on the cylindrical extension 48 along with the urging produced by the bellows 45. Similarly, the diameter of the lip seal 50 is greater than the diameter of a lip 53 of the fill pipe 35. As a result, there is less pressure acting on the disc 27 than on the plate 47 so that this urges the disc 27 into sealing engagement with the lip 53 of the fill pipe 35.

The operation of this embodiment is the same as that described for the sealing arrangement of FIGS. 1 and 2. Thus, the vapor recovery arrangement is sealed from the atmosphere.

Referring to FIG. 5, there is shown another form of sealing arrangement for use with the nozzle body 10 of FIG. 1. A bellows 60, which is formed of the same material as the bellows 20, is secured to the outlet 12 of the body 10 by an adhesive, for example. The bellows 60 has a portion 61, which is bonded to a surface 62 of a member 63, having its inner surface 64 formed as a sector of a sphere. The member 63 is preferably formed of a suitable plastic such as Delrin, for example. The bellows 60 also has a portion 65, which is bonded to end surface 66 of the member 63. Thus, the bonding of the portions 61 and 65 to the member 63 connects the bellows 60 to the member 63.

The plate 26 and the disc 27 of FIG. 1 are replaced by a support member 67, which is preferably formed of a suitable plastic such as Delrin, for example, and a member 68, which is bonded to the support member

67. The member 68 is preferably formed of gasoline resistant synthetic rubber.

The member 68 has an opening with a straight portion 69 engaging the inclined surface 33 of the collar 32 to form a seal therebetween when the spout 14 is not inserted in the fill pipe 35 in the same manner that the portion 30 of the opening 29 of the disc 27 engages the inclined surface 33 of the collar 32 to form a seal.

The member 68 has an end portion 70 engaging the surface 64, which is formed as a sector of a sphere, of the member 63 and is held thereagainst by the bellows 60, which continuously urges the member 63 toward the free end of the spout 14. The end portion 70 of the member 68 functions in the same manner as the cup seal 50 of the modification of FIGS. 3 and 4.

The support member 67 has a cylindrical extension 71 to support a cylindrical portion 72 of the member 68. There also is contact between the end of the cylindrical extension 71 of the support member 67 and the surface 64 of the member 63.

The bellows 60 has a larger diameter than the end portion 70. The end portion 70 has a larger diameter than the lip 53 of the fill pipe 35 as shown in FIG. 3. Accordingly, the same utilization of the vapor pressure is obtained as in the embodiment of FIGS. 3 and 4.

The nozzle body 10 has a guard 73, which is preferably formed of metal mounted on the outlet 12 and retained thereon by a clamp 74, which is similar to the clamp 21 of FIG. 1. The guard 73, which also is bonded to the end of the bellows 60, protects the bellows 60 and limits the amount of compression of the bellows 60.

Referring to FIG. 6, there is shown another modification of the sealing arrangement for use with a liquid dispensing nozzle of the more particularly shown and described in the copending patent application of Charles A. Holder for "Liquid Dispensing Nozzle," Ser. No. 68,154, filed Aug. 31, 1970 and assigned to the same assignee as the assignee of this invention. As more particularly shown and described in the aforesaid Holder application, the liquid dispensing nozzle includes a nozzle body 80 having an inlet 81 to which a hose is connected to supply a liquid such as gasoline, for example, to the interior of the body 80. The body 80 has an outlet 82 with which a spout 83 communicates to receive liquid from the interior of the body 10.

The spout 83 is connected to spout adapter 84, which is secured to the outlet 82 of the body 80 by a screw 85. The spout 83 is retained in the end of the spout adapter 84 by threading and bonding.

The gasoline is supplied from the inlet 81 to the outlet 82 through opening of a poppet valve 86 by a manually operated lever or handle 87. Opening of the valve 86 causes gasoline to flow into the spout 83.

The spout 83 has a vapor recovery tube 88 mounted therein. The vapor recovery tube 88 communicates with a vapor recovery passage 89 in the nozzle body 80. The vapor recovery passage 89 communicates with vapor recovery equipment in the manner more particularly described in the aforesaid Holder application. The vapor recovery tube 88 also communicates with an annular chamber 90 for the reasons specifically described in the aforesaid Holder application.

The lower end of the vapor recovery tube 88 communicates with an opening 91 in the wall of the spout 83. The opening 91 is sealed from the atmosphere. The sealing of the opening 91 is accomplished by a member

92, which is slidably mounted on the spout 83 and preferably formed of gasoline resistant synthetic rubber, the plate 26, the disc 27, and the collar 32.

Resilient means, such as a spring 93, is disposed between the member 92 and a collar 94, which is fixed to the spout 83, to continuously urge the member 92 toward the free end of the spout 83. The member 92 has its surface 95 formed as a sector of a sphere for cooperation with the cylindrical extension 25 of the plate 26 in the same manner as the surface 24 of the member 22 is formed.

The member 92 has an inwardly projecting annular portion 96 cooperating with the outer surface of the spout 83 to form a seal therebetween. Thus, the opening 91 is sealed from the atmosphere.

When the spout 83 is inserted in the opening 34 of the fill pipe 35, the disc 27 ceases to engage the collar 32 whereby vapor can escape from the tank being filled through the opening 29 of the disc 27 and the opening 28 in the plate 26 into the space formed between the member 92, the plate 26, and the disc 27. The vapor passes from the space through the opening 91 in the spout 83 into the vapor recovery tube 88.

If desired, the plate 26 and the disc 27 of FIG. 6 may be replaced by the members 67 and 68 of FIG. 5. Additionally, the plate 26 of FIG. 6 may be replaced by the plate 47 and the seal 50 of FIGS. 3 and 4 if desired.

An advantage of this invention is that it enables the spout of a liquid dispensing nozzle to be disposed within most any type of fill pipe of a tank while still having a seal for the vapor recovery arrangement. Another advantage of this invention is that the sealing arrangement is readily adapted for use with various types of liquid dispensing nozzles.

For purposes of exemplification, particular embodiments of the invention have been shown and described according to the best present understanding thereof. However, it will be apparent that changes and modifications in the arrangement and construction of the parts thereof may be resorted to without departing from the spirit and scope of the invention.

What is claimed is:

1. A liquid dispensing nozzle having a body, a spout extending from said body and having its free end for disposition in an opening of a fill pipe of a vehicle tank or the like, and means to return vapor from the tank being filled; the improvement comprising means to form a seal between the fill pipe opening and said vapor return means when said spout is disposed in the fill pipe; said sealing means including a member mounted for sliding movement along said spout; means continuously urging said member toward the free end of said spout; said member having a sealing surface formed as a sector of a sphere; first means mounted for sliding movement along said spout and rotating movement about said spout; said first means being disposed between said member and the free end of said spout; said first means being continuously positioned to engage said sealing surface of said member to form a seal therebetween; said spout having stop means disposed thereon between said first means and the free end of said spout to engage said first means when said spout is not disposed in the fill pipe to form a seal therebetween; said vapor return means communicating with a sealed space formed between said spout, said sealing surface of said member, said first means, and said spout stop means; and said first means being removed from

sealing engagement with said spout stop means while remaining in sealing engagement with said member when said spout is inserted in the fill pipe by compression of said urging means, said first means forming a seal with the fill pipe independently of said member orientation to cause communication between said vapor return means and the tank being filled.

2. The improvement according to claim 1 in which said first means includes first and second members secured to each other, said first member of said first means engaging said sealing surface of said member to form the seal between said first means and said member, and said second member of said first means engaging said spout stop means to form the seal between said first means and said spout stop means when said spout is not disposed in the fill pipe.

3. The improvement according to claim 2 in which said first member of said first means includes a cylindrical extension extending toward said sealing surface of said member and said cylindrical extension has a seal supported on its end to engage said sealing surface of said member to form the seal therebetween.

4. The improvement according to claim 3 including a bellows disposed in surrounding and spaced relation to said spout to form a portion of said vapor return means between said spout and said bellows, said bellows having one end connected to said body and its other end connected to said member, and said bellows comprising said urging means.

5. The improvement according to claim 2 including a bellows disposed in surrounding and spaced relation to said spout to form a portion of said vapor return means between said spout and said bellows, said bellows having one end connected to said body and its other end connected to said member, and said bellows comprising said urging means.

6. The improvement according to claim 2 in which said vapor return means is disposed within said spout

and has one end communicating exterior of said spout with the space between said member, said first means, and said spout means; said member has a portion in sealing relation with the outer surface of said spout; and said urging means comprises resilient means mounted on said spout.

7. The improvement according to claim 1 in which said first means includes first and second members secured to each other, said first member of said first means having a first portion engaging said sealing surface of said member to form the seal between said member and said first means, and said first member having a second portion engaging said spout means to form the seal between said first and spout means when said spout is not disposed in the fill pipe.

8. The improvement according to claim 7 including a bellows disposed in surrounding and spaced relation to said spout to form a portion of said vapor return means between said spout and said bellows, said bellows having one end connected to said body and its other end connected to said member, and said urging means comprising said bellows.

9. The improvement according to claim 1 including a bellows disposed in surrounding and spaced relation to said spout to form a portion of said vapor return means between said spout and said bellows, said bellows having one end connected to said body and its other end connected to said member, and said bellows comprising said urging means.

10. The improvement according to claim 1 in which said vapor return means is disposed within said spout and has one end communicating exterior of said spout with the space between said member, said first means, and said spout means; said member has a portion in sealing relation with the outer surface of said spout; and said urging means comprises resilient means mounted on said spout.

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