

[72] Inventors **Edmond T. Patnaude**
 1 S. 671 Carrol Gate Road, Wheaton, Ill.
 60187;
Bernard L. Kleinke, 1960 Lincoln Park W.,
 Chicago, Ill. 60614
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Primary Examiner—Donald F. Norton
Attorney—Fidler, Bradley, Patnaude & Lazo

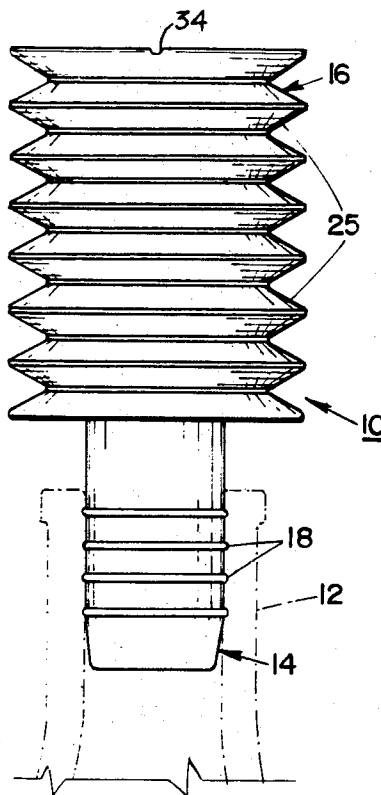
[54] **PUMP AND CLOSURE ASSEMBLY**
6 Claims, 5 Drawing Figs.

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 [51] Int. Cl. **B65d 51/16**
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 56, 47, 48, 3, 74, 100; 220/44, 44 C; 222/3, 207;
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ABSTRACT: A pump and closure assembly is adapted to be connected to a sealable container over an opening therein to evacuate the container and then automatically seal it, whereby the freshness of the contents of the container can be preserved. In one embodiment, the assembly includes a tubular connector which is adapted to fit snugly into the mouth of the container and which is connected to a bellows pump. The bellows pump can be manually operated to pump air from the container through a one-way valve which permits the air to be withdrawn and then seals the mouth of the container to prevent air from entering the container.



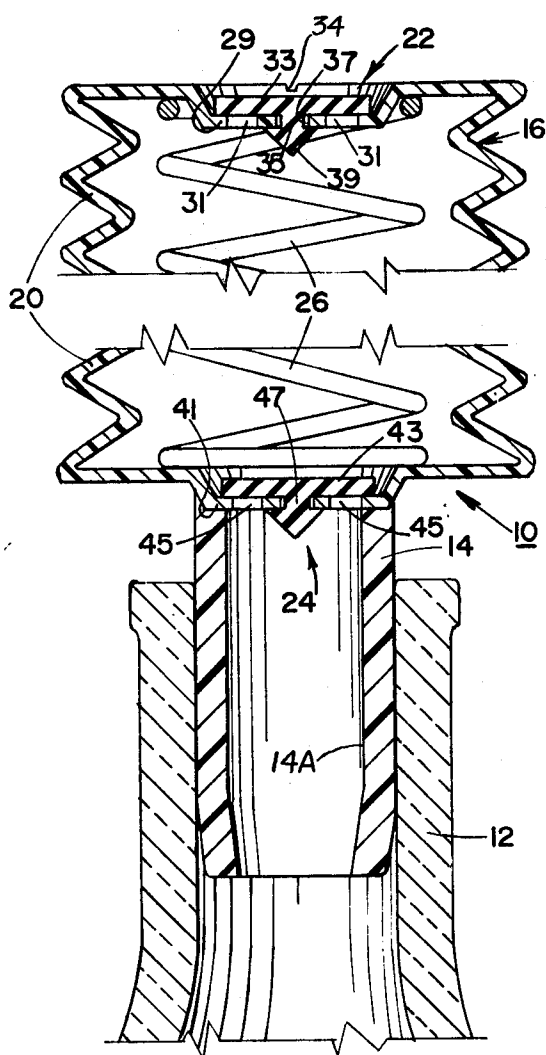


Fig. - 2

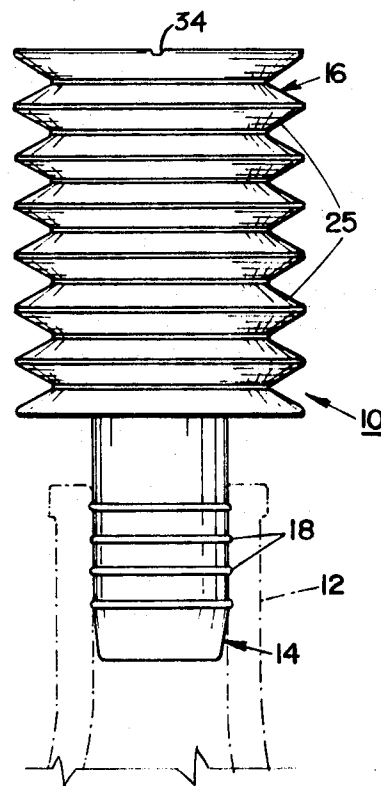


Fig.-1

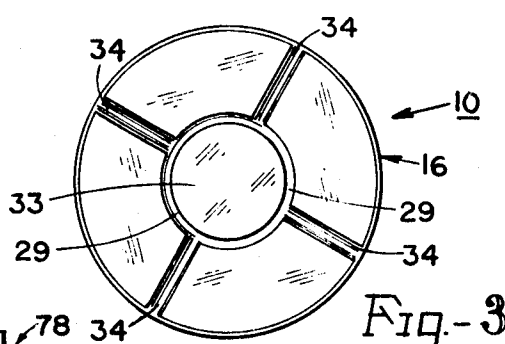


Fig.-3

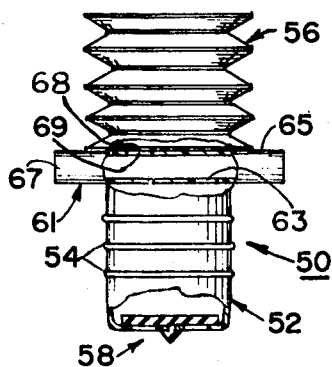


Fig.-4

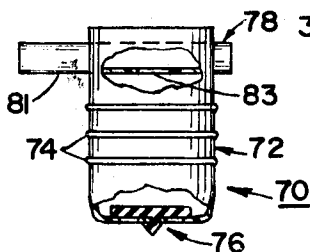


Fig.-5

INVENTORS
EDMOND T. PATNAUDE
BERNARD L. KLEINKE

PUMP AND CLOSURE ASSEMBLY

The present invention relates to a pump and closure assembly for a container, and it more particularly relates to a device which is adapted to be attached to a container to evacuate the container and then automatically seal it.

Many products are packaged in hermetically sealed or vacuum sealed containers to preserve the freshness of the product. However, once the seal is broken and a portion of the contents of the container is removed, air enters the container, and thus the remaining portion of the contents deteriorates in the container during subsequent storage. For example, wine is commonly packaged in a hermetically sealed bottle to preserve the wine until it is ready for use. When the stopper is removed and a portion of the wine is used, the unused portion of the wine cannot be stored for a long period of time without deterioration. Even if the stopper is used to reseal the bottle, air in the bottle causes the wine to oxidize, thereby adversely affecting the taste of the wine. As a result, especially where fine wines are concerned, it is usually necessary to consume all of the wine at one occasion. Therefore, it would be desirable to have a device which can be used with the original container to evacuate it and then seal it so that the contents of the container can be stored for an indefinite period of time. Moreover, the device should be relatively inexpensive to manufacture and easy to use.

Therefore, it is the principal object of the present invention to provide a new and improved device for use with a container to preserve the contents thereof.

A further object of the present invention is to provide a device which removes air from a container and then automatically seals it.

Very briefly, the above and further objects of the present invention may be attained by providing means, such as a bellows pump, for withdrawing air from a container and then automatically seals the container to prevent air from entering the container.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof will best be understood by reference to the following detailed description taken in connection with the accompanying sheet of drawings, wherein:

FIG. 1 is a front elevational view of a pump and closure assembly which is constructed in accordance with the present invention;

FIG. 2 is a fragmentary, enlarged view in cross section of the assembly of FIG. 1, showing the assembly inserted in the mouth of a bottle;

FIG. 3 is an enlarged top view of the assembly of FIG. 1;

FIG. 4 is a front elevational view, partly broken away, of another pump and closure assembly which is constructed in accordance with the present invention; and

FIG. 5 is a front elevational view, partly broken away, of still another pump and closure assembly which is constructed in accordance with the present invention. Referring now to the drawings, and more particularly to FIG. 1 thereof, there is shown a pump and closure assembly 10 which is inserted into the mouth of a bottle 12. The container 12 may be a wine bottle, but it is to be understood that the pump and closure assembly of the present invention may be adapted to cooperate with many other types of vacuum sealable containers. The assembly 10 generally comprises a tubular connector 14 which is adapted to be inserted into the mouth of the bottle 12, and a bellows pump 16 which is attached to one end of the connector 12. A series of flexible annular ridges or rings 18 on the connector 14 serve as O-rings to seal the connector to the mouth of the bottle 12.

In use, after removing a portion of the contents of the bottle 12, the bottle can be vacuum sealed by inserting the connector 14 of the assembly 10 into the mouth of the bottle 12. The bellows pump 16 can then be manually operated to withdraw the air from the bottle 12 by axially compressing and then releasing it. The pumping operation can be performed several times

to ensure that substantially all of the air is removed from the bottle 12. After the bellows pump 16 is released, the mouth of the bottle 12 is automatically sealed by the assembly 10 to prevent air from entering the bottle. Once the bottle is evacuated, the contents of the bottle can be stored indefinitely without spoiling. In order to reopen the bottle 12, the connector 14 can readily be removed from the mouth of the bottle.

Considering now the pump and closure assembly 10 in greater detail with reference to FIGS. 2 and 3 of the drawings, the bellows pump 16 includes a cylindrical bellows 20 having an exhaust one-way valve 22 in its top end to permit air to be exhausted from its interior and an intake one-way valve 24 in its opposite end to permit air to be drawn into its interior from the inside of the bottle 12 via an axially aligned bore 14A in the connector 14. The bellows 20 is molded from a flexible plastic material and includes, as best shown in FIG. 1, a series of gussets or annular folds 25 which enable the bellows 20 to be compressed to eliminate the air from its interior. An axially aligned coil spring 26 is located in the interior of the bellows 20 to assist in restoring the bellows to its normal unstressed condition after being compressed. The spring 26 should be sufficiently small in diameter such that it does not contact the bellows 20 when it is compressed. As shown in the drawings, the tubular connector 14 is molded of plastic material and is heat welded to the underside of the bellows 20.

The exhaust valve 22 is a one-way check valve which comprises a valve seat 29 forming a portion of the top surface of the bellows 20 and having a plurality of holes 31 extending therethrough and a flexible valve member 33 on the outside of the bellows 20 for sealing over the holes 31. In order to permit the air to leave the bellows 20 as the user's hand pushes downwardly on the top wall of the bellows, the valve seat 29 is disposed in an outwardly tapered recess in the top wall and, as best shown in FIG. 3, a series of grooves 34 extend radially from the recess to the periphery of the bellows 20 to provide passageways for the escaping air. The valve member 33 is composed of a flexible material, such as rubber, and is circular in shape. The valve member 33 should be relatively thin in cross section to enable it to be sufficiently flexible so that it can be readily blown away from the holes 31. However, the member 33 should be sufficiently thick in cross section to be adequately rigid to prevent air from escaping through the holes 31 when the bellows 20 is released. In order to attach the valve member 33 to the valve seat 29, a centrally disposed stem or finger 35 extends from the center of the underside of the valve member 33 through a hole 37 in the valve seat 29 and has an enlarged portion 39 at the inside of the bellows 20 for holding the valve member 33 in engagement with the bottom wall of the recess 29 when the member 33 is in its closed position. When the bellows 20 is compressed, air at the inside of the bellows 20 is forced through the holes 31 in the valve seat 29 against the valve member 33 to flex it into a cup shape away from the holes 31, whereby air is exhausted from the inside of the bellows 20 via the valve 22. After compressing the bellows 20 and eliminating the air from the bellows, the valve member 33 snaps back into engagement with the valve seat 29 to seal the holes 31 to prevent air from entering the bellows via the holes 31. When the bellows 20 is released to permit it to return to its original shape, air is drawn from the bottle 12 into the bellows 20 via the intake valve 24 due to the suction produced by the evacuated bellows, without drawing air from the atmosphere through the exhaust valve 22.

The intake valve 24 is a one-way check valve and is similar to the exhaust valve 22. The valve 24 comprises a valve seat 41 which is an integral portion of an outwardly extending portion of the bottom wall of the bellows 20, and a circular valve member 43 which is located on the inside of the bellows 20 and which sealably covers a plurality of holes 45 in the valve seat 41. The valve member 43 is similar to the valve member 33 of the valve 22 and is attached to the valve seat 41 by means of a centrally disposed stem or finger 47 in the same manner in which the valve member 33 is attached to its valve seat 29.

When the bellows 20 is compressed to exhaust the air therefrom and then released, the inherent resiliency of the bellows 20 and the spring 26 causes the bellows 20 to snap back to its original shape. In so doing, the bellows 20 draws air from the bottle 12 through the holes 45 to force the valve member 43 out of sealing engagement with the holes. Thus, air enters the bellows 20 from the bottle 12, which is thereafter automatically sealed by the valve member 43 which snaps back into engagement with the valve seat 41 to seal over the holes 45.

Referring now to FIG. 4, there is shown a pump and closure assembly 50 which is constructed in accordance with the present invention and which includes only a single one-way valve. The assembly 50 includes a tubular connector 52 having a plurality of resilient annular rings 54 for sealing the connector to the mouth of a container, such as the bottle 12 shown in FIGS. 2 and 3 of the drawings, and a bellows pump 56 which is connected to the top end of the tubular connector 52. While the assembly 50 is adapted to be inserted into the mouth of a bottle, it is to be understood that it could be constructed to cooperate with any type of vacuum sealable container. A one-way intake valve 58 is disposed in the bottom wall of the connector 52 and is substantially identical to the intake valve 24 of the pump and closure assembly 10. A tube 61 extends through aligned holes at the top end of the tubular connector 52 and is connected thereto by any suitable technique, such as heat welding. The tube 61 has a hole 63 in the bottom thereof near an opened end 65 to permit the air which is drawn from the container through the one-way intake valve 58 to be conveyed to the atmosphere through the opened end 65, the opposite end 67 of the tube 61 being closed.

In order to draw the air from the container via the intake valve 58, the cylindrically shaped bellows pump 56 has an imperforate top wall and a bottom wall which has a hole 68 so that when the bellows is manually depressed, it forces air through the hole 68 and then through an aligned hole 69 in the top of the tube 61 near its closed end 67 and then out its opened end 65. As a result, air is drawn from the container through the intake valve 58 and into the tube 61 via the lower hole 63. In this regard, the upper hole 69 is displaced from the lower hole 63 so that the air passing through the tube 61 educts air from the bottle. When the bellows pump 56 is released, air is drawn into the bellows 56 from the open end 65 of the tube 61 and also from the container via the valve 58 and the lower hole 63. After each pumping operation, the exhaust valve 58 seals the container in the same manner in which the valve 24 seals the bottle 12.

The tubular connector 52, the bellows 56, and the tube 61 are molded of suitable plastic material, but other materials may also be used.

Referring now to FIG. 5, there is shown a pump and closure assembly 70 which is also constructed in accordance with the present invention. As shown in FIG. 5, the assembly 70 does not employ a bellows pump, and it employs only a single one-way valve. The assembly 70 generally comprises a tubular connector 72 having a plurality of resilient rings 74 to adapt the assembly 70 to be inserted into the mouth of a bottle, an exhaust one-way valve 76 disposed in the bottom wall of the connector 72 in the same manner as the valve 24 of the assembly 10 to permit air to be withdrawn from the container and then to seal it, and a tube 78 which is open at both ends and which extends through aligned holes in the tubular connector 72 and sealed to the connector by any suitable technique, such as heat welding. While the assembly 70 is adapted for use with a bottle, such as the bottle 12 shown in FIGS. 2 and 3, it is to be understood that the assembly 70 may also be adapted to cooperate with other types of vacuum sealable containers. The connector 72, and the tube 78 are molded of a suitable plastic material, but other materials may also be used as well.

One end of the tube 78, such as the longer end portion 81, may be connected to a source of air or other fluid under pres-

sure to blow the air through the tube 78 so that air may be drawn from the bottle through the exhaust valve 76 and then through a hole 83 in the lower side of the tube 78 to enter the stream of air flowing through the tube. Thus, the tube 78 serves as an eductor. Any suitable source of air under pressure can be employed, such as the mouth of the user who blows through the tube 78.

In view of the foregoing description, it should now be apparent that there is provided in accordance with the present invention, a pump and closure assembly which attaches to a container to pump the air therefrom and then automatically seals the container. The assembly is relatively inexpensive to manufacture, and it is quickly and easily operated.

While the present invention has been described in connection with particular embodiments thereof, it will be understood that many changes and modifications of this invention may be made by those skilled in the art without departing from the true spirit and scope thereof. Accordingly, the appended claims are intended to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

We claim:

1. A pump and closure assembly for use with a sealable container comprising:

a hollow member adapted to be sealably received in an opening in said container;

means connected in fluid communication to said hollow member for creating a pressure differential to draw air from said container via said hollow member;

air intake one-way valve means responsive to said pressure differential for permitting air to be drawn from said container and for sealably blocking said opening to prevent air from entering said container;

said intake one-way valve comprises a valve seat having a plurality of apertures extending therethrough to permit air to flow from said container via said hollow member, and a resilient valve member for engaging said valve seat to seal over said holes to prevent air from flowing through said holes into said container and for moving out of engagement with said valve seat to permit air to flow through said holes from said container in response to said pressure differential,

said means for creating a pressure differential comprising a bellows having an opening at one end and having an exhaust one-way valve to permit air to be withdrawn from the interior of said bellows to create said pressure differential when it is compressed and to prevent air from entering said bellows via said exhaust valve,

said hollow member being connected to said bellows over said opening therein,

whereby air is forced from the interior of said bellows via said exhaust valve and then air is drawn into the interior of said bellows from said container via said intake valve which then seals said opening in said container.

2. A pump and closure assembly according to claim 1, wherein said exhaust valve comprises a valve seat having a plurality of holes therein and forming a portion of the bellows and a flexible valve member for engaging said valve seat to seal over said holes to prevent air from entering the interior of said bellows via said holes in said valve seat and for moving out of engagement with said valve seat to permit air to flow from the interior of said bellows in response to the air flowing from the interior of said bellows via said holes in the exhaust valve seat.

3. A pump and closure assembly according to claim 2, further including a spring mounted in the interior of said bellows to assist in restoring said bellows to its original shape after compressing said bellows.

4. A pump and closure assembly for use with a sealable container comprising:

a hollow member adapted to be sealably received in an opening in said container;

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means connected in fluid communication to said hollow member for creating a pressure differential to draw air from said container via said hollow member;

air intake one-way valve means responsive to said pressure differential for permitting air to be drawn from said container and for sealably blocking said opening to prevent air from entering said container,

said intake one-way valve comprises a valve seat having a plurality of apertures extending therethrough to permit air to flow from said container via said hollow member, and a resilient valve member for engaging said valve seat to seal over said holes to prevent air from flowing through said holes into said container and for moving out of engagement with said valve seat to permit air to flow through said holes from said container in response to said pressure differential, said valve seat is connected to and extends transversely across one end of said tubular member, said valve member including a centrally disposed stem extending through a corresponding one of said holes in said valve seat, said stem having an enlarged portion for retaining said valve seat between said valve member and said enlarged portion, said holes in said valve seat being aligned with and communicating with the interior of said hollow member, said hollow member being a hollow tube and having a plurality of external resilient rings for sealing said tube to said sealable container in said opening.

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5. A pump and closure assembly according to claim 4, wherein said means for creating a pressure differential comprises a tubular member having a closed end and an opened end and having a pair of axially displaced holes, and a bellows having an opening at one of its ends, said hollow member being connected to said bellows over said opening in said bellows and said tubular member being connected to said hollow member with one of said pair of holes in said tubular member being aligned with said opening in said bellows and the other one of said pair of holes being disposed opposite to said intake valve so that said bellows can force air through its opening and the aligned hole in said tubular member and out said opened end of said tubular member, whereby air is drawn from said container via said intake valve through the other one of said pair of holes in said tubular member and out its opened end.

6. A pump and closure assembly according to claim 4, wherein said means for creating a pressure differential comprises a tubular member connected to said hollow member and having a pair of opened ends and having a hole disposed opposite to said intake valve, one of said pair of opened ends being adapted to be connected to a source of fluid under pressure to force fluid through said tubular member and out the other opened end so that air is drawn from said container via said intake valve through said hole and out said other opened end.

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