

[54] COMBINATION CONTAINER WITH DISPOSABLE CLOSURE AND LINEAR ASSEMBLY

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[22] Filed: Apr. 15, 1974

[21] Appl. No.: 460,692

[52] U.S. Cl. 220/63 R; 220/298

[51] Int. Cl.² B65D 25/14

[58] Field of Search 220/63 R, 293, 296, 298, 220/65, 85 F, 86 R

[56] References Cited

UNITED STATES PATENTS

1,574,690	2/1926	Radabaugh	220/63 R X
1,977,862	10/1934	Scholtes	220/63 R
2,338,604	1/1944	Silveyra	220/63 R
2,721,674	10/1955	Lazard	220/63 R
3,276,617	10/1966	Rempt	220/296
3,477,610	11/1969	Hansen	220/86 R X

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[57] ABSTRACT

A combination container with sealing closure and lining assembly wherein the closure and lining assembly

is removable for reuse or pollution-free disposal. The closure and liner assembly is particularly adapted for use with containers having a formed opening in one wall thereof. The elastomeric liner is collapsible for easy insertion into the container through the opening therein and has a shape, when expanded, that conforms to the inner contour of the container. The closure to which the neck of the liner is secured has an upper section which fits sealingly against the outer surface of the container wall in a region surrounding the opening, and a lower section which is insertable through the opening and upon rotation fits under and engages inwardly facing lip surfaces surrounding the opening. A radially extending marginal edge portion of the opening and a locking projection on the closure are aligned in an interference fit when the closure is installed to inhibit removal of the closure and liner until desired. The locking stop is severable on forced rotation of the closure whereby the closure may be removed. A bore extends through the closure to the interior of the liner and a plug is insertable therein to close off the bore. A tubular member is insertable through the bore to feed material to or withdraw material from the liner and a sealing member provides a sliding contact seal about the tubular member as it is inserted or withdrawn. A substantially cylindrical collar may be inserted in the opening surrounding the liner during removal of the liner to protect the liner from damage by edges of the opening.

17 Claims, 14 Drawing Figures

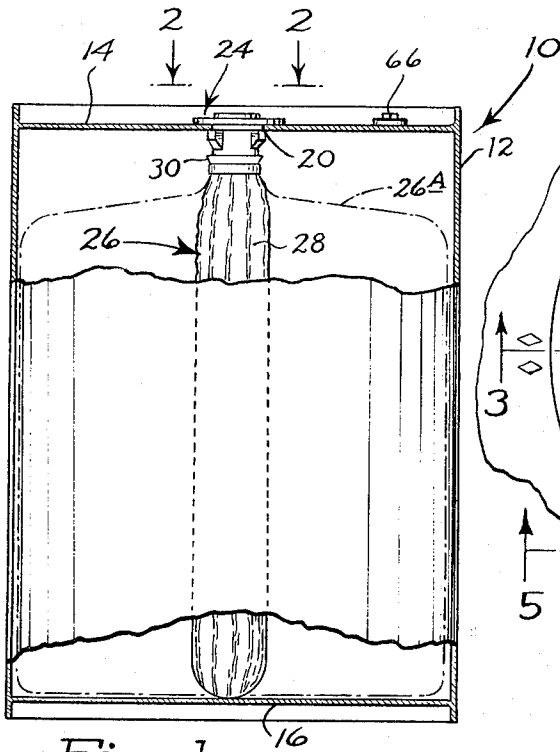


Fig. 1.

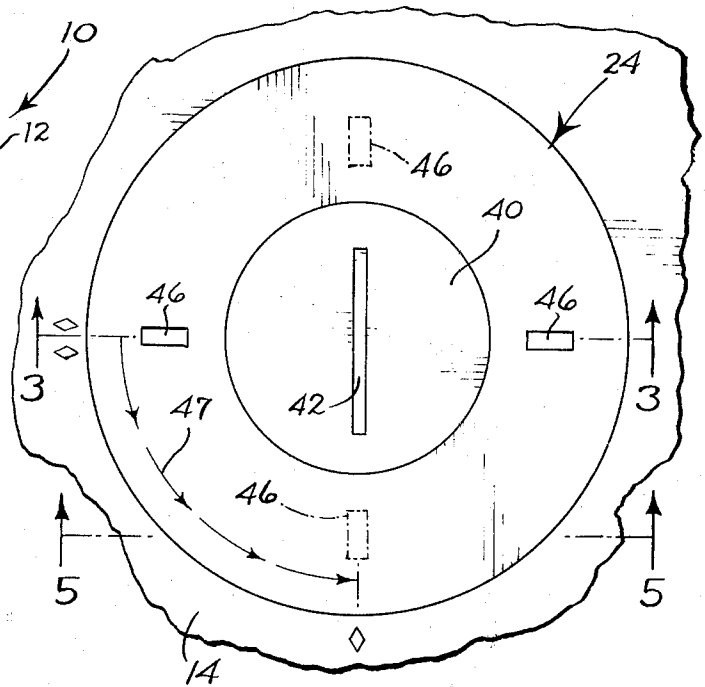


Fig. 2.

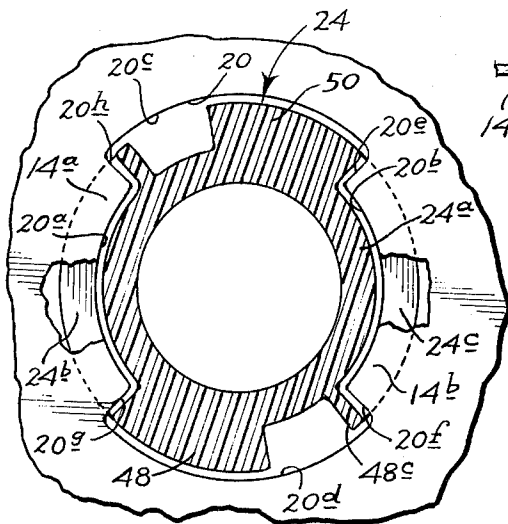


Fig. 4.

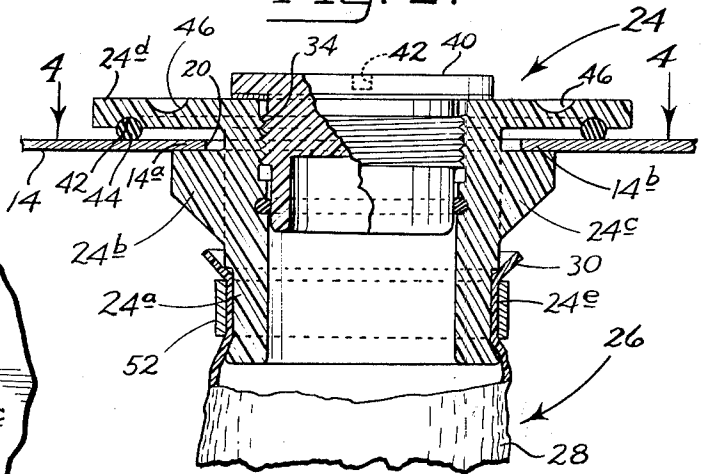


Fig. 3.

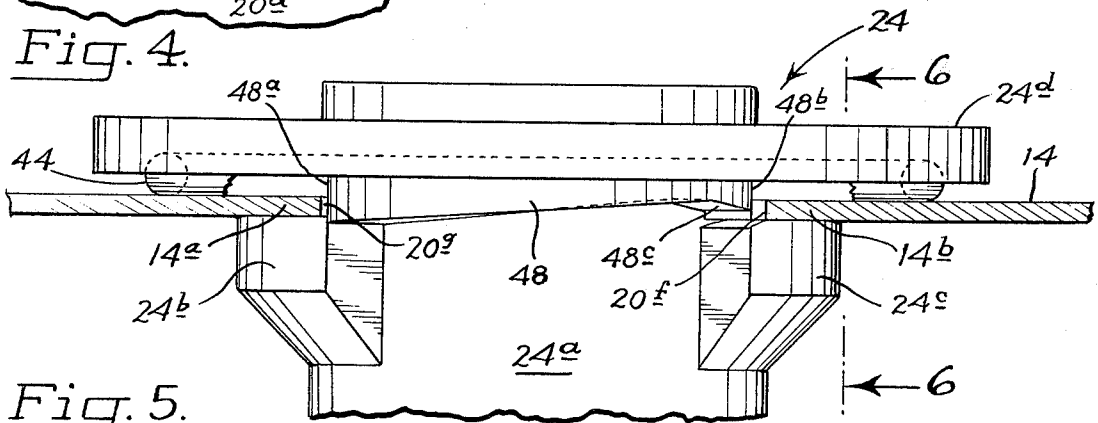


Fig. 5.

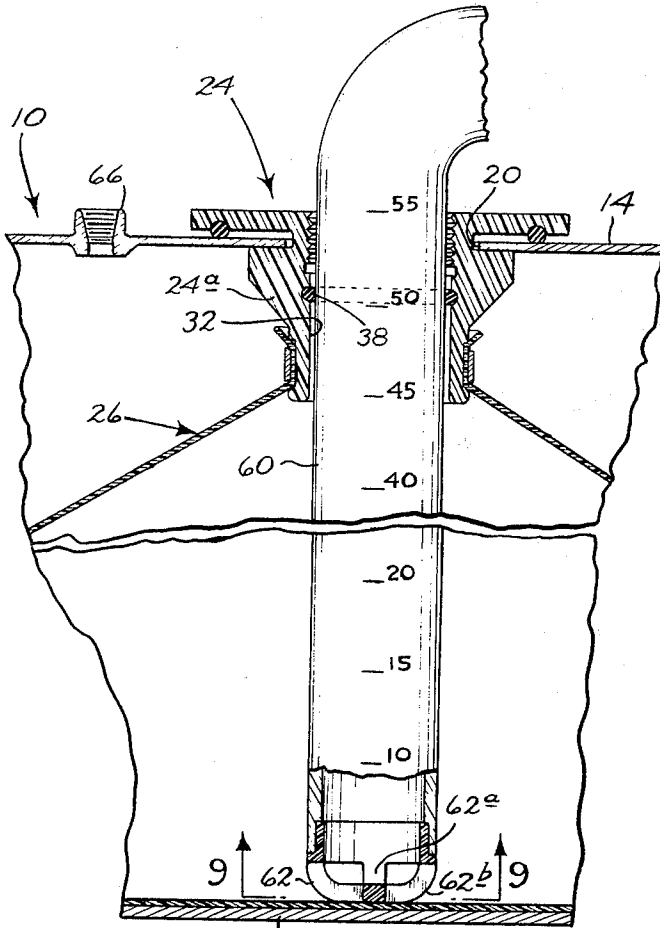


Fig. 8.

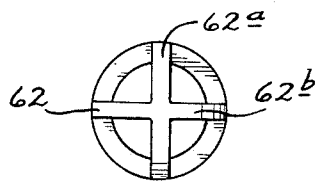


Fig. 9.

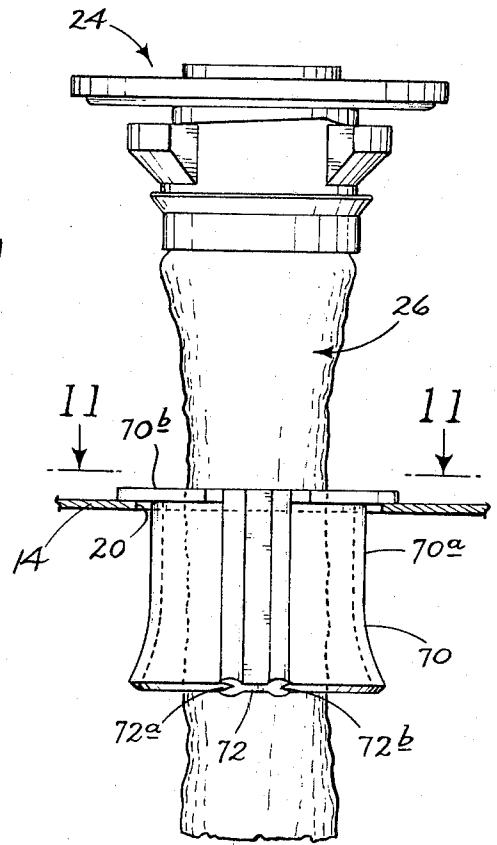


Fig. 10.

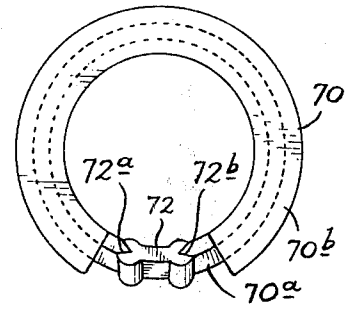


Fig. 11.

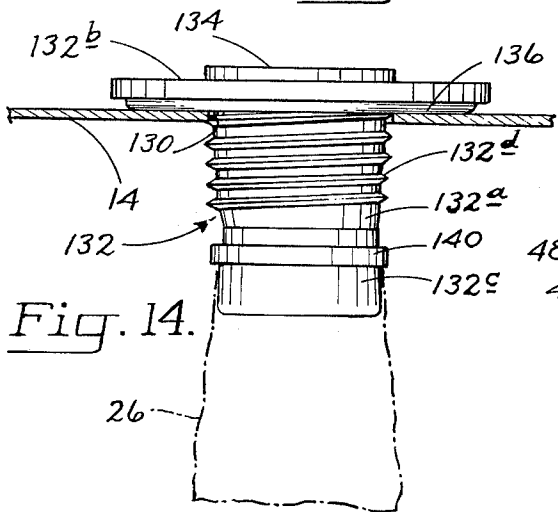


Fig. 14.

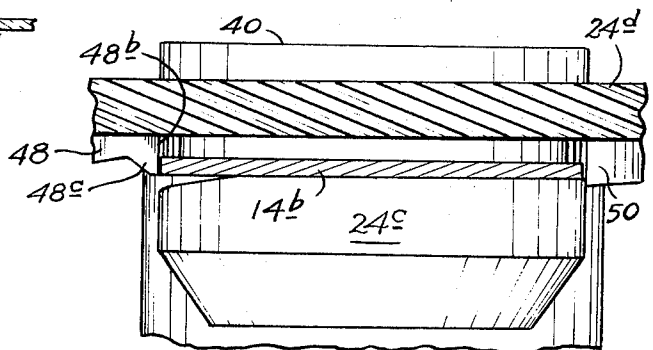
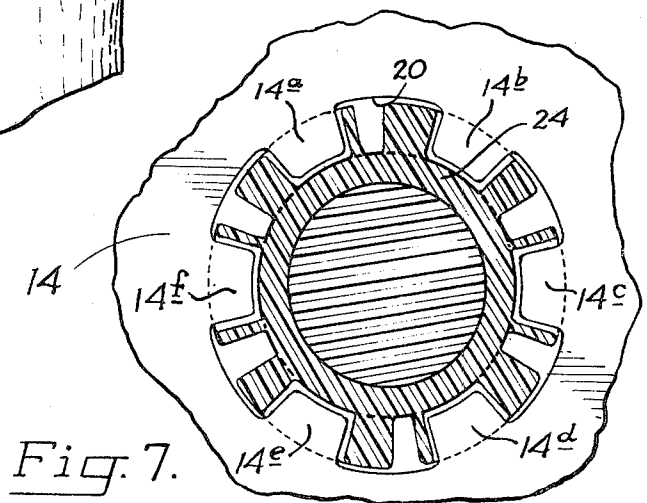
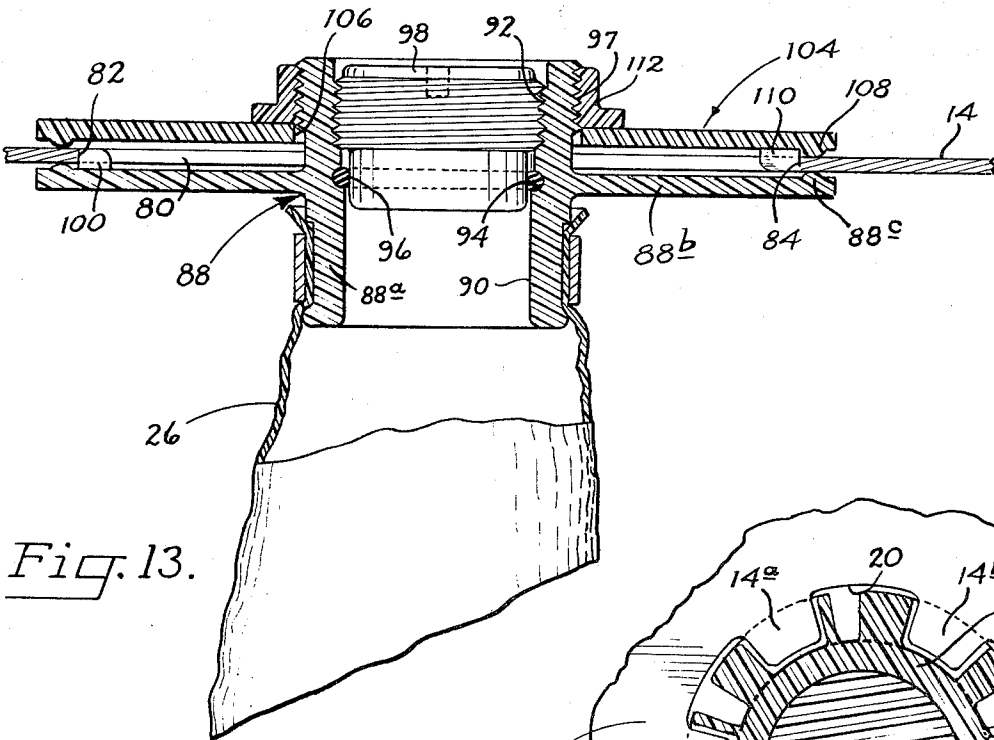
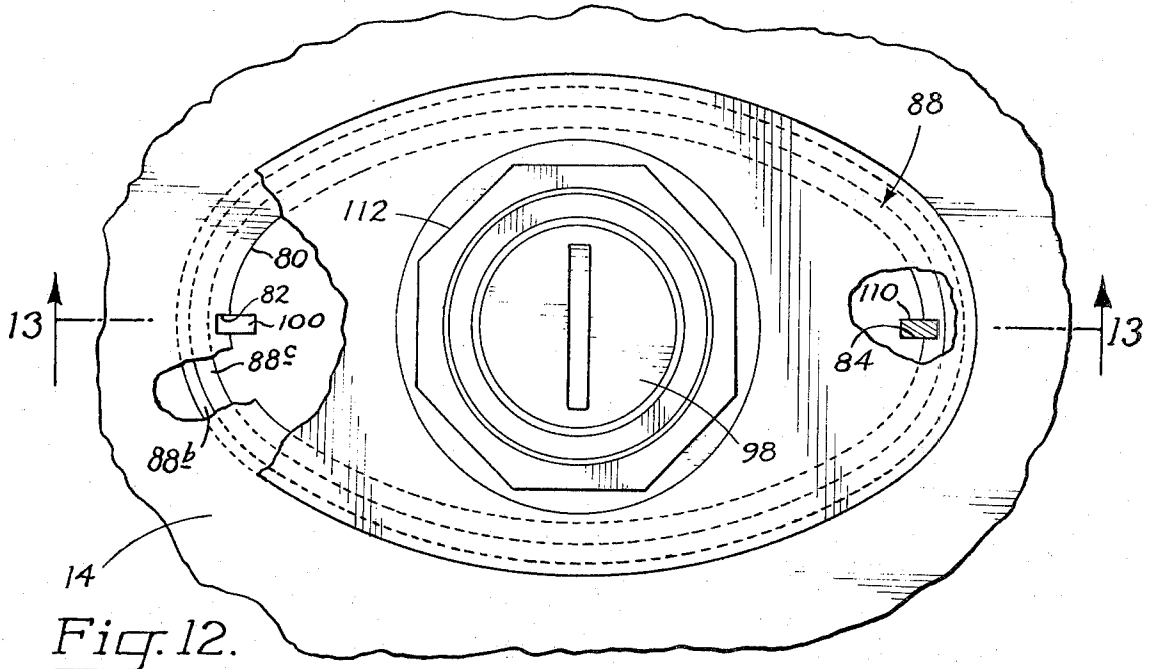


Fig. 6.



COMBINATION CONTAINER WITH DISPOSABLE CLOSURE AND LINER ASSEMBLY

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a container with a disposable closure and liner assembly, and more particularly to such a closure and liner assembly which may be inserted through and secured in a formed opening in a wall of the container without the requirement for specialized securing adapters previously being secured to the wall of the container.

Containers of various sizes and configurations are utilized throughout industry for confining, storing and transporting materials, such as hazardous and nonhazardous chemicals and certain caustic and toxic waste materials. The containers are usually fabricated of metal or synthetic materials to provide adequate structural stability and to permit repeated reuse of the containers.

However, certain problems are encountered in the reuse of such containers. In particular, difficulties occur when the containers are used with the hazardous, caustic, and waste substances mentioned above. Since it is difficult to empty completely drums and other standard containers, it is common for the remnant contents of a container to contaminate the new contents when the container is reused. In addition, the interior surfaces of the containers are subject to corrosion and deterioration with repeated use, and can, therefore, contaminate the container contents. Furthermore, as a result of such corrosion and deterioration, it is common for older containers to develop cracks and leaks.

Both the contamination of materials and the leakage from the containers often result in pollution of the environment and hazard to humans and the surrounding area. Although the deterioration of containers and the amount of contamination encountered in reuse can be reduced through periodic washing and cleaning of the containers, such operations often are inconvenient and expensive and in some instances, are no longer allowed. Furthermore, unless complicated equipment is used, cleaning operations can involve hazardous human contact with the toxic materials, as well as pollution of the environment. In addition to small containers used in industry, railroad and ships' tanks and permanent storage tanks also are subject to all of the above disadvantages.

In addition to washing the containers, numerous methods have been proposed to solve the above-noted problems. For example, it has been suggested that protective coatings or sprays be applied to the interior of the containers during manufacture. This is partially satisfactory, but does not eliminate the necessity for cleaning the containers or eliminate human contact with materials being carried by the containers. More recently, it has been suggested that inner liners of elastomeric film or other inert material be utilized. However, the liners available at the present time all have significant disadvantages. In particular, a satisfactory closure and liner should be inexpensive and easy to use with standard containers. Moreover, the liner should be easily installed and/or removed for disposal or reuse if that is desired. Also, it is essential, where caustic or toxic materials or other hazardous substances are being carried that means be provided for sealing the liner and

that the liner be removable without breaking the seal so that it can be disposed of without human contact of the contents. Finally, it is essential that means be provided for filling or withdrawing material from the liner with a sealed condition existing to prevent escape of toxic or hazardous material during such filling or withdrawing operation.

Many of the above-mentioned problems occur also when it is desired to carry relatively pure substances, such as foods or chemicals, and there is need to prevent exterior contaminants from entering the container.

Accordingly, it is an object of the invention to provide a container with a disposable closure and liner assembly which overcomes the disadvantages outlined above.

It is another object of the invention to provide a disposable closure and liner assembly which is inexpensive to manufacture and which is easy to install and remove from containers of standard configuration having a wall with a formed opening therein, without the need for adapters permanently secured to the wall of the container.

It is a further object of the invention to provide such a closure and liner assembly which is susceptible of being tightly sealed to and removed from the container without disturbing the sealed condition of the liner.

It is yet another object of the invention to provide such a closure and liner assembly which can be utilized for handling caustic, toxic and other materials without human contact of the materials.

These and other objects of the invention are attained by a combination closure and liner assembly especially adapted for use with containers. The elastomeric liner is collapsible into a tightly folded package for easy insertion into containers through a formed opening in a wall thereof, and has a shape, when expanded, that conforms generally to the inner contours of the container. The neck of the liner is secured to the closure around one end of a bore extending through the closure element. The bore is normally sealed by a removable plug that communicates with the interior of the liner. The closure and liner assembly can be installed in or removed from a formed opening in a wall of the container with the plug in a sealed condition so that human contact with the contents of the liner is avoided. With the plug removed, the internal bore of the closure element is adapted to receive an elongate tube there-through which may be inserted as desired into the liner to facilitate filling or withdrawal of material from the liner. A seal within the bore provides a sliding contact seal about the tube preventing materials from being discharged into the atmosphere in the vicinity of the container.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention will become more fully apparent as the following description is read in conjunction with the drawings, wherein:

FIG. 1 is a side elevation view of a container, with portions broken away, with disposable closure and liner assembly according to the invention therein;

FIG. 2 is a top plan view on an enlarged scale of a closure element of the invention taken generally along the line 2—2 in FIG. 1;

FIG. 3 is a cross-sectional view taken generally along the line 3—3 in FIG. 2;

FIG. 4 is a view taken generally along the line 4—4 in FIG. 3;

FIG. 5 is an enlarged view taken generally along the line 5—5 in FIG. 2;

FIG. 6 is a view taken generally along the line 6—6 in FIG. 5;

FIG. 7 is a plan view taken generally along the plane similar to the plane of line 4—4 in FIG. 3, but illustrating a modified version of the closure device of the invention;

FIG. 8 is an enlarged cross-sectional view of the container, closure and liner assembly with portions broken away, illustrating the insertion of a fill and withdrawal tube inserted therein;

FIG. 9 is a view taken generally along the line 9—9 in FIG. 8;

FIG. 10 is a plan view of a protective collar for use during withdrawal of the closure and liner assembly;

FIG. 11 is a top plan view of the collar taken generally along the line 11—11 in FIG. 10;

FIG. 12 is a top plan view of a modified form of a closure and liner assembly according to the invention;

FIG. 13 is a cross-sectional view taken generally along the line 13—13 in FIG. 12; and

FIG. 14 is a cross-sectional elevation view of a modified closure and liner assembly.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Referring to the drawings and first particularly to FIG. 1, at 10 is indicated generally a drum or container of conventional design. The container has a continuous cylindrical side wall 12 closed by upper and lower ends 14, 16, respectively. The upper end 14 of the container includes a formed opening 20 best illustrated in FIG. 4. Opening 20 is of generally circular configuration. A pair of circumferentially spaced-apart projecting portions 14a, 14b of wall 14 project radially inwardly a distance toward the center of the opening. The side-to-side dimensions between the arcuate inner edges 20a, 20b of projections 14a, 14b is referred to as the minor side-to-side dimension of opening 20 and the side-to-side dimension between arcuate inner edge portions 20c, 20d is referred to as the major dimension of the opening. Projections 14a, 14b also have edge margins, indicated generally at 20e, 20f, 20g, 20h, which extend radially inwardly toward the center of the opening. The upper surfaces of projections 14a, 14b are referred to herein as outwardly facing lip surfaces and the undersides of these projections are referred to as inwardly facing lip surfaces.

The closure and liner assembly of the invention includes an adapter, or closure, member 24 to which a bag, or liner, 26 is secured. The closure and liner are secured together to form a unitary assembly whereby the liner can be inserted through the opening in the top of the container and expanded, when filled, to conform to the inner surface of the container. The closure member is adapted for sealing engagement with the formed opening in the wall of the container and serves to support the liner within the container. The liner can be fabricated in numerous physical forms within the scope of the invention.

The liner preferably is formed of an elastomeric material, such as polyethylene or polyurethane film and includes a body 28 having a neck opening 30 integral therewith. Such elastomeric materials provide a liner of adequate strength that is extremely tear-resistant. The selection of a particular material is critical only in that

the elastomer selected must not be subject to deterioration by the material to be confined in the container.

The body of the liner, when empty, is adapted to form a compact, tightly collapsed package to facilitate installation in the container. In the embodiment illustrated, the liner is arranged in bellows-type folds, which can be permanently formed in the liner by means of a heat process. Use of such folds is advantageous in that it permits the liner to self expand during filling without fouling. Other means of folding or compacting the liner can be utilized, including twisting or rolling of the liner.

Referring to FIGS. 2—6, closure member 24 of the assembly is illustrated in detail. The closure member includes a central, generally cylindrical, body portion 24a having a diameter slightly smaller than the side-to-side dimension between edge margins 20a, 20b of the opening. An elongate cylindrical bore 32 extends through body portion 24a (see FIG. 3). The upper end of bore 32 is internally threaded at 34 and an annular groove 36 extends about an intermediate portion of the bore. An elastomeric O-ring seal 38 is seated in groove 36 with an inwardly facing surface of the seal projecting a distance inwardly from the surface of bore 32.

A threaded plug 40 may be screwed into threaded portion 34 of bore 32 with a smooth cylindrical lower outer surface of the plug sealingly engaging the inner surface of O-ring 38 to provide a seal between the plug and the bore. A slot 42 is provided in the top of plug 40 for the insertion of a tool for screwing it into or out of the bore.

Closure member 24 also includes a pair of oppositely disposed arcuate shoulder portions, or elements, 24b, 24c which project outwardly to opposite sides of body portion 24a. As is best seen in FIG. 4, the outer surfaces of shoulder portions 24b, 24c are arcuate, and have a side-to-side dimension, as measured from the outer edge of portion 24b to the outer edge of portion 24c, which is somewhat less than the major dimension of opening 24 in the container wall as measured between margins 20c, 20d. The length of each of shoulder portions 24b, 24c, measured circumferentially of the closure member, is somewhat less than the spacing between edge margins 20e, 20h and between edge margins 20f, 20g on projections 14a, 14b. Such configuration of the shoulders permits them, when rotated counterclockwise 90° from the position shown in FIG. 4, to pass vertically through the openings between projections 14a, 14b. The diameter of body portion 24a allows it to pass freely between the projections 14a, 14b.

After insertion of the body portion and shoulder portions through opening 20 in the just-defined first position, the closure member may be rotated in a clockwise direction as viewed in FIG. 4 to what is referred to herein as a second position, as shown in solid outline in FIG. 4, with shoulder portions 24b, 24c underlying and engaging the undersides of projections 14a, 14b, respectively. As is seen in FIGS. 5 and 6, the upper surface of each shoulder portion in a region adjacent what might be considered its leading edge (the edge of the shoulder portion which leads on rotation of the member in a clockwise direction as seen in FIG. 4) inclines upwardly on progressing toward its other end. This depressed leading edge and inclined surface, as will become more apparent as the invention is further described, aids in initiating setting of the closure member and rotating it to a closed, or locked, position.

Referring to FIGS. 2, 3, 5 and 6, a substantially planar, circular upper flange, or portion, 24d radiates out-

wardly from central body portion 24a in a position spaced above shoulder portions 24b, 24c. The peripheral edge of flange 24d projects outwardly beyond the outer margins of shoulder portions 24b, 24c. An annular groove 42 extending about the underside of flange 24d receives an O-ring seal 44 therein. When the closure unit is in its operative position, O-ring 44 rests atop wall 14 of the container. As will become more fully apparent below, with installation of the closure assembly, flange 24d is urged toward the top of wall 14, thus pressing O-ring 44 into tight sealing engagement with the upper surface of the container. Referring to FIGS. 2 and 3, oppositely disposed indentations 46 in the upper surface of flange 24d are provided to receive projections on an appropriate tool for turning the closure element in the direction of arrows 47 between its closed position as illustrated with indentations 46 in solid outline and a released position as illustrated by indentations 46 in dot-dash outline.

Referring to FIGS. 5 and 6, secured to and projecting outwardly from central body portion 24a of the closure element and downwardly from flange 24d are a pair of arcuate, opposed stop and locking portions indicated generally at 48, 50. Portions 48, 50 are identical, and thus only one will be described in detail. Referring to FIG. 5, such a portion is arcuate and extends about a segment of the periphery of central body portion 24a between shoulder portions 24b, 24c, with one of its edges 48a contiguous and joining with the trailing edge of shoulder portion 24b and its opposite end 48b contiguous and spaced slightly above the leading edge of shoulder portion 24c. As is seen in FIG. 5, the underside of portion 48 inclines upwardly toward flange 24d throughout a major portion of its length with a minor end portion thereof, adjacent end 48b, slanting downwardly again toward shoulder portion 24c to form what is referred to herein as a stop, or locking, projection 48c.

In operative position, with the closure element inserted and rotated to the position shown in FIGS. 3-6, stop projection 48c is aligned in an interference fit with a radially extending marginal edge 20f or 20h of the opening. This inhibits rotation of the closure element in a counterclockwise direction as viewed in FIG. 4, from its closed position, as illustrated in these drawings, back to an open, or released, position. Projection 48c is constructed of a material which is severable, or breakable, on sufficient shear force being applied thereto on rotation of the closure device whereby the stop projection may be sheared off. This then would prevent accidental rotation of the closure device to a release position, and such shearing off of the stop portion would indicate to later potential users that the device previously has been used.

A lower, necked down, portion 24e of the central body portion has a diameter which is somewhat smaller than the minor side-to-side dimension of the formed opening in the container. Neck 30 of liner 26 is secured to this portion of the closure by a clamp extending peripherally thereabout as indicated generally in cross section at 52.

Installation of such a closure and liner assembly is a simple matter. First, liner 26 is lowered through opening 20 until it is fully within the container. Closure device 24 then is positioned whereby shoulder portions 24b, 24c may be slipped through the major diameter portions of opening 20. Once they are slipped downwardly therethrough with O-ring seal 44 coming to rest

against the upper surface of wall 14, the closure device is rotated in a clockwise direction as illustrated in FIG. 4, to place the closure device in the position illustrated in FIGS. 2-6. On rotation of the closure device inclined leading edge portions of shoulder portions 24b, 24c pass under radially extending marginal edge portions of projections 14a, 14b and then the inclined surfaces of the shoulder portion bias the wall portions surrounding the opening against the underside of O-ring seal 44 to seal the closure device to the wall of the container. Continued rotation of the closure device brings the leading edges of stop portions 48, 50 into engagement with radially extending marginal edges 20e, 20g of projections 14b, 14a, respectively, to stop further rotation of the device. With the closure device thus positioned, and referring to FIGS. 5 and 6, projections like that illustrated at 48c are placed in interfering alignment with projecting portions 14a, 14b to inhibit rotation of the closure device to a release position.

Supply of material to, or withdrawal of material from, the liner within the container may be effected through an elongate, tubular member, such as that indicated generally at 60 in FIG. 8. With removal of plug 40 from bore 32, elongate, hollow tube 60 may be inserted therethrough with its outer surface contacting O-ring 38. The O-ring thus provides a sliding contact seal between the bore and the tube.

The lower end of tube 60 has a stop device 62 secured therein with cross members 62a, 62b extending thereacross and defining openings into the interior of the tube. Device 62 allows the lower end of the tube to rest on the bottom of the container within liner 26.

To fill the liner within the container, material is fed through the tube into the liner, which then expands to take the general configuration of the interior of the container, as illustrated in dot-dash outline at 26A in FIG. 1. A vent opening, such as that indicated generally at 66 in FIG. 8 may be provided for venting air from the interior of the container surrounding the liner as the liner is filled. A standard threaded plug may be screwed into opening 66 to close the vent opening when not in use.

Withdrawal of material from the liner is equally as simple, in that with the tube inserted as shown in FIG. 8, a suction device may be attached to the opposite end of the tube to withdraw material from the liner. Another method of discharging material from the liner could be realized by attachment of a fluid pressure line to opening 66 in such a manner as to inject fluid under pressure to the region in the container surrounding the liner, thus to force material from the liner and upwardly through tube 60.

As illustrated in FIG. 8, markings may be provided at spaced-apart locations longitudinally along the tube to indicate the extent of insertion of the tube through bore 32 to effect withdrawal of desired quantities of material. Explaining further, should it be desired to remove 15 gallons of material from a filled standard 55 gallon drum with which the system is illustrated, tube 60 would be inserted through bore 32 until the marking, indicated generally at 15, was aligned with the top of closure device 24. The tube thus would be inserted to a depth sufficient to withdraw 15 gallons from the container if the container is full. Similarly, insertion of the tube to other marked positions would result in corresponding withdrawal of material.

After filling or withdrawal of material from the liner, plug 40 is screwed back into the opening to provide a

sealed closure for the top of the container.

Referring to FIGS. 10 and 11, a collar 70 is illustrated for facilitating removal of the liner and protecting it against tearing as it is removed. Collar 70 may be made of a plastic material and has a substantially cylindrical side wall 70a which has a diverging, or bell-shaped, configuration adjacent its lower end. An annular flange 70b radiates outwardly from the upper edge of side wall 70a. Device 70 is split longitudinally along one of its sides whereby it may be opened up to be wrapped about liner 26 when the liner is partially withdrawn from the container as illustrated in FIG. 10. An elongate spacer 72 having grooves 72a, 72b extending along its opposite longitudinal edges may be inserted between opposed edge margins of the split in wall 70a to close off the opening therein.

During removal, closure device 24 and liner 26 are raised slightly from the container as illustrated in FIG. 10, the split collar 70 is wrapped around the used liner with spacer 72 then being inserted between opposed edges of the split and the collar then is lowered through the opening with flange 70b resting on peripheral edges of opening 20 in the container wall. The relatively smooth inner surface of the collar acts as a protecting guide for the liner as it is withdrawn from the container.

Referring to FIG. 7, a modified form of the closure device is illustrated. In this modification, a greater number of projections 14a-14f, of smaller side-to-side dimensions than were provided in the embodiment illustrated in FIGS. 2-6 project inwardly toward the center of opening 20. Correspondingly, a similar increase in the number of shoulder portions on closure device 24 are provided for insertion through the spaces between projections 14a-14f and for locking thereunder on sealing rotation of the device. Such a closure device, with a greater number of more closely spaced projections about the opening and shoulder projections on the closure device, may provide a more secure sealing between the O-ring seal and the top of the container.

Referring to FIGS. 12 and 13, another embodiment of the invention is illustrated. In this embodiment of the invention, the formed opening 80 in wall 14 of the container is substantially ovate, having a major dimension extending in a direction from the left to the right side in FIG. 12, and a minor dimension extending in a direction from top to bottom in the figure. Indentations, or notches, 82, 84 are formed in opposite ends of the opening.

The closure device 88 of this form of the invention has a central, substantially cylindrical body portion 88a, a bore 90 with a threaded upper end 92, and an annular groove 94 seating an annular, elastomeric O-ring seal 96 as previously described for the unit in FIGS. 2-6. The upper end of body portion 88a also is externally threaded as indicated at 97. A plug 98 screwed into threaded upper portion 92 of the bore similarly is available to close off the bore and sealingly engage O-ring 96.

Radiating outwardly from a central region of body portion 88a of the closure device is a substantially planar, ovate lower member, or portion, 88b. A half-round projection 88c extends peripherally about lower portion 88b adjacent its outer margin, and projects upwardly from the upper surface thereof. Portion 88b is somewhat flexible facilitating insertion through opening 80, as will be described in greater detail below. A substantially rectangular projection 100 is secured to

the upper surface of lower portion 88b adjacent one of its ends and is adapted to fit within notch 82, as illustrated.

A removable upper section 104 for the closure device has a substantially ovate configuration and is of substantially the same outer dimensions as previously described lower portion 88b. Explaining further, each of these portions 88b, 104 have major dimensions which are greater than the major dimension of opening 80, and minor dimensions which are greater than the minor dimension of opening 80. Upper section 104 has an opening 106 extending centrally therethrough facilitating movement of section 104 onto and off of central body portion 88a of the device. A half-round projection 108 extends peripherally about section 104 adjacent its outer margin and projects downwardly from the lower surface thereof in a position substantially overlying projection 88c on lower portion 88b. Section 104 also has a substantially rectangular projection 110 thereon adapted to fit within notch 84. A nut 112 screwed on the threaded outer surface of central body portion 88a is operable to draw lower section 88b and section 104 toward each other.

Explaining the attachment of the device illustrated in FIGS. 12 and 13, with nut 112 and upper section 104 removed, liner 26 is lowered through the opening. Lower section 88b is rotated to place its major dimension substantially in the direction of the minor dimension of opening 80. One end of portion 88b then is inserted through the opening until it is fully below the container wall and then it is rotated slightly and the opposite end of portion 88b is flexed whereby it may be inserted at the other side of the opening. Once the lower section is inserted under wall 14 it is rotated to place its major dimension in the direction of the major dimension of opening 80 with projection 88c against the underside of the wall and projection 100 in notch 82. Upper section 104 then is lowered over central body portion 88a and nut 112 is screwed down and against it to tighten the two into sealing engagement against opposite sides of the wall. Projections 100, 110 fitting into notches 82, 84, respectively, prevent rotation of the upper and lower sections during tightening of nut 112 and throughout further use of the device.

Referring to FIG. 14, another embodiment of the invention is illustrated. In this embodiment, an opening 130 in wall 14 of the container is circular. The closure device 132 of this form of the invention has a substantially cylindrical body portion 132a with an internal bore, threaded upper inner end, and annular groove seating an elastomeric O-ring seal, as previously described for the other embodiments of the invention. A plug 134 screwed into the bore of body portion 132a similarly closes off the bore and sealingly engages the O-ring therein.

A circular flange portion 132b radiates outwardly from the upper end of body portion 132a and has an annular O-ring seal 136 seated on its underside to engage the top of wall 14. The lower end 132c of body portion 132a is somewhat conical in shape being larger in diameter at its bottom than in a region spaced above its bottom.

The neck of a bag, indicated generally in dashed outline at 26, is secured to conical lower lower portion 132c of the central body portion by a ring 140 which fits thereabout. The ring is so positioned that when it is pressed down over the neck of the bag, it tightens to seal the top of the bag against the closure device. As

greater downward force is exerted by the bag it pulls the ring down to tighten even more firmly thereabout.

An intermediate portion 132d of central body portion 132a is threaded. This threaded portion 132d is larger in diameter at its top than at its bottom. The threads are operable to screw into opening 130 to tighten the closure device in wall 14.

Installation of the embodiment of the invention of FIG. 14 also is a simple matter. After bag 26 has been connected to the closure device by ring 140 the bag is lowered into the container through opening 130. The closure device then is screwed tightly into the opening with O-ring 136 being brought into tight engagement with the outer surface of wall 14.

It should be understood that the liners, closure devices, plugs for the closure devices, and the rings securing the liners to the closure devices all may be made of a material, such as plastic, which is readily consumable in a high-temperature incinerator. In this way, once a liner and closure device have been used, they may be destroyed to prevent further use and hazardous contamination.

It should be evident from the above that such a closure and liner assembly is adapted for use with containers having only a formed opening cut therein, without the need for special adapter devices secured, as by welding, to the wall of the container. Further, the invention permits ease of attachment and release of the closure and liner assembly to facilitate its use with such containers.

By providing a closure device having sealing means therein through which a tubular member may be inserted for filling or withdrawal of material in the liner an essentially pollution-free filling or withdrawal of material from the container is possible. Further, with the sealed plug closure device provided, materials may be stored or carried in the containers without fear of contamination, and the liner, once it is emptied, may be removed from the container in a still closed position to prevent human contact of materials therein.

Such a closure and liner assembly also may be used for handling of materials which it is desired to keep relatively pure and free from contamination from outside sources, such as foods and chemicals.

While various embodiments of the invention have been described herein, it should be apparent to those skilled in the art that further variations and modifications are possible without departing from the spirit of the invention.

It is claimed and desired to be secured by Letters Patent:

1. A combination container with disposable closure and liner assembly wherein

said container comprises a wall having a formed opening extending therethrough with marginal edges surrounding said opening defining inwardly and outwardly facing lip surfaces, said formed opening having major and minor side-to-side dimensions as measured along angularly disposed lines extending in the plane of the wall, with said major dimension being greater than said minor dimension,

said closure comprises a member adapted to fit in and close said opening, said closure having a lower section adapted for insertion through said opening when in one position relative to said opening and being adapted upon rotation to a second position following insertion for engaging said inwardly fac-

ing lip surface, said lower section of said closure having first and second side-to-side dimensions as measured along angularly disposed lines in a plane paralleling the plane of the wall, with said first dimension being greater than said minor dimension but less than said major dimension, and said second dimension being less than said minor dimension, an upper section overlying said outwardly facing lip surface, sealing means interposed between said upper section and said outwardly facing lip surface, a bore extending through said member from the exterior to the interior of said container, and removable plug means for closing said bore, and said liner comprises a pliable, collapsible bag having a continuous body and neck integral with said body, said neck being fixedly secured to said closure about the inner end of said bore.

2. The combination of claim 1, wherein said bore in the closure is substantially cylindrical and is adapted to receive an elongate tube therethrough which projects into said liner and has an opening therein communicating with the interior of said liner, and which further comprises peripheral sealing means in said bore for engaging the periphery of such a tube and providing a sliding contact seal between the bore and tube.

3. A combination container with disposable closure and liner assembly wherein

said container comprises a wall having a formed opening extending therethrough with marginal edges surrounding said opening defining inwardly and outwardly facing lip surfaces, said opening being generally circular in outline throughout a portion of the periphery of the opening and including a plurality of wall portions which are spaced-apart circumferentially about said opening and which project radially inwardly toward the center of said opening, the undersides of said projections defining said inwardly facing lip surface,

said closure comprises a member adapted to fit in and close said opening, said closure having a lower section adapted for insertion through said opening when in one position relative to said opening and being adapted upon rotation to a second position following insertion for engaging said inwardly facing lip surface, an upper section overlying said outwardly facing lip surface, sealing means interposed between said upper section and said outwardly facing lip surface, a bore extending through said member from the exterior to the interior of said container, and removable plug means for closing said bore, and

said liner comprises a pliable, collapsible bag having a continuous body and neck integral with said body, said neck being fixedly secured to said closure about the inner end of said bore.

4. The combination of claim 3, wherein said projections have edge margins which are disposed along lines radiating inwardly generally toward the center of said opening, and said closure further comprises at least one locking projection thereon positioned in interfering alignment with one of said edge margins when said closure is rotated to its second position, said locking projection being operable to inhibit rotation of said closure from its second to its first position for removal.

5. The combination of claim 4, wherein said locking projection is severable at a preselected shear force to permit forced rotation of said closure from its second to its first positions for removal.

11

6. A combination container with disposable closure and liner assembly wherein

said container comprises a wall having a formed opening extending therethrough with marginal edges surrounding said opening defining inwardly and outwardly facing lip surfaces, said closure comprises a member adapted to fit in and close said opening, said closure having a lower section adapted for insertion through said opening when in one position relative to said opening and being adapted upon rotation to a second position following insertion for engaging said inwardly facing lip surface, an upper section overlying said outwardly facing lip surface, sealing means interposed between said upper section and said outwardly facing lip surface, a bore extending through said member from the exterior of the interior of said container, and removable plug means for closing said bore, said lower section having an engaging surface facing said upper section which is adapted to engage the inwardly facing lip surface of the edge margin of the opening, said engaging surface defining an inclined plane sloping toward said upper section to wedge the edge margin of the opening tightly against said sealing means on rotation of the closure from its first to its second position, and said liner comprises a pliable, collapsible bag having a continuous body and neck integral with said body, said neck being fixedly secured to said closure about the inner end of said bore.

7. The combination of claim 6, wherein said bore in the closure is substantially cylindrical and is adapted to receive an elongate tube therethrough which projects into said liner and has an opening therein communicating with the interior of said liner, and which further comprises peripheral sealing means in said bore for engaging the periphery of such a tube and providing a sliding contact seal between the bore and tube.

8. A combination container with disposable closure and liner assembly wherein

said container comprises a wall having a formed opening extending therethrough with marginal edges surrounding said opening defining inwardly and outwardly facing lip surfaces, said opening being generally circular throughout a portion of its periphery and including a plurality of circumferentially spaced apart projections thereon extending inwardly toward the center of said opening, said closure comprises a member adapted to fit in and close said opening, said closure having a central body portion of a configuration to fit through the space between the radially inwardly facing edges of said projections, a lower section adapted for insertion through said opening when in one position relative to said opening and being adapted upon rotation to a second position following insertion for engaging said inwardly facing lip surface, said lower section comprising a shoulder projecting radially outwardly from said central body in a position to pass between spaced projections of the container wall on insertion of the closure in its first position and to fit against the inwardly facing lip surface of one of said projections on rotation of the closure from its first to its second position, an upper section overlying said outwardly facing lip surface, sealing means interposed between said upper section and said outwardly facing lip surface, a bore extending through said member from the ex-

12

terior to the interior of said container, and removable plug means for closing said bore, and said liner comprises a pliable, collapsible bag having a continuous body and neck integral with said body, said neck being fixedly secured to said closure about the inner end of said bore.

9. The combination of claim 8, wherein said upper section comprises a flange radiating outwardly from said central body and spaced above said shoulder with outer marginal edges of the flange extending radially outwardly from the central body a distance greater than said shoulder.

10. The combination of claim 8, wherein said shoulder has a leading edge facing in the direction in which the shoulder moves on rotation of the closure from its first to its second position and the surface of said shoulder facing said flange inclines toward said flange on progressing from its leading edge toward its opposite edge.

11. The combination of claim 8, wherein said bore in the closure is substantially cylindrical and is adapted to receive an elongate tube therethrough which projects into said liner and has an opening therein communicating with the interior of said liner, and which further comprises peripheral sealing means in said bore for engaging the periphery of such a tube and providing a sliding contact seal between the bore and tube.

12. A combination container with disposable closure and liner assembly wherein

said container comprises a wall having a formed opening extending therethrough with marginal edges surrounding said opening defining inwardly and outwardly facing lip surfaces,

said closure comprises a member adapted to fit in and close said opening, said closure having a lower section adapted for insertion through said opening when in one position relative to said opening and being adapted upon rotation to a second position following insertion for engaging said inwardly facing lip surface, an upper section overlying said outwardly facing lip surface, sealing means interposed between said upper section and said outwardly facing lip surface, a bore extending through said member from the exterior to the interior of said container, and removable plug means for closing said bore, said opening in said wall and said upper and lower sections of said closure being generally ovate, with the major and minor dimensions of said upper and lower sections being greater than the major and minor dimensions, respectively, of said opening,

said liner comprises a pliable, collapsible bag having a continuous body and neck integral with said body, said neck being fixedly secured to said closure about the inner end of said bore.

13. The combination of claim 12, wherein said lower section is flexible permitting flexing thereof for insertion through said opening with the major dimension of said lower section disposed generally in the direction of the minor dimension of said opening.

14. The combination of claim 13, wherein said closure further comprises a central body, said lower section being secured to and projecting radially outwardly from said central body and said upper section is removably connected to said central body, and which further comprises tightening means operable to bias said upper and lower sections toward each other and against said inwardly and outwardly facing lip surfaces of said open-

13

ing.

15. The combination of claim 12, which further comprises cooperating locating means on said upper and lower sections and said wall of the container for properly positioning and holding said sections in their second positions.

16. The combination of claim 12, wherein said bore in the closure is substantially cylindrical and is adapted to receive an elongate tube therethrough which projects into said liner and has an opening therein communicating with the interior of said liner, and which further comprises peripheral sealing means in said bore

14

for engaging the periphery of such a tube and providing a sliding contact seal between the bore and tube.

17. The combination of claim 3, wherein said bore in the closure is substantially cylindrical and is adapted to receive an elongate tube therethrough which projects into said liner and has an opening therein communicating with the interior of said liner, and which further comprises peripheral sealing means in said bore for engaging the periphery of such a tube and providing a sliding contact seal between the bore and tube.

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