Feb. 16, 1960 C. BRAMMING 2,925,187

CLOSURES FOR VACUUM BOTTLES

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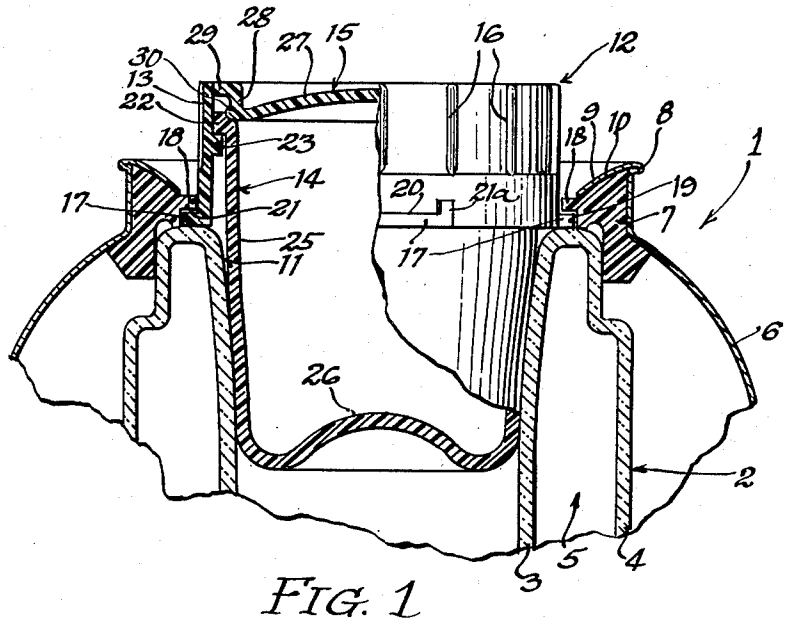


FIG. 1

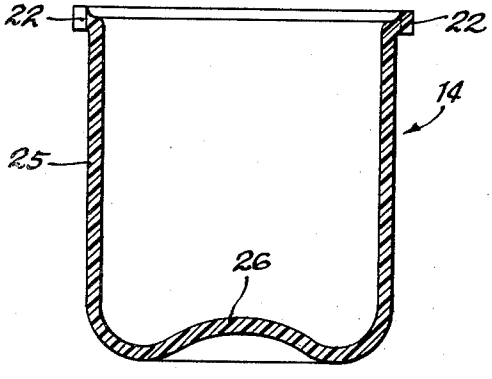


FIG. 2

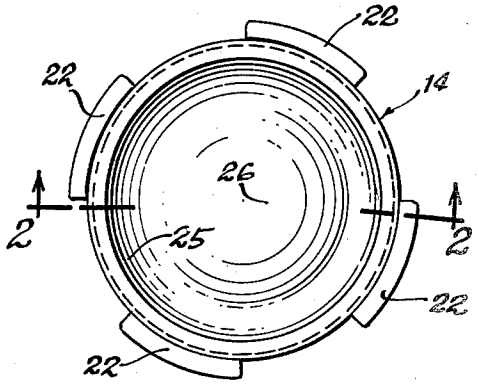


FIG. 3

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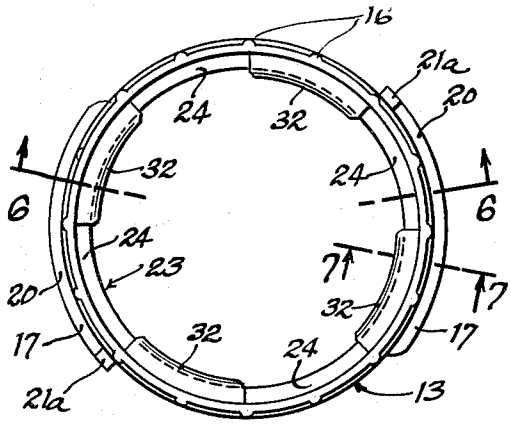


FIG. 5

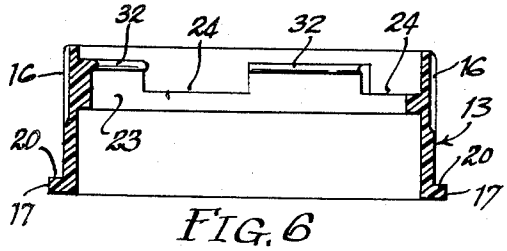


FIG. 6

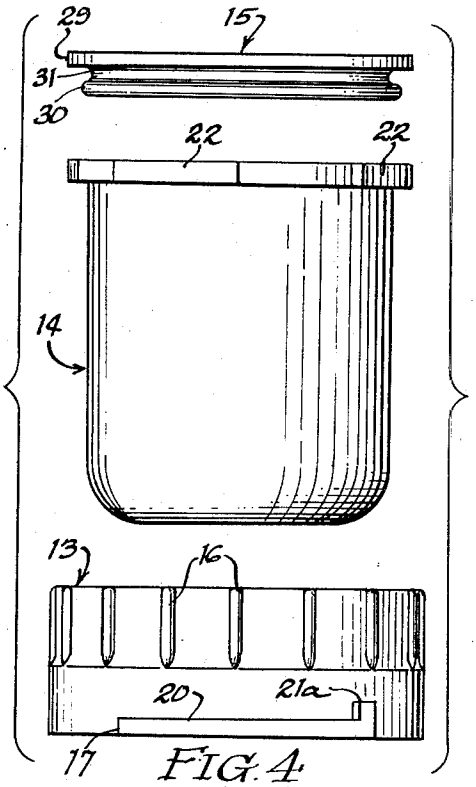


FIG. 4

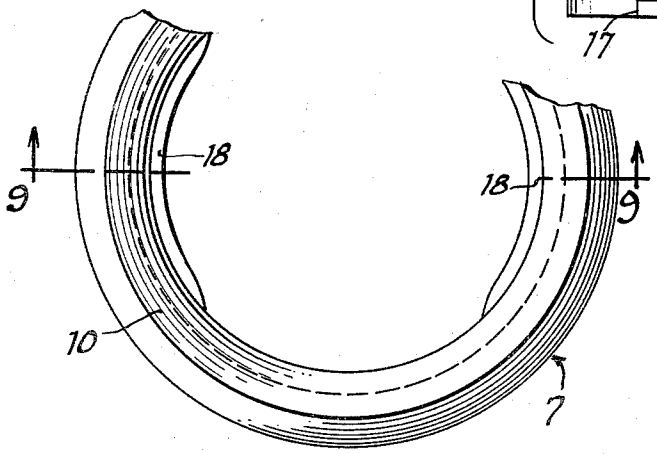


FIG. 8

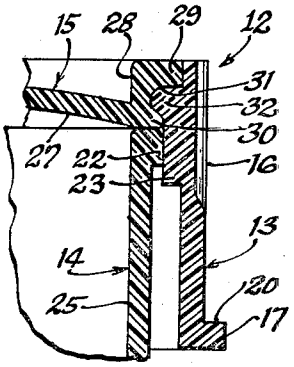


FIG. 7

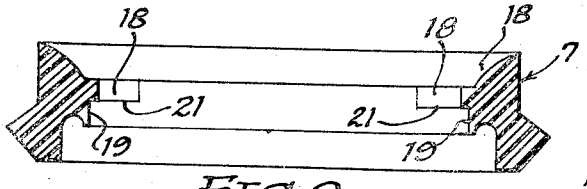


FIG. 9

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CLOSURES FOR VACUUM BOTTLES

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Fig. 10

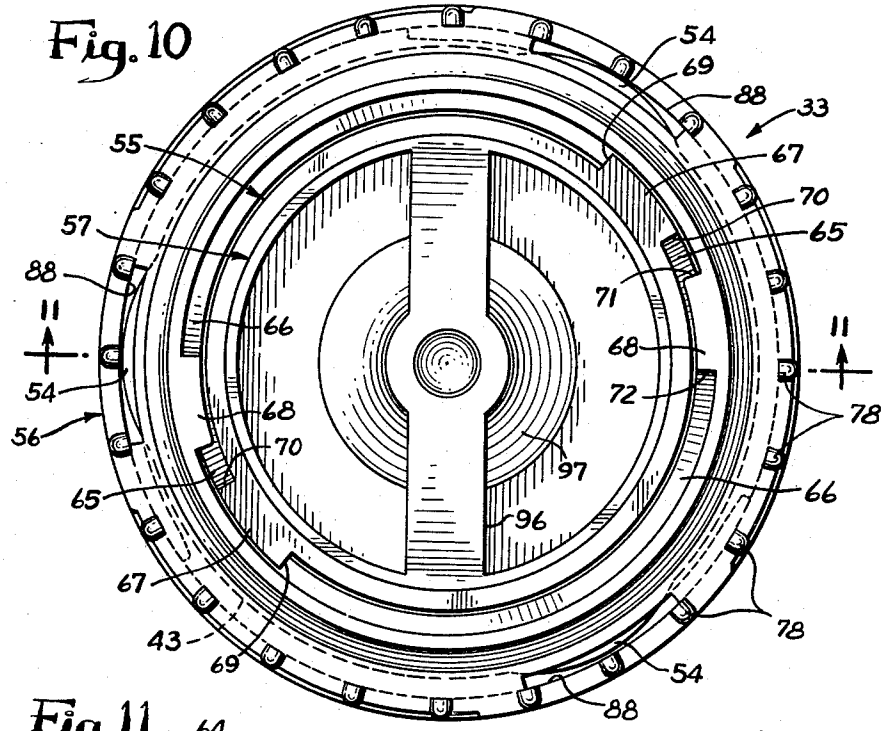
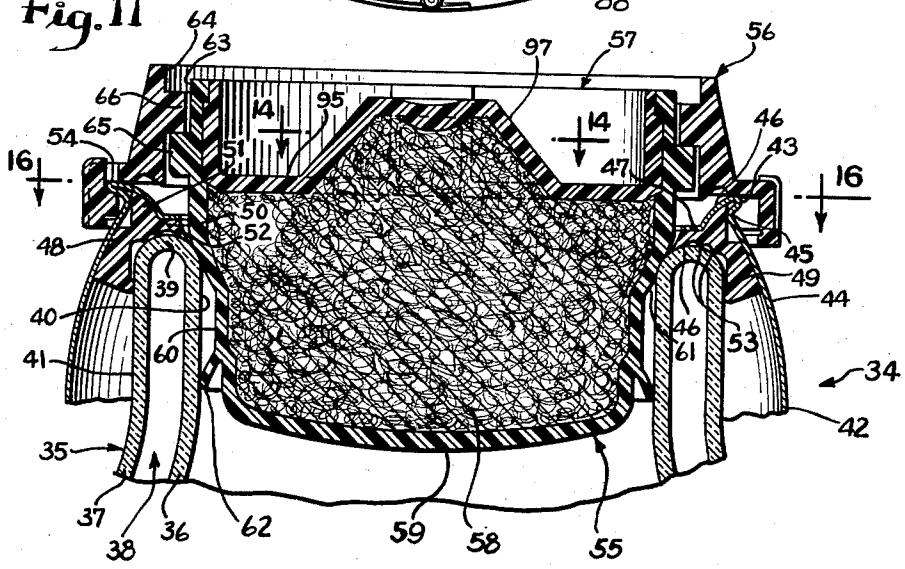


Fig. 11



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Fig. 12

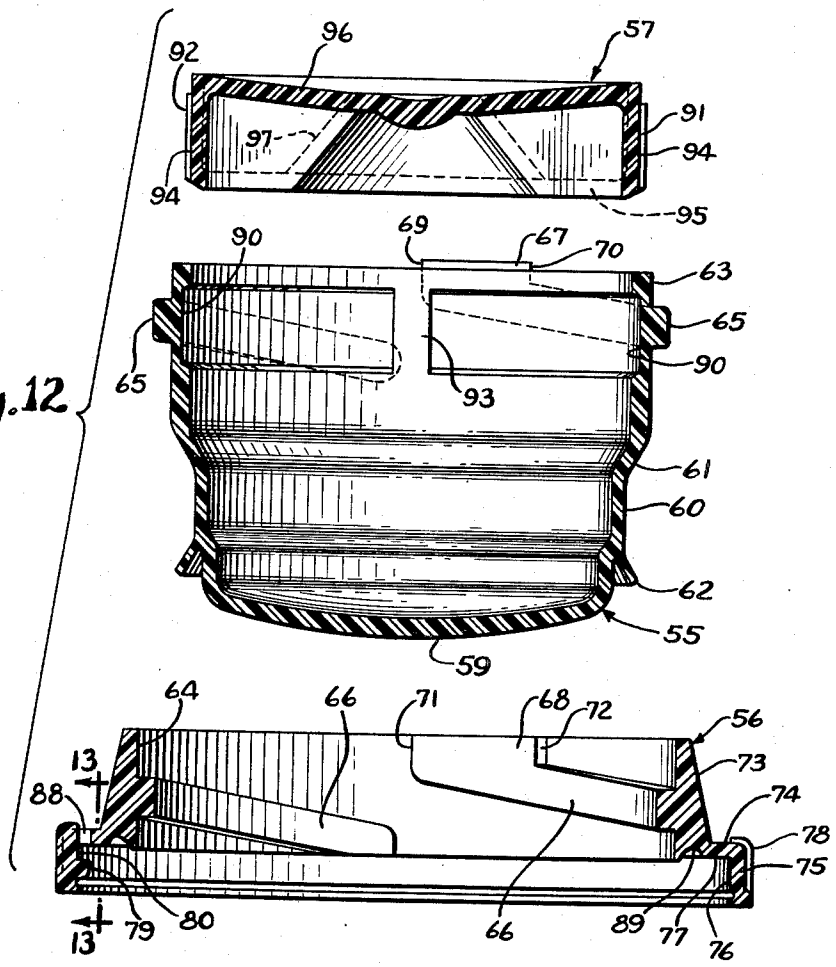


Fig. 13

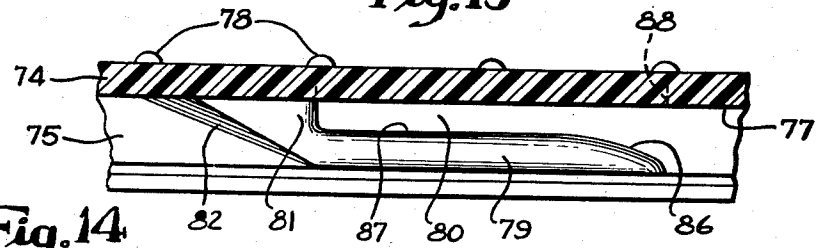
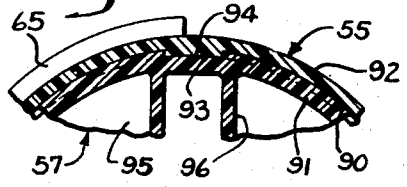


Fig. 14



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CLOSURES FOR VACUUM BOTTLES

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Fig. 15

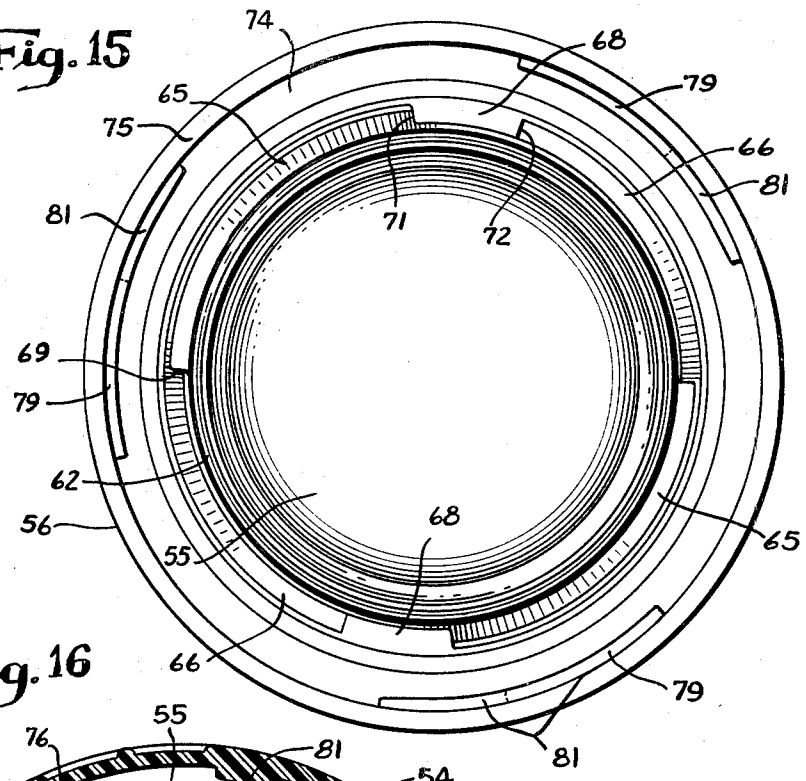
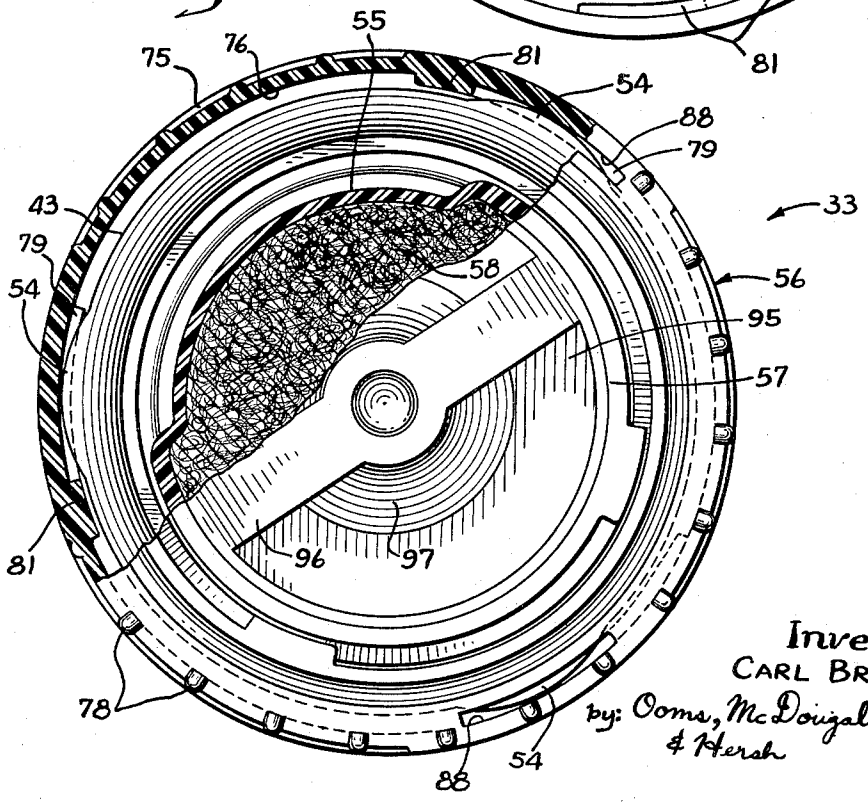


Fig. 16



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Patented Feb. 16, 1960

2,925,187

CLOSURES FOR VACUUM BOTTLES

Carl Bramming, Nashville, Tenn., assignor to Aladdin Industries, Incorporated, Nashville, Tenn., a corporation of Illinois

Application December 3, 1956, Serial No. 626,037

13 Claims. (Cl. 215—13)

This invention relates to vacuum bottles or the like and pertains more particularly to new and improved closures for vacuum bottles.

This application is a continuation in part of the co-pending application of the present applicant, Serial No. 497,134, filed March 28, 1955, and now abandoned.

One object of the present invention is to provide new and improved closures which will provide effective seals for vacuum bottles or the like.

A further object is to provide a new and improved stopper which is sanitary, tasteless and odorless and which possesses excellent heat insulating qualities.

Another object is to provide new and improved closures which may be locked in place on a vacuum bottle, yet may readily be moved thereon and removed therefrom.

It is another object to provide a closure which may be made entirely out of plastic material and yet will provide an effective seal and will remain in place on the vacuum bottle.

A further object is to provide a new and improved closure having a mounting ring which may be secured to the vacuum bottle and which is in threaded engagement with a stopper member so that the stopper member will be adjustably movable into the mouth of the vacuum bottle.

Another object is to provide a new and improved closure which will seal the vacuum bottle effectively, whether the pressure in the vacuum bottle is greater or less than atmospheric pressure.

It is another object to provide a new and improved closure which will provide an effective seal despite variations in the size and shape of the neck or mouth on the vacuum bottle.

A further object is to provide new and improved closures which are effective, long lasting and dependable, yet are reasonably simple and low in cost.

Further objects and advantages of the present invention will appear from the following description, taken with the accompanying drawings, in which:

Fig. 1 is a fragmentary elevational view, partly in longitudinal cross section, of a vacuum bottle and a closure therefor, to be described, by way of example, as a first illustrative embodiment of the present invention.

Fig. 2 is a longitudinal sectional view of a stopper member embodied in the closure of Fig. 1, the view being taken generally along a line 2—2 in Fig. 3.

Fig. 3 is a top view of the stopper member of Fig. 2.

Fig. 4 is an exploded elevational view of the closure of Fig. 1.

Fig. 5 is a top view of a supporting and locking ring embodied in the closure of Fig. 1.

Fig. 6 is a longitudinal sectional view of the ring, taken generally along a line 6—6 in Fig. 5.

Fig. 7 is a fragmentary enlarged sectional view of the ring, with the stopper member and a retaining disk assembled therein, the view being taken generally along a line 7—7 in Fig. 5.

Fig. 8 is a fragmentary top view of a gasket which is employed in the vacuum bottle of Fig. 1 to lock the closure in place.

Fig. 9 is a central, longitudinal sectional view of the gasket, taken generally along a line 9—9 in Fig. 8.

Fig. 10 is a top view of a modified closure, to be described, by way of example, as a second illustrative embodiment of the present invention.

Fig. 11 is a fragmentary elevational sectional view, taken generally along a line 11—11 in Fig. 10, and showing the closure of Fig. 10 mounted on a vacuum bottle.

Fig. 12 is an exploded elevational sectional view of the closure of Figs. 10 and 11.

Fig. 13 is a fragmentary enlarged elevational sectional view taken generally along a line 13—13 in Fig. 12.

Fig. 14 is a fragmentary horizontal sectional view taken generally along a line 14—14 in Fig. 11.

Fig. 15 is a bottom plan view of the closure of Figs. 10 and 11.

Fig. 16 is a plan view somewhat similar to Fig. 10, but partly in horizontal section, generally along the line 16—16 in Fig. 11, and with the parts of the closure shown in changed positions.

If the drawings are considered in greater detail, it will be seen that Fig. 1 illustrates the upper end portion of an exemplary vacuum bottle 1 provided with the usual vacuum insulated filler or receptacle 2 having inner and outer walls 3 and 4 separated by an evacuated space 5. The receptacle 2, which is usually made of glass, is protected by an outer casing, of which only the upper collar portion 6 is shown. An annular gasket or sealing ring 7 is interposed between the upper end of the collar 6 and the vacuum insulated receptacle 2, in order to prevent the entry of any fluid into the space between the glass filler and the outer protective jacket. The gasket 7 also serves as a pad to support the upper end of the filler 2. It is preferred in this instance to form the gasket 7 of a soft, pliable resilient plastic material, such as polyethylene, although the gasket may be made of natural or synthetic rubber or any other similar material.

The illustrated vacuum bottle of Fig. 1 is provided with a pouring lip 8 which is formed on the upper end of the protective collar 6 in the manner disclosed and claimed in the co-pending application of Carl Bramming, Serial No. 473,082, filed December 6, 1954, for Vacuum Bottle Having Pouring Lip. However, the pouring lip forms no part of, and is not essential to the present invention. A flaring internally tapered generally bell-shaped flange 9 extends inwardly and downwardly from the lip 8. It will be seen that the gasket 7 has an upper surface 10 which fits snugly against the underside of the flange 9.

An opening or mouth 11 is formed at the upper end of the vacuum insulated receptacle 2. It will be seen that the mouth 11 tapers downwardly in diameter to a slight extent. The mouth 11 may be relatively small or relatively large in diameter, inasmuch as the present invention is applicable to both wide-mouthed and narrow-mouthed vacuum bottles.

The mouth 11 is adapted to be closed by means of a closure unit 12. In this instance, the closure unit 12 is formed in three parts, comprising an outer relatively rigid locking and supporting ring 13, an inner relatively flexible and resilient stopper member 14 and a flexible, resilient disk 15 adapted to retain the stopper member within the supporting ring.

The supporting ring 13 is of thin-walled cylindrical form and may be made of a suitable relatively rigid material, such as a polystyrene plastic. Other plastic materials or even metal may alternatively be employed. To afford a finger grip, a plurality of longitudinal ridges 16 are formed on the outer surface of the supporting ring 13 adjacent its upper end. Two outwardly project-

ing diametrically opposed lugs 17 are formed on the lower end of the ring 13, in order to retain the closure unit 12 on the vacuum bottle by interlocking with a complementary pair of lugs 18 formed on the gasket ring 7. Undercut groove elements 19 are formed beneath the gasket lugs 18 to receive the closure lugs 17. The lugs 17 and 18 are generally rectangular in cross section and are formed with substantially flat and level interengaging surfaces 20 and 21.

At one end of each lug 17, an upwardly projecting finger 21*a* is formed to limit rotation of the closure unit 12. When the closure unit 12 is inserted into the vacuum bottle the lugs 17 are initially aligned with the spaces between the gasket lugs 18. Then, the closure unit 12 is rotated so as to move the lugs 17 under the lugs 18. The rotation is continued until the finger 21*a* engages the ends of the lugs 18, whereupon further rotation is arrested.

The stopper member 14 is in the form of a thin-walled generally cup-shaped member received within the supporting ring 13. It is preferable to form the stopper member 14 of polyethylene, but other flexible resilient materials may be employed.

To prevent relative rotation between the supporting ring 13 and stopper member 14, the upper end of the stopper member is provided with a plurality of angularly spaced outwardly projecting lugs 22 (Figs. 2 and 3). An annular rib or ridge 23 is provided within the supporting ring 13 and is formed with a set of upwardly and inwardly opening slots or grooves 24 (Figs. 5 and 6) adapted to receive the stopper lugs 22. Thus the grooved rib 23 acts as a shoulder to support the stopper 14.

As shown, the stopper 14 comprises a substantially cylindrical side wall 25 (Fig. 2) which is closed at its lower end by an upwardly arching dome shaped lower end wall 26. To assure a positive seal between the closure and the vacuum bottle, the side wall 25 of the stopper member 14 is made slightly larger in diameter than the mouth 11 of the receptacle 2. When the closure 12 is inserted into the mouth 11, the cylindrical side wall 25 is compressed inwardly as shown in Fig. 1. Thus, the side wall 25 intimately engages and conforms in shape to the inside of the mouth 11.

The inward compression of the side wall 25 causes the arching lower wall 26 to be flexed upwardly into a more sharply domed position, as will be apparent from a comparison of Figs. 1 and 2. Thus, the construction of the lower wall 26 is such as to accommodate the inward flexing of the side wall 25. Moreover, the upward flexing of the lower wall 26 increases the volume of the confined space in the filler 2 below the stopper member 14. This action tends to relieve some of the pressure which is generated in the filler 2 when the closure 12 is inserted. With conventional stoppers, this pressure tends to eject the stopper. However, the pressure relieving action of the domed lower wall 26 largely prevents the pressure from exerting an undue upward force on the closure 12. Moreover, the upward force caused by this internal pressure is taken up by the interaction between the locking lugs 17 and 18 on the closure 12 and the gasket 7. By virtue of these lugs 17 and 18, the closure 12 is positively retained in the mouth 11 of the vacuum bottle.

The disk 15 serves to retain the stopper member 14 in the supporting ring 13. At the same time, the disk 15 closes the upper ends of the ring 13 and the stopper member 14 so as to exclude foreign material.

The illustrated disk 15 comprises an upwardly arching circular body portion 27 formed with an upwardly projecting peripheral flange 28. From Fig. 7, it will be seen that the flange 28 is adapted to be received within the annular rib 23 formed on the supporting ring 13. The upwardly extending flange 28 terminates in an outwardly projecting flange 29, which overlies the rib 23 and is flush with the upper end of the ring 13, the flange 29 being snugly received within the ring 13 above the rib 23. It will be seen that the rib 23 is spaced below the upper end of the ring 13 to accommodate the flange 29.

The disk 15 is retained within the ring 13 by means of interengaging shouldered elements on the disk and the ring. In the case of the disk 15, the shouldered element takes the form of a peripheral bead or flange 30 formed around the lower margin of the disk. A groove 31 is defined between the bead 30 and the flange 29.

In the case of the ring 13, the shouldered locking elements take the form of a plurality of angularly spaced flange elements 32 projecting inwardly from the upper margin of the rib 23. It will be seen that the flange elements 32 are disposed between the slots 24. With the closure unit 12 assembled, the flange elements 32 are received in the groove 31 so that they will interlock with the bead 30. It will be seen from Fig. 1 that the bead 30 engages the upper end of the stopper member 14 and thereby confines the lugs 22 to the lower ends of the slots 24. Accordingly, the disk 15 prevents relative longitudinal movement between the supporting member 13 and the stopper member 14.

To facilitate assembly and disassembly of the closure unit 12, it is preferable to form the retaining disk 15 of a flexible resilient material, such as polyethylene, for example. Other suitable materials may, of course, be employed, however. The disk 15 is easily removable so that the closure unit 12 may be disassembled for cleaning.

All of the parts of the closure may be molded at extremely low cost out of synthetic plastic materials. This is also true of the gasket ring 7.

Despite the low cost of the closure, it is extremely efficient and dependable. The resilient inner member of the closure forms a positively effective seal with the mouth of the vacuum bottle. Moreover, the locking lugs on the outer closure member cooperate with the complementary lugs on the gasket to retain the closure unit in a positive manner on the vacuum bottle. The domed lower wall of the flexible, resilient inner member not only accommodates inward flexing of the inner member, but also tends to relieve the pressure generated in the vacuum bottle by the insertion of the closure. Thus, the closure may be inserted more easily than heretofore.

Fig. 10 illustrates a modified closure 33, to be described by way of further example as a second illustrative embodiment of the present invention. The closure 33 is adapted to be mounted on a vacuum bottle 34 or the like. In this case, the vacuum bottle 34 includes the usual vacuum insulated filler or receptacle 35, made of glass or the like. The receptacle 35 has inner and outer walls 36 and 37 with an evacuated space 38 therebetween. It will be seen that the inner and outer walls 36 and 37 are joined in their upper ends to form a rounded upper edge portion 39 on the filler 35. A mouth 40 is formed in the upper end of the filler or receptacle 35. In this case, the receptacle 35 is wide mouthed, but nevertheless is slightly reduced in its upper end to form a neck 41 on the receptacle.

In accordance with the usual practice, a protective jacket 42 is mounted around the fragile vacuum insulated receptacle 35 to protect the receptacle against breakage. Only the upper portion of the jacket 42 is illustrated.

In this case, the vacuum bottle 34 is formed with an annular pouring lip 43 which flares upwardly and outwardly from the mouth 40 of the receptacle 35. In the illustrated construction, the pouring lip 43 is formed on the upper end of the jacket 42. Thus, the jacket 42 has an inwardly and upwardly tapering upper portion 44 which is formed outwardly adjacent its upper end to define the annular pouring lip 43. An annular recess 45 is formed under the pouring lip 43 so that the lip will

project outwardly from the upper end portion 44 of the jacket 42. A flange 46 projects inwardly and downwardly on the jacket 42 from the pouring lip 43, to form an upper surface along which the contents of the receptacle 35 will flow toward the lip 43, when the contents are poured out of the receptacle. A flange 46 has an inner, horizontal terminal portion 47 which is spaced above the rounded upper edge 39 of the receptacle 35. The flange 46 is curvilinear in form and is arranged to flare upwardly and outwardly.

The space between the receptacle 35 and the upper end portion 44 of the jacket 42 is sealed by a gasket or sealing ring 48. It will be seen that the gasket 48 has a depending flange portion 49 which is received between the upper end of the receptacle 35 and the upper portion 44 of the jacket 42. A generally horizontal flange 50 extends inwardly on the gasket 48 and is received between the rounded upper edge 39 of the receptacle 35 and the horizontal flange portion 47 on the jacket 42. A vertical flange 51 projects upwardly under the curvilinear flange 46 on the jacket 42. Thus, the flanges 50 and 51 fit snugly under flange portions 46 and 47 on the jacket 42.

It will be seen that the horizontal gasket flange 50 terminates in a flexible, tapered depending lip 52 which forms a seal with the rounded upper edge 39 on the receptacle 35. In addition, the rounded upper edge 39 is engaged by a plurality of sharp annular sealing ridges 53 on the underside of the horizontal flange portion 50.

In order that the closure 33 may be locked on the vacuum bottle 34, the pouring lip 43 is formed with a plurality of angularly spaced outwardly projecting lugs 54. Three such lugs 54 are provided in the present instance. It will be seen that the lugs 54 are produced by forming the jacket 42 outwardly at three points around the pouring lip 43. The jacket 42 and the pouring lip 43 may be made of metal, or any other suitable material, such as plastics. Although the pouring lip 43 is shown as part of the jacket 42, it may be formed as part of the vacuum insulated receptacle, or as part of the gasket.

The illustrated closure 33 comprises a stopper member 55 which is movable into the mouth 40 so as to close the vacuum insulated receptacle 35. The stopper 55 is carried by a mounting ring 56 adapted to be secured to the vacuum bottle 34 so as to retain the stopper in the receptacle 35. A generally disk-shaped member 57 is provided to close the upper end of the stopper member 55. The disk member 57 also prevents the upper end of the stopper 55 from collapsing and becoming disengaged from the mounting ring 57. The stopper 55 may be filled with loose insulating material 58 to improve the insulating quality of the stopper. The disk member 57 retains the insulating material 58 in the stopper 55. The insulating material 58 may take the form of ground cork or the like.

It will be seen that the stopper member 55 is hollow, thin-walled and generally cup-shaped in form. Thus, the stopper member 55 has a bottom wall 59 and a side wall 60 which is roughly cylindrical in shape. It will be seen that the bottom wall 59 is downwardly domed in form.

To form a seal with the mouth 40 adjacent the top of the receptacle 35, the side wall 60 of the stopper 55 is provided with a downwardly tapering, generally frusto-conical portion 61 which is engageable with the inner part of the rounded upper edge 39 on the receptacle 35. To form a second seal with the mouth 40 at a point spaced downwardly from the top of the receptacle 35, the stopper 55 is formed with an outwardly and downwardly flaring skirt or lip 62 which is thin and flexible. Thus, the lip 62 is adapted to be flexed inwardly as the stopper 55 is inserted into the mouth 40. The inherent resiliency of the frusto-conical lip 62 presses the lip outwardly against the mouth 40. It will be seen that the lip 62 is spaced downwardly from the tapering portion 61 on the stopper 55 and is adjacent the lower end of the stopper. The illustrated lip 62 is formed integrally with the stopper 55. It is preferred to mold the stopper 55 from a relatively soft, flexible, resilient, tasteless and odorless plastic material, such as polyethylene, but other suitable materials may be employed.

The tapered side wall portion 61 and the lip 62 are flexible so as to conform to any variations or irregularities in the size and shape of the mouth 40. Moreover, the entire side wall 60 may be flexed inwardly to fit any slightly undersize mouth 40. The bottom wall 59 will bulge downwardly to accommodate such compression of the side wall 60. Any pressure that may develop within the receptacle 35 tends to flex the lip 62 outwardly with increased force against the mouth 40 so as to maintain the seal between the stopper 55 and the mouth. If the pressure within the receptacle 35 is less than atmospheric, the entire stopper 55 will be pressed downwardly by the atmospheric pressure so that the tapered portion 61 will engage the receptacle 35 with increased force.

The upper end of the stopper member 55 is formed with a generally cylindrical portion 63 which is movable within a generally cylindrical opening 64 in the mounting ring 56. Mating threads 65 and 66 are provided on the stopper 55 and the ring 56 so that the stopper 55 may be screwed downwardly into firm sealing engagement with the receptacle 35. Thus, the position of the stopper 55 may be adjusted to conform to any variations in the size and shape of the receptacle 35. In mass production of vacuum insulated receptacles, dimensional variations are frequently encountered because of the difficulty in making such thin-walled glass articles to close tolerances.

The threads 65 on the stopper member 55 take the form of a pair of external double lead threads which are symmetrically disposed on opposite sides of the stopper, as indicated in Figs. 11 and 12. The threads 65 project outwardly from the cylindrical upper portion 63 of the stopper 55. Likewise, the mating threads 66 on the mounting ring 56 project inwardly from the cylindrical opening 64. It will be seen that upwardly projecting stop elements 67 and 68 are formed at the upper ends of the threads 65 and 66 so as to limit the extent to which the stopper 55 may be rotated in the mounting ring 56. It will be seen that each of the stop elements or lugs 67 has opposite end portions 69 and 70. Likewise, each of the stop lugs 68 has opposite end portions 71 and 72. When the stopper 55 is screwed downwardly to the greatest possible extent, the end portions 70 on the stopper engage the end portions 71 on the mounting ring 56. When the stopper 55 is screwed upwardly to the greatest possible extent, the end portions 69 engage the end portions 72.

In the illustrated arrangement, the fit between the stopper 55 and the mounting ring 56 is quite loose. In this way, the stopper 55 can center itself in the mouth 40 of the receptacle 35. Moreover, the loose fit makes it easy to screw the stopper 55 downwardly into the mouth 40.

In the illustrated mounting ring 56, the opening 64 for the stopper 55 is formed in an upstanding portion 73. The mounting ring 56 has a generally horizontal flange 74 which projects outwardly from the upstanding portion 73 at its lower end. A generally cylindrical flange 75 extends downwardly from the outer edge of the horizontal flange 74. It will be seen that the inside of the depending flange 75 forms a downwardly facing opening 76 which is receivable over the pouring lip 43 and is large enough to pass over the locking lugs 54. A downwardly facing internal shoulder 77 is defined by the lower side of the horizontal flange 74. As shown in Fig. 11, the internal shoulder 77 is engageable with the top of the pouring lip 43.

The outside of the depending flange 75 is formed with a large number of generally vertical ridges or ribs 78 so that the flange 75 may be gripped securely in

mounting the ring 56 on the vacuum bottle 34 and in removing the ring therefrom. Each of the ridges 78 curves inwardly at its upper end and extends part way across the horizontal flange 74.

The ring 56 is adapted to be secured to the lugs 54 on the vacuum bottle 34 by means of a plurality of locking lugs or ribs 79 which are formed on the inside of the flange 75 and are adapted to meet with the lugs 54. In this case, there are three of the locking ribs 79 spaced at equal angular intervals around the flange 75. The ribs 79 project inwardly from the flange 75 and are spaced downwardly from the shoulder 77 so as to define channels or recesses 80 adapted to receive the lugs 54. One end of each channel 80 is closed by a stop element 81 which projects inwardly and extends between the shoulder 77 and the corresponding rib 79. The stops 81 are adapted to engage the lugs 54 when the mounting ring 56 is rotated to its fully locked position. Each stop 81 has a downwardly facing, inclined and beveled surface 82 on the side opposite from the corresponding channel 80 so that the mounting ring 56 will ride up over the lugs 54 if the mounting ring is rotated in the incorrect direction to lock the ring on the vacuum bottle 34.

To provide a progressive locking action, each rib 79 is formed with a curved downwardly sloping end portion 86 which is movable under and against the corresponding locking lug 54 on the vacuum bottle. As the ring 56 is rotated, the camming action between the sloping edges 86 and the lugs 54 draws the ring 56 downwardly so that it will be firmly seated on the pouring lip 43. The remainder of each rib 79 has a horizontal upper edge surface 87.

The flexibility of the depending flange 75 is enhanced locally adjacent the ribs 79 by forming slots 88 through the horizontal flange 74. It will be seen from Figs. 10 and 13 that the slots 88 are arranged in overlying relation to the ribs 79. By virtue of the slots 88, the portions of the flange 75 adjacent the ribs 79 may be flexed downwardly or outwardly to accommodate any variations in the size or shape of the locking lugs 54.

The flexibility of the entire horizontal flange 74 is enhanced by forming an annular downwardly facing groove 89 in the shoulder 77 at the base of the flange 74.

To receive and retain the disk member 57, the upper portion 63 of the stopper 55 is formed with an internal generally annular recess or channel 90. It will be seen from Figs. 11 and 12 that the disk member 57 is formed with a generally cylindrical outer flange portion 91 having a peripheral rib 92 projecting outwardly therefrom for reception in the channel 90. The interlocking engagement between the rib 92 and the channel 90 prevents the disk member 57 from shifting vertically with respect to the stopper member 55.

Locking elements are formed on the disk member 57 and the stopper member 55 to prevent relative rotation between the members. In this case, the channel 90 is interrupted at diametrically opposite points by two vertical ribs 93 which are adapted to interlock with diametrically opposite vertical channels or grooves 94 formed in the rib 92 on the disk member 57.

From Fig. 11, it will be seen that the disk member 57 is closed by a generally horizontal wall or web 95 which is connected to the lower end of the peripheral flange 91. To provide a hand grip for use in rotating the stopper 55, the web 95 is formed with a raised portion or rib 96 which extends diametrically across the disk member 57. The rib or cross bar 96 is generally of inverted channel-shaped form and is centrally reinforced by a frusto-conical formation 97. It will be seen that the top of the rib 96 is downwardly bowed and thus is downwardly depressed in its central portion. The disk member 57 may be cemented in place within the stopper member 55 but this is not strictly necessary because the disk member 57 is tightly retained by the engagement between the rib 92 and the channel 90.

The mounting ring 56 and the disk 57 may be molded out of a suitable plastic material, which need not be so flexible as the material employed in the stopper 55. Thus, a relatively rigid plastic material such as polystyrene may be employed for the mounting ring 56 and the disk 57.

The closure 33 may be assembled initially by inserting the stopper 55 into the mounting ring 56. This may readily be done before the disk 57 is inserted, because the upper end of the stopper 55 will collapse inwardly to a sufficient extent to permit the stops 67 and 68 to pass each other. The assembly is completed by adding the loose insulating material 58 to the stopper 55 and inserting the disk 57 with sufficient force to stretch the upper end of the stopper member 55 and permit the rib 92 to enter the channel 90. Once the disk 57 is in place, however, it is quite difficult to remove. As already indicated, the disk 57 may be cemented or bonded to the stopper 55 so as to prevent any possible disassembly of the closure and so as to insure that water and other liquids will be excluded from the stopper 55. However, such cementing or bonding is not strictly necessary because of the tight fit between the disk 57 and the upper end of the stopper 55.

The closure 33 is mounted on the vacuum bottle 34 by grasping the depending flange 75 on the mounting ring 57 and pushing the stopper 55 downwardly into the mouth 40 of the receptacle 45. By virtue of the ribs 78, the flange 75 forms a convenient and effective hand grip for the mounting ring 56. The mounting ring 56 is pushed downwardly until the internal shoulder 77 engages the pouring lip 43. Then, the mounting ring 56 is rotated so as to move the locking ribs 79 under the locking lugs 54. The tapered end portions 86 of the locking ribs 79 provide a progressive locking action. When the ring 56 is fully locked, the stops 81 engage the lugs 54.

It will be seen that the threads 65 and 66 have a right-hand pitch and that the ring 56 is locked by clockwise rotation thereof. Thus, the locking rotation of the ring 56 tends to loosen the stopper 55 in the mouth 40 so that the seating of the ring 56 is thereby facilitated. Once the ring 56 has been locked on the vacuum bottle 34, the cross bar or rib 96 on the disk 57 is grasped and turned so as to rotate the stopper 55. In this way, the stopper 55 is screwed downwardly into firm engagement with the receptacle 35. The downwardly tapered side wall portion 61 of the stopper 55 seats against the rounded upper edge 39 on the receptacle 35 and forms a seal therewith. A second seal is formed by the depending outwardly flaring lip 62 which engages the mouth 40 at a point spaced downwardly from the top of the receptacle 35. The lip 62 is flexible to accommodate any variations or irregularities in the size and shape of the mouth 40. The downwardly tapered side wall portion 61 is similarly flexible.

If any pressure greater than atmospheric pressure develops in the vacuum insulated receptacle 35, the pressure will press the flexible lip 62 outwardly against the mouth 40 and thereby will improve the seal between the lip 62 and the mouth. The mounting ring 56 will retain the stopper 55 in the mouth 40. If the pressure in the vacuum insulated receptacle 35 becomes less than the surrounding atmospheric pressure, the atmospheric pressure will press the stopper 55 downwardly so as to seat the downwardly tapered wall portion 61 of the stopper even more firmly against the rounded upper edge 39 on the receptacle 35. Thus, the closure will maintain an effective seal under all conditions of pressure within the receptacle.

The parts of the closure, including the stopper member, the mounting ring and the retaining disk may be molded inexpensively out of plastic materials. The stopper member may be made out of a tasteless and odorless plastic,

such as polyethylene, which will not impart any taste or odors to the contents of the vacuum bottle, and will not absorb any taste or odors from the contents. The closure may readily be cleaned and thus kept sanitary.

Due to the thin-walled construction of the stopper member, the inherent insulating value of the plastic from which the stopper member is formed, and the added insulating value of the insulating filler in the stopper member, the closure has a high insulating value. Thus, the contents of the vacuum insulated receptacle may be maintained at either a higher or a lower temperature than the surrounding atmospheric temperature for long periods of time.

By virtue of the screw mounting of the stopper member, the closure may be adjusted to provide an effective seal for the vacuum bottle despite wide variations in the size and shape of the mouth portion on the vacuum insulated receptacle. The closure will not become dislodged accidentally, and will maintain the seal in whatever position the vacuum bottle may be carried. Nevertheless, the closure is easy to mount on the vacuum bottle and is easy to remove therefrom. Any vacuum that may develop in the filler 35 may be broken by pushing the closure laterally after loosening the mounting ring. This will flex the stopper member so as to permit the outside air to enter the filler.

Various other modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention, as set forth in the foregoing description and defined in the following claims.

I claim:

1. In a vacuum bottle, the combination comprising an outer casing, a vacuum-insulated receptacle housed therein and having an upper end portion with a mouth formed therein, a relatively flexible resilient thin-walled cup-shaped stopper member disengageably received in said mouth and forming a seal therewith, a relatively rigid supporting ring receiving the upper end portion of said stopper member and having an outer peripheral hand grip portion, a disk-like member for retaining said stopper member in said supporting ring, and interengageable positive locking elements on said supporting ring and said casing for disengageably retaining said ring thereon.

2. A closure for a vacuum bottle or the like, comprising, in combination, a relatively rigid supporting ring having internal upwardly facing shoulder means therein, said ring having an outer portion with hand grip means thereon, a relatively flexible resilient thin-walled cup-shaped member having its upper end portion received within said ring and having outwardly projecting means engaging said shoulder means, and a flexible resilient disk disengageably received within said ring above said cup-shaped member, said ring and said disk having interlocking elements disengageably retaining said disk in said ring.

3. A closure for a vacuum bottle or the like, comprising, in combination, a supporting ring having a plurality of angularly spaced upwardly opening internal recesses therein, a flexible resilient thin-walled cup-shaped member having its upper end portion received within said ring and having a plurality of outwardly projecting angularly spaced lugs disengageably received in said recesses to prevent relative rotation between said ring and said cup-shaped member, said cup-shaped member having an upwardly domed flexible lower end wall, a flexible resilient disk received within said ring above said cup-shaped member, said ring and said disk having interlocking shoulder elements disengageably retaining said disk in said ring, said supporting ring having a lower end portion formed with a plurality of angularly spaced outwardly projecting lugs for locking the closure to the vacuum bottle.

4. A closure for a vacuum bottle or the like, comprising, in combination, a substantially rigid thin-walled supporting ring having an internal annular rib spaced downwardly from its upper end and formed with a plurality of angularly spaced upwardly opening slots, a flexible resilient thin-walled cup-shaped member having its upper end portion received within said ring and having a plurality of outwardly projecting angularly spaced lugs disengageably received in said slots to prevent relative rotation between said ring and said cup-shaped member, an upwardly arching flexible resilient disk having an upwardly projecting peripheral flange disengageably received within said rib, said rib and said disk having interlocking shoulder elements disengageably retaining said disk in said ring, said disk having an outwardly projecting flange formed at the upper end of said upwardly projecting flange and received within said ring in overlying relation to said rib, said supporting ring having a lower end portion formed with a plurality of angularly spaced outwardly projecting lugs for locking the closure to the vacuum bottle.

5. A closure for a vacuum bottle, comprising, in combination, a flexible resilient thin-walled cup-shaped member disengageably receivable in the mouth of the vacuum bottle and having a generally cylindrical side wall and an upwardly domed lower end wall, said side wall of said cup-shaped member having a free-state diameter greater than that of the mouth so that said cup-shaped member will be flexed inwardly when positioned in said mouth, said lower wall being movable upwardly into a position more sharply domed than its free-state position when said cup-shaped member is positioned inside the mouth, said lower wall thereby accommodating inward flexing of said side wall and also being effective to relieve pressure generated in said receptacle by insertion of said member, a relatively rigid supporting ring receiving the upper end portion of said cup-shaped member, said ring having an internal annular rib formed with a plurality of angularly spaced upwardly opening grooves, said cup-shaped member having a plurality of angularly spaced outwardly projecting lugs formed at its upper end and disengageably received in said grooves, and a flexible resilient upwardly arched disk having an upwardly projecting peripheral flange formed with an external annular groove, said rib having inwardly projecting flange elements extending between said grooves therein and disengageably received in said external annular groove in said disk to lock said disk on said closure, said supporting ring having a lower skirt portion formed with a plurality of angularly spaced outwardly projecting lugs to lock said closure on the vacuum bottle.

6. In a vacuum bottle, the combination comprising an outer casing, a vacuum insulated receptacle housed therein, said receptacle having an upper end portion with an open mouth formed therein, a closure for closing said mouth, said closure comprising a flexible resilient thin-walled cup-shaped member disengageably received in said mouth and forming a seal therewith, said closure including a supporting ring receiving the upper end portion of said cup-shaped member, said ring having internal upwardly facing shoulder means, said cup-shaped member having outwardly projecting means formed at its upper end and disengageably received on said shoulder means said closure including a flexible resilient disk disengageably received in said ring, said ring and said disk having interlocking elements disengageably retaining said disk therein, said supporting ring having a lower skirt portion formed with a plurality of angularly spaced outwardly projecting lugs, and means on said casing forming inwardly projecting undercut lugs disengageably cooperating with said lugs on said ring to lock said closure on said vacuum bottle.

7. In a vacuum bottle, the combination comprising an outer casing, a vacuum-insulated receptacle housed therein, said receptacle having an upper end portion with an open mouth formed therein, a closure for closing

said mouth, said closure comprising a flexible resilient thin-walled cup-shaped member disengageably received in said mouth and having a generally cylindrical side wall in disengageable sealing relation with the inside of said mouth, said cup-shaped member having an upwardly domed lower end wall, said side wall of said cup-shaped member having a free-state diameter greater than that of the inside of said mouth so that said cup-shaped member will be flexed inwardly when positioned in said mouth, said lower wall being movable upwardly into a position more sharply domed than its free-state position when said cup-shaped member is positioned inside the mouth, said lower wall thereby accommodating inward flexing of said side wall and also being effective to relieve pressure generated in said receptacle by insertion of said member, said closure including a relatively rigid supporting ring receiving the upper end portion of said cup-shaped member, said ring having an internal annular rib formed with a plurality of angularly spaced upwardly opening grooves, said cup-shaped member having a plurality of angularly spaced outwardly projecting lugs formed at its upper end and disengageably received in said grooves, said closure including a flexible resilient upwardly arched disk having an upwardly projecting peripheral flange formed with an external annular groove, said rib having inwardly projecting flange elements extending between said grooves therein and disengageably received in said external annular groove in said disk to lock said disk on said closure, said supporting ring having a lower skirt portion formed with a plurality of angularly spaced outwardly projecting lugs, and means on said casing forming inwardly projecting undercut lugs disengageably cooperating with said lugs on said ring to lock said closure on said vacuum bottle.

8. In a vacuum bottle, the combination comprising an outer casing, a vacuum-insulated receptacle housed therein, said receptacle having an upper end portion with an open mouth formed therein, a gasket ring disposed between the upper ends of said casing and said receptacle, a closure for closing said mouth, said closure comprising a flexible resilient thin-walled cup-shaped member disengageably received in said mouth and having a generally cylindrical side wall in disengageable sealing relation with the inside of said mouth, said cup-shaped member having an upwardly domed lower end wall, said side wall of said cup-shaped member having a free-state diameter greater than that of the inside of said mouth so that said cup-shaped member will be flexed inwardly when positioned in said mouth, said lower wall being movable upwardly into a position more sharply domed than its free-state position when said cup-shaped member is positioned inside the mouth, said lower wall thereby accommodating inward flexing of said side wall and also being effective to relieve pressure generated in said receptacle by insertion of said member, said closure including a relatively rigid supporting ring receiving the upper end portion of said cup-shaped member, and said ring having an internal annular rib formed with a plurality of angularly spaced upwardly opening grooves, said cup-shaped member having a plurality of angularly spaced outwardly projecting lugs formed at its upper end and disengageably received in said grooves, said closure including a flexible resilient upwardly arched disk having an upwardly projecting peripheral flange formed with an external annular groove, said rib having inwardly projecting flange elements extending between said grooves therein and disengageably received in said external annular groove in said disk to lock said disk on said closure, said supporting ring having a lower skirt portion formed with a plurality of angularly spaced outwardly projecting lugs, and means on said gasket forming inwardly projecting undercut lugs disengageably cooperating with said lugs on said ring to lock said closure on said vacuum bottle.

9. In a vacuum bottle, the combination comprising a vacuum insulated receptacle having an upper end portion with a mouth formed therein, a jacket received around said receptacle and having an upper end portion extending around the upper end portion of said receptacle with a gasket therebetween, an annular pouring lip formed on said upper end portion of said jacket and flaring outwardly and upwardly from the upper end portion of said receptacle, said pouring lip having a plurality of angularly spaced locking lugs projecting outwardly therefrom, a mounting ring having a depending flange receivable over said pouring lip and locking lugs, said flange having a plurality of inwardly projecting locking lugs movable under said lugs on said pouring lip to lock said ring on said jacket, said ring having hand grip means on its outer periphery for use in rotating said ring to move said lugs thereon into and out of locking relation with said lugs on said pouring lip, said mounting ring having a generally horizontal flange extending inwardly from the upper end of said depending flange, said horizontal flange being engageable with the upper end of said pouring lip, said lugs on said ring defining recesses between said horizontal flange and said lugs for receiving said lugs on said pouring lip, a stop element extending inwardly from said depending flange at one end of each of said recesses for engaging the corresponding lug on said pouring lip to limit rotation of said ring and define the locked position thereof, said horizontal flange having slots therein adjacent said lugs on said depending flange to provide for flexure of said depending flange adjacent said lugs, said mounting ring having a generally cylindrical opening therein, a flexible resilient generally cup-shaped thin-walled stopper member having an upper end portion received in said opening in said ring, said stopper member having a lower portion receivable in said mouth in said receptacle, said mounting ring having a pair of internal threads projecting inwardly thereon into said generally cylindrical opening, said upper end portion of said stopper member having a pair of outwardly projecting external threads thereon mating with said internal threads, said stopper member having an internal generally annular recess therein adjacent the top thereof, a generally disk-shaped element receivable in said internal annular recess to prevent collapsing movement of the upper end portion of said stopper member and thereby retaining said stopper member in said mounting ring, said internal and external threads being formed with stop means limiting rotation of said stopper member to retain said stopper member in said mounting ring, interengaging elements on said disk-shaped element and said stopper member to prevent relative rotation therebetween, said disk-shaped element having a pair of upwardly facing recesses therein with a rib therebetween extending across said disk-shaped element to provide a hand grip for rotating said disk-shaped element and said stopper member, and a body of loose insulating material received in said stopper member and retained therein by said disk-shaped element.

10. In a closure for a vacuum bottle or the like, the combination comprising a flexible resilient hollow generally cup-shaped thin-walled stopper member for closing a vacuum bottle, a mounting ring movably received around the upper end portion of said stopper member, means on said mounting ring for disengageably securing said ring on the vacuum bottle, mating threads on said stopper member and said ring for advancing and retracting said stopper member, stop means on said stopper member and said ring for limiting inward and outward screwing movement of said stopper member to retain said stopper member in said ring, a disk member received within said upper end portion of said stopper member for preventing inward collapsing movement of said stopper member, means for retaining said disk member in said stopper member against rotation and outward movement with respect to said stopper member,

hand grip means on said disk member for rotating said stopper member, and a filling of loose insulating material in said stopper member under said disk member.

11. In a vacuum bottle, the combination comprising a vacuum insulated receptacle having an upper end portion with a mouth therein, means forming an annular pouring lip extending upwardly and outwardly from said mouth, a plurality of angularly spaced outwardly projecting lugs on said pouring lip, a mounting ring having a lower portion with a downwardly facing opening therein receivable over said pouring lip, said ring having an internal downwardly facing shoulder in said opening engageable with said pouring lip, a plurality of inwardly projecting locking ribs formed on said ring in said opening and spaced downwardly from said internal shoulder for movement under said lugs to lock said ring on said pouring lip, inwardly projecting stop elements disposed between said ribs and said shoulder at one end of each of said ribs for engaging said lugs to limit rotation of said ring and define the locked position thereof, a plurality of slots extending through said ring adjacent said ribs to provide for local flexure of said ring, a stopper having an upper end portion movably received in said ring, said stopper having a lower end portion receivable in said mouth to form a seal therewith, and mating threads on said stopper and said ring for advancing said stopper into said mouth.

12. In a closure for a vacuum bottle or the like, the combination comprising a flexible resilient generally cup-shaped stopper member, a mounting ring movably received around the upper end portion of said stopper member, means on said mounting ring for disengageably securing said ring to a vacuum bottle, mating threads on said stopper member and said ring for advancing and retracting said stopper member, means on said stopper member and said ring for retaining said stopper member in said ring, a disk member received within said upper end portion of said stopper member for preventing inward collapsing movement of said stopper member, means for retaining said disk member in said stopper member against rotation and outward movement with respect to said stopper member, and hand grip means on said disk member for rotating said stopper member.

13. In a closure for a vacuum bottle, or the like, the combination comprising a mounting ring having a lower portion with a downwardly facing opening therein, said ring having an internal downwardly facing shoulder in said opening, a plurality of inwardly projecting locking ribs formed on said ring in said opening and spaced downwardly from said internal shoulder, inwardly projecting stop elements disposed between said ribs and said shoulder at one end of each of said ribs, a plurality of slots extending through said ring adjacent said ribs to provide for local flexure of said ring, a stopper having an upper end portion movably received in said ring, said stopper having a lower portion extending below said ring, and mating threads on said stopper and said ring for advancing and retracting said stopper.

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