

Nov. 6, 1956

H. S. DARLINGTON, JR

2,769,583

CLOSURE

Filed May 12, 1954

Fig. 1.

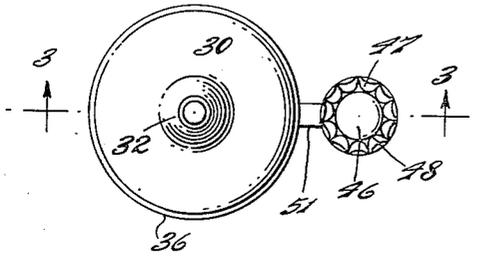


Fig. 2.

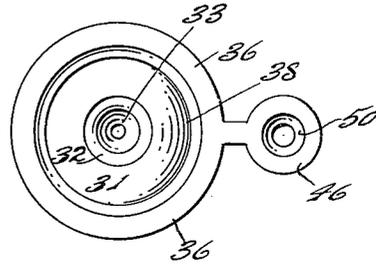


Fig. 3.

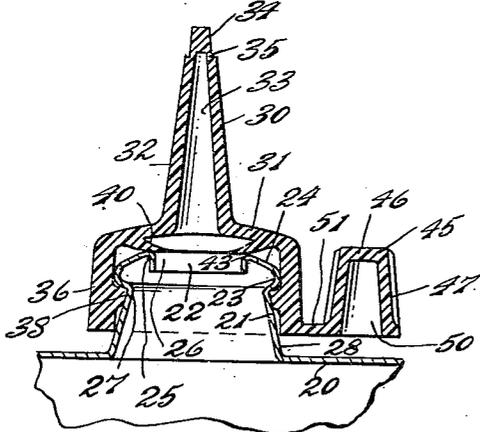


Fig. 5.

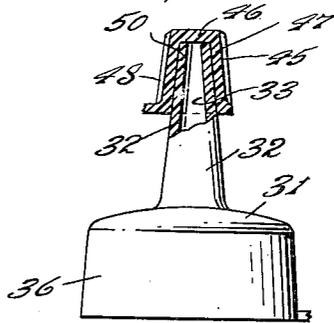


Fig. 4.

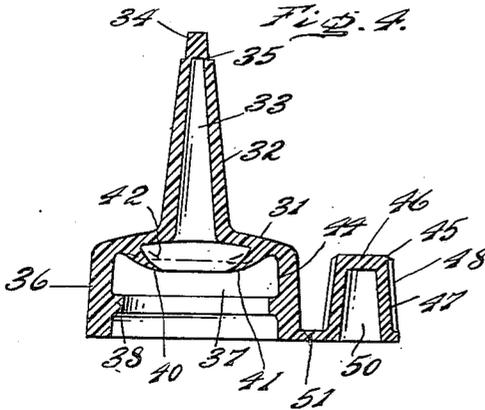
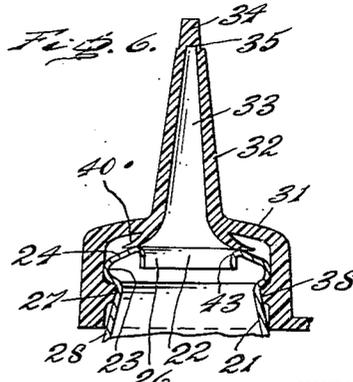


Fig. 6.



INVENTOR.  
Henry S. Darlington, Jr.

BY 

ATTORNEYS.

1

2

2,769,583

CLOSURE

Henry S. Darlington, Jr., Media, Pa., assignor to A. H. Wirz, Inc., Chester, Pa., a corporation of Pennsylvania

Application May 12, 1954, Serial No. 429,251

4 Claims. (Cl. 222—541)

The present invention relates to closures for containers, including caps and spouts.

A purpose of the invention is to obtain a tight seal with the neck of a container notwithstanding wide variations in the size and contour of the neck.

A further purpose is to make a more economical closure by making an integral molding of a closure and cap, preferably a spout and cap.

A further purpose is to maintain the seal between the closure and the neck of a container notwithstanding the effect of the contents of the container on the material of the closure, tending to cause the material to swell.

A further purpose is to accomplish a seal with the neck of the container by an elastic diaphragm extending from the end wall of the closure diagonally to the axis, and deflected by the end wall of the neck to an engaging position at a greater angle to the axis.

A further purpose is to make the diaphragm deflect preferentially to the flange and preferably also to the end wall of the closure, by making the diaphragm thinner than these other walls and preferably also making the diaphragm converge to a point at the end remote from the end wall of the closure.

A further purpose is to engage a fillet on the end wall of the neck by the diagonal diaphragm.

A further purpose is to extend a spout from the closure and close the spout by a removable plug.

A further purpose is to provide an auxiliary cap for the spout and connect it to the main closure, preferably at the flange by an integral strand.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoint of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a top plan view of the closure of the invention.

Figure 2 is a bottom plan view of the closure of Figure 1.

Figure 3 is a section on the line 3—3 of the closure of Figure 1, including a portion of the container.

Figure 4 is a view corresponding to Figure 3, showing the closure removed from the container and the diaphragm in the position of rest.

Figure 5 is a side elevation partly in axial section showing the closure of Figures 1 to 4 after the plug has been removed from the end of the spout and the auxiliary cap has been applied to close the end of the spout.

Figure 6 is a view corresponding to Figure 3, omitting the auxiliary cap, showing a variation in the construction of the diaphragm.

Describing in illustration but not in limitation and referring to the drawings:

Great difficulty has been encountered in finding suitable closures for containers, due particularly to the following conditions:

1. The containers themselves, whether made from glass, metal or plastic, vary considerably in size and shape, so that it is often difficult to make a closure operate effectively on all of a run of containers which are supposed to be identical.

2. The materials for production of the closures themselves vary in dimensions and it is difficult to produce a large number of closures which are absolutely identical.

In accordance with the invention, an effective seal to the container is accomplished by an elastic diaphragm forming part of the closure and extending diagonally and engaging the end of the container neck.

Considering now in detail the form of Figures 1 to 5 inclusive, it will be evident that the closure of the invention is applicable to any suitable make of container, whether denominated a bottle, vial, can, collapsible tube or other receptacle, and whether composed of metal, glass or plastic.

For convenience in illustration, I illustrate a container 20 which in the particular illustration may suitably be an oil can composed of metal, and having a neck 21 ending in a neck opening 22 through which the contents of the container may be discharged. The construction of the neck may conform to any one of a variety of standards (including a threaded neck), but preferably will include an external annular neck bead 23, which may be of any desired cross sectional contour, here shown as a gradually curved bead construction. The bead is conveniently located outside and adjoining the end opening 22, and merges with the end wall 24 which in the form shown is gradually diagonally inwardly sloping, terminating in an interior fillet 25 at the neck opening 22, and then having a generally axially extending interior neck opening wall 26. The end wall 24 is like a fillet itself due to the slope from a high ring near the center to lower portions near the outside.

Immediately behind the neck bead 23 there is an annular recess 27 which is adapted to receive and hold a rib on the closure. From the recess 27 the neck tapers outwardly toward the body of the container at 28.

The closure applied on the container of the present invention may be made of any suitable elastomer, examples being polyethylene, polyvinyl-chloride, natural rubber, buna S, buna N, or the like. The entire closure, according to the invention, is desirably made on a single injection molding and is therefore integral.

The closure 30 as shown in the present invention is provided with a spout, but it will be evident that the invention is applicable in many of its aspects whether or not a spout is present, and the closure may simply be a cap or cover in some cases where the spout is not required.

The closure has an end wall 31 which in the preferred embodiment connects to a spout 32, the spout desirably tapering outwardly and converging away from the end wall, and similarly forming an internal tapering spout bore 33. At the end an integral plug 34 is secured beyond the bore 33, and it joins the main spout wall for a thin short break-off portion 35, permitting removal of the plug to open the spout and dispense the contents either by breaking off the plug with the fingers, or cutting off the wall 35 with the fingernail or with a knife.

It will of course be evident that the spout can taper gradually or more abruptly or have substantially parallel walls as desired.

The end wall 31 at its outer end joins an annular flange 36 which forms an interior socket 37 and engages around the neck of the container.

The flange at its interior has an annular inwardly extending integral rib 38 which is adapted to engage at the annular recess 27 immediately behind the reverse face of the neck bead 23.

The cross section of the rib 38 may be of a round fillet

character or rectangular as preferred, the generally rectangular form being shown.

On the interior of the end wall 31 and extending into the socket 37 is a diaphragm 40 which is adapted to engage the end of the neck of the container. The diaphragm 40 is elastic, so that it can deflect from a free position or position of rest 41 as shown in Figure 4 in full lines to a dot-and-dash position of compression or sealing as shown by dot-and-dash lines at 42 in Figure 4, when the closure is on the neck. In the position of sealing, the diaphragm engages the end of the neck, and preferably engages at 43 on the inner fillet 25, thus giving a relatively small area of engagement and assuring firmer sealing, or permissibly engaging on the end wall 24. The diaphragm will engage and seal on any of a wide variety of end constructions of the neck ring. The diaphragm is made with a wall thickness substantially less than the wall thickness of the flange at 44 between the end wall and the rib 38, so that the deflection necessary to permit the rib 38 to engage in the recess 27 will occur in the diaphragm, since the rib 38 is so close to the end wall that it cannot seat behind the bead 23 until the closure moves down by compression of the diaphragm 40 to the position shown in Figure 3. The diaphragm also is on the average desirably made thinner than the end wall 31 at positions where the diaphragm is not present, and this is desirably accomplished by thinning the diaphragm progressively to a point at the inner end as shown in Figures 4 and 5.

I find that it is convenient to use a diaphragm having a thickness at the base (adjoining the end wall) of between about 0.040 and 0.080 inch, and having a length on the diagonal of between  $\frac{1}{8}$  and  $\frac{3}{16}$  inch and tapering substantially uniformly to a substantially feather edge at the inside. This diaphragm is capable of deflecting adequately to pull the closure out of the injection mold.

An auxiliary cap 45 is provided having a closure end 46 and a tapering flange 47 at the side, knurled at the outside at 48. An interior tapering socket 50 is formed, and when the plug is removed for dispensing the contents, the auxiliary cap fits on and frictionally engages on the end of the spout as shown in Figure 5. The auxiliary cap is, before use, connected to the closure proper, preferably at the base of the flange by an integral elastomer band 51, which can be part of the gating in molding the assembly.

In operation, the closure is forced over the neck of the container, compressing the diaphragm and thus producing a seal by the diaphragm engaging at 43 on the end of the neck. A second seal is formed by engagement of the rib 38 against the annular recess 27. The container is shipped in the condition illustrated in Figure 3. When the user desires to dispense the contents he breaks off the plug 34 at 35 and after dispensing part of the contents when it is desired to close the container the band 51 is broken and the auxiliary cap is applied as in Figure 5.

In some cases the diaphragm will diverge outwardly instead of inwardly and an outwardly diverging form of diaphragm 40' is shown in Figure 6.

With the form of Figures 1 to 5, the included angle of divergence of the diaphragm in its position of rest should be between 45 and 75 degrees, preferably between 55 and 65 degrees and most desirably about 60 degrees out from

the closure axis or center line and when it is sealed it will be deflected to a larger angle which will be preferably at an angle of 75 to 90 degrees and preferably about 80 degrees out from the axis, incidental to sealing. With the form of Figure 6, the angle will preferably have the same numerical value, but the included angle is opposite to that of Figures 1 to 5.

The same general character of fillet engagement at 43 is provided in Figure 6 as in the other forms.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a container including a neck provided with an external annular neck bead, an external annular recess behind the neck bead, an end opening in the neck and an end wall on the neck beyond the neck bead, the invention which comprises an integral elastomer closure comprising an end wall positioned beyond and in spaced relation to the end wall of the neck and adapted to close the opening in the neck, an annular flange extending around the outside of the neck, having an internal annular rib on the flange which engages firmly immediately behind the external bead on the neck, and having an integral elastic diaphragm extending from the inside of the end wall in a direction diagonal to the axis of the flange in repose of the closure, occupying the space between the end wall of the closure and the end wall of the neck, displaced by the end wall of the neck to a position at which the diaphragm engages diagonally and seals against the end wall of the neck, the angle of the diaphragm to the axis in sealing position being between 75 and 90 degrees, the diaphragm being compressed against the end wall of the neck when the rib on the inside of the flange engages immediately behind the bead on the neck ring.

2. A container according to claim 1, in which the diaphragm is thinner than the wall of the flange and thinner than the end wall of the closure and thus yields preferentially.

3. A container according to claim 1, in which the diaphragm converges to the point at the end which engages the end wall of the neck.

4. A container according to claim 1, in which the end wall of the neck forms a fillet and the diaphragm engages said end wall at the fillet.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

55	1,714,874	Hothersall	May 28, 1929
	1,891,826	McGinnis	Dec. 20, 1932
	2,392,195	Shonnard	Jan. 1, 1946
	2,601,039	Livingstone	June 17, 1952
	2,625,306	Murphy	Jan. 13, 1953
60	2,670,885	Allen	Mar. 2, 1954

##### FOREIGN PATENTS

952,781	France	May 9, 1949
---------	--------	-------------