

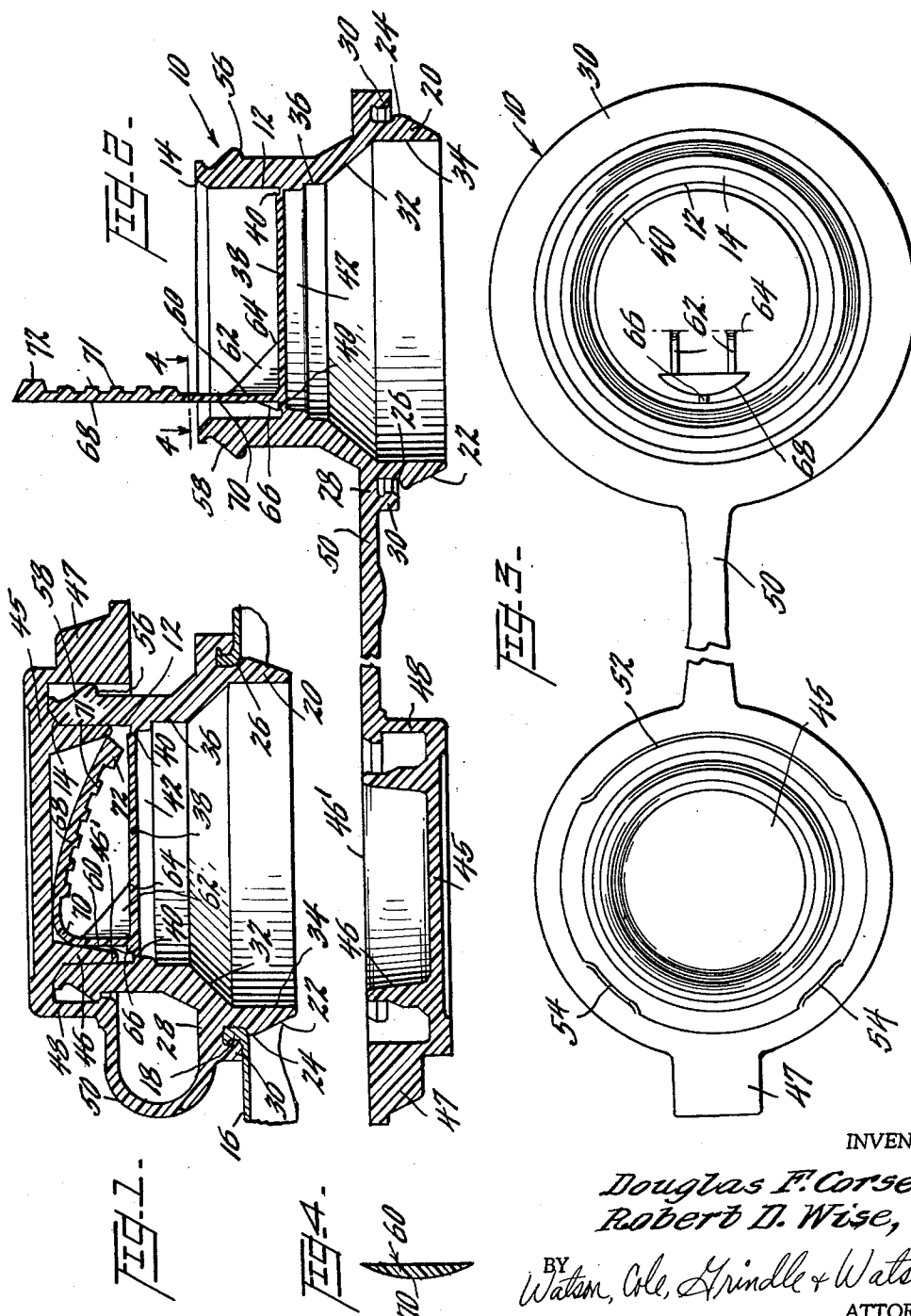
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SPOUT TYPE CONTAINER CLOSURE

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SPOUT TYPE CONTAINER CLOSURE

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This invention relates to improvements in a container closure of the type incorporating a generally tubular pouring spout or nozzle adapted for disposition in the dispensing opening of the container and equipped with a flexible sealing diaphragm extending across the interior of the spout inwardly from the mouth thereof in order to permit application to the spout of a closure cap having an annular sealing rib or element extending into the spout through its mouth.

Such a diaphragm functions primarily as shipping seal and must be removed in order to permit discharge of the container contents through the spout. Although it has been customary to remove such a diaphragm simply by punching it inwardly into the container, this is undesirable inasmuch as it may thereafter obstruct the spout and interfere with discharge of the container contents.

In order to insure complete removal of the diaphragm outwardly through the mouth of the container it has heretofore been proposed in the prior application of Edward F. Heekin and Robert D. Wise, Serial No. 77,404, filed December 21, 1960, and of common ownership herewith, to form the diaphragm with an encircling weakened zone defining a tear line at or contiguous to its juncture with the inner wall of the spout and to provide a resiliently flexible tab affixed to one edge of the diaphragm adjacent its tear line in such manner that the flexible tab normally tends to project itself outwardly from the spout when the closure cap is removed, where upon it may be grasped and a pull applied thereon to tear away the diaphragm.

It is the primary object of the present invention to associate with the diaphragm of such a closure cap a rigid lever adapted to facilitate initiation of the tearing out of the diaphragm through the transmission thereto of the tearing out force with a definite mechanical advantage.

It is a further object to so dispose the parts that the aforesaid lever is spaced radially inwardly from the encircling tear line of the diaphragm and from the inner wall of the spout, to permit reception between the wall and the lever of the annular rib of the closure cap and in which the lever is nevertheless adapted to transmit the tearing force to the tear line and concentrate it within a relatively small area.

To the foregoing ends, the lever itself is arranged to fulcrum about an axis provided by folding of the flexible diaphragm about a line extending chordally thereacross on the radially inner side of the lever, while the lever is provided with a radially outwardly projecting arm extending from its lower end beneath the aforesaid annular rib and fixedly connected to the diaphragm closely adjacent the encircling weakened zone or tear line.

It is also an object to further concentrate or localize this initial application of the tearing away force by making the aforesaid lever arm of relatively small circumferential extent along its connection to the diaphragm.

It is a still further important object to provide the lever with an automatically resiliently outwardly projectable pull tab or handle extending from its upper or free end, the pull tab being adapted for confinement within the space between the cap and diaphragm and within the annular rib of the cap, and being resiliently deflectable outwardly through the mouth of the cap upon its removal. It is a further important object to provide such a struc-

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ture in which the several parts including the spout and its diaphragm, together with its lever and pull tab may all be integrally formed of a suitable plastic such as polyethylene by usual plastic molding operations.

The foregoing, as well as other incidental objects and advantages, are all attained by the preferred embodiment of the invention illustrated in the accompanying drawings in which:

FIGURE 1 is a diametrical section through a container closure in accordance with the invention, the container to which the closure is applied being shown fragmentarily.

FIGURE 2 is a view taken on the same section as FIGURE 1, but with the captive closure cap removed and with the pull tab as well as the closure cap in the normal positions which they occupy before application of the cap to the spout.

FIGURE 3 is a plan view of the structure shown in FIGURE 2.

FIGURE 4 is a cross-section of the line 4-4 of FIGURE 2.

Referring now in detail to the accompanying drawings, the spout proper, designated 10 in its entirety, is generally of tubular structure and circular cross-section, its interior being formed with a circular cross-section bore 12 extending completely therethrough in an axial direction from one end to the other and terminating at its upper end in an upwardly opening mouth 14. Different portions of this bore 12 may be of varying diameters. It will be understood that the spout or nozzle of the invention when in use is secured within the dispensing or outlet opening of a container for either granular materials or liquids whereby the contents of the container may be dispensed by pouring outwardly through the bore 12 of the spout.

The particular type of container and the manner of securing the spout within its opening is not material to the present invention, though for purpose of exemplification there is shown fragmentarily the upper end wall or portion 16 of a metal can or container having a central opening of circular shape defined by the annular upwardly turned rim 18. The lower end portion of the spout, which is of relatively large diameter, is shown as provided with a depending pilot portion 20 provided with an exterior downwardly converging conical pilot surface 22. The lower end of pilot portion 20 is of somewhat smaller external diameter than the opening defined by the rim 18, to be readily received within and for guiding the rest of the plug into the opening. The spout as has been above suggested will be formed preferably of a somewhat resilient plastic material such as polyethylene, whereby the plug 20 may be slightly radially compressed in passing through the rim 18. Thus its maximum diameter portion 24, which is of slightly larger diameter than the inner periphery of flange 18, is provided with an upwardly presented annular shoulder 26 adapted for locking engagement beneath the minimum diameter portion of the outwardly curled rim 18. It thereby prevents withdrawal of the plug portion 20 and also sealingly engages the interior periphery of the flange 18. Moreover it will be seen that the radially outwardly projecting collar 28 of the spout extends radially across the top of the rim 18 and carries a depending annular skirt 30, having its lower edge face in an abutting sealing engagement with the upper surface of container end 16. In the instant embodiment the bore 12 through the spout has varying diameter cylindrical portions and preferably includes a tapered or funnel like portion 32 converging inwardly from the enlarged inner end bore portion 34 to function as a funnel.

Spaced radially inwardly of the spout from its mouth 14 and extending in a radially plane across the bore 12

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is a circular diaphragm 38 which is relatively thin and flexible and which is encircled by a suitably weakened zone 40 which may be relatively thinner than the diaphragm central body 38 itself. It thus defines a tear line encircling the central body 38 of the diaphragm preferably at the juncture of the diaphragm with the inner wall of the container spout.

It has been found that it will facilitate clean tearing away of the diaphragm 38 in an upward direction if the interior of the spout is provided with a radially inwardly projecting annular rib 42 of somewhat smaller internal diameter than the bore section 12, the weakened zone 40 being integrally formed with and connected to the inner periphery of this rib 42 in the plane of its upper surface or shoulder. It has been found by actual experience that the aforesaid arrangement will provide a clean tearing away of the diaphragm along its tear line 40.

With the spout of the invention there is employed the conventional closure cap 45 which is removably disposed in the mouth 14 of the spout and which is provided with an integral annular sealing rib 46 depending a substantial distance into the mouth and frictionally engaging and sealing against the side walls of the bore portion 12 within the spout. The lower or inner end edge 46' of the annular sealing rib is spaced somewhat above the diaphragm as will readily be seen by reference to FIGURE 1. In the instant embodiment, the cap 45 is of the more or less conventional captive snap-on type incorporating a depending exterior skirt 48 integrally connected by the flexible connector 50 to the spout. The skirt 48 is formed at its lower edge with radially inwardly projecting lugs, one or more of which may be disposed at suitable intervals around the circumference thereof, as at 52 and 54—54, for holding engagement beneath the downwardly presented annular shoulder 56 surrounding the exterior of the spout. Shoulder 56 is defined by the under-cut face of a radially projecting annulus extending around the spout and having a conical cam surface 58 to slidably engage and radially relatively expand the several lugs 54—54 and 52 as the polyethylene cap 45 is pressed down and over and into the mouth 14 of the spout.

Fixedly secured to and projecting axially upwardly from the diaphragm 38 is a rigid lever 60 which is preferably molded integrally with the diaphragm 38. It will be seen that this lever 60 is spaced radially inwardly from the wall 12 of the spout 4 to permit reception of the depending sealing rib 46 of the cap between it and the wall 12, the radially outer face of the lever 60 preferably being of substantially cylindrical curvature to better avoid interference with the rib 46.

Since the lever 60 in the preferred embodiment, being integrally moulded with the diaphragm 38, is of somewhat flexible polyethylene plastic material, it is reinforced and rigidified by means of one or more reinforcing webs or buttresses 62 extending diagonally from the upper end portion of the lever 60 generally toward the midportion of the diaphragm 38 with their diaphragm engaging ends terminating along a common line 64 as shown in FIGURE 3. This line 64 which extends chordally with respect to the diaphragm 38 and its encircling tear line 40, provides a fulcrum or axis about which the lever 60 may be radially inwardly swung, thereby causing the diaphragm 38 to fold substantially along the line of said axis to provide the lever fulcrum or hinge. Inward swinging of the lever 62 about its fulcrum 64 will exert an upward force on the diaphragm between the lever and the tear line 40. It will be noted however that, by virtue of the disposition of the tear line 40 contiguous to the inner wall of the bore 12, it will thereby be spaced radially outwardly somewhat from the base of the lever 60 and in fact will be disposed beneath the depending sealing rib 46 of the cap 45.

As is well known, it is rather difficult to initiate the tearing of a flexible plastic material. However, once the

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tearing has been initiated, it may generally be continued with but slight resistance. Therefore, in order to facilitate the inception of the tearing away action of the diaphragm, the lever 60 has affixed thereto a radially outwardly projecting lever arm 6 which may be in the form of a web integral with the base of the lever 60 and also with the diaphragm 38. The free radially outwardly disposed end of this lever 66 extends beneath the edge of the sealing rib 46 to the tear line 40, its free end being secured to the diaphragm 38 at the tear line so that the upward tearing force exerted by inward swinging of the lever 62 will be transmitted through this lever arm 6 directly to a localized area at its juncture with the tear line 40. To better concentrate or localize the said action, and thereby facilitate the inception of the tearing, it is desirable to proportion the lever arm 66 so that it has but a very slight circumferential thickness or dimension at its free end, as will be readily apparent by inspection of FIGURE 3.

It will be seen that the upper end of the lever 60 terminates below the level of the spout mouth 14 in order to avoid interference with the cap 45. The interior diameter of the mouth 14 and bore 12 will normally be comparatively so small, as not to permit easy insertion of the user's fingers into the bore through the mouth 14 for manipulating the lever 60 to remove the diaphragm. Moreover it is in many instances undesirable and perhaps dangerous for the user to insert his fingers into the spout where the container to which the spout is applied is used for storing various chemicals or caustic substances, etc. Therefore, in order to facilitate actuation of the lever 60 sufficiently to initiate the tearing action and thereafter to permit completion of the tearing out and removal through the spout mouth of the diaphragm 38, the free end of the lever is provided with a preferably integral resiliently flexible extension in the form of a pull out tab or handle 68. Preferably this tab 68 is formed adjacent its juncture with the free end of the lever 60 with a relatively thin and thereby highly flexible zone of material 70, while the remainder of the tab from said zone 70 to its free end may be thicker and thus stiffer, all to the end that the resiliently flexible zone 70 may function somewhat in the manner of a resiliently hinged connection between the lever 60 and the remainder of the tab 68. The major dimension or width of the zone 70 of maximum flexibility extends generally tangentially to the outer periphery of the circular diaphragm 38, thereby causing the tab 68 to be guided generally radially or diametrically of the cap when it is swung downwardly to collapsed position between the cap 45 and the diaphragm 38 as shown in FIGURE 1.

Normally the lever 60 and its various portions 70 and 68 are integrally formed to extend rectilinearly in alignment with each other in a direction substantially parallel to the axis of the spout, all as is shown best in FIGURE 2, so that when the cap 45 is removed, the downwardly folded tab 68 is automatically erected by virtue of its own resiliency to project a very substantial distance out of the mouth of the spout 10 whereby it is readily accessible to be grasped and pulled. In order to permit the obtaining of a good frictional grip on the tab the inner or under face of same may be provided with a series of raised cross-wise extending ribs such as 71 and the end thereof formed with an enlargement 72. The outer or upper side or surface of the tab 68 however will preferably be of smooth configuration and preferably cylindrically rounded about the same axis and radius as the outer face of the lever 60, all to avoid any projections which might catch on or interfere with application of the cap 45.

While the length of the tab 68 is not critical it has been found quite desirable to form it of sufficient length that its free end 72, when folded down by application of the cap 45 will engage beneath the lower edge of the cap rib 46. Also it is desirable that the extent of flexing of the

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tab provided by its zone of maximum flexibility 70, be such that the tab is maintained in its downwardly deflected position solely by engagement of its free end 72 with the rib 46, other portions of the tab being free of engagement with the downwardly presented face of the cap 45, all to the end that the cap is able to apply a maximum mechanical advantage against the lever arm provided by tab 68 to maintain it deflected, or otherwise stated, the tab itself can exert but a minimum and inconsequential amount of upward force tending to displace the cap.

With the foregoing arrangement the diaphragm 38 will normally serve as an effective shipping seal for the container to which it is applied, to prevent loss of its contents even in the event of accidental removal of the cap 45, and also to visually indicate whether or not the contents have been tampered with.

In order to dispense the contents of the container through the spout, it is necessary first for the user to remove the snap-on cap 45 by finger pressure beneath the removal tab 47 thereof, whereupon the pullout tab 68 will instantaneously and automatically erect itself to project substantially out of the mouth of the spout.

Removal of the diaphragm outwardly through the mouth of the container may be effected by grasping the free end portion of the tab, bending same radially inwardly across and diagonally to the plane of the diaphragm and exerting a lengthwise pull on the free end portion of the tab. This will first act on the lever 60 to tilt same about its fold line or fulcrum 64, on flexible diaphragm 38. This in turn will cause the lever arm 66 to initiate tearing away of the diaphragm along the tear line or weakened zone 40 at the juncture of said zone with the free end of lever 66. From this point the tearing will spread circumferentially in both directions along the tear line as the lever 60 is further tilted until it reaches a position substantially in alignment with the tab 68, following which a continued pull on the tab 68 will complete the tearing away and removal of the diaphragm 38.

In this application there has been shown and described but a single preferred embodiment of the invention, simple by way of disclosure in the preferred mode of carrying out the invention, as by law required. However, it will be readily apparent that the invention is capable of other and different embodiments, and that its several details may be readily modified in various ways, all without departing from the substance of the invention as defined by the appended claims.

We claim:

1. In a spout type container closure, a generally tubular pouring spout of resiliently flexible material formed with a bore therethrough terminating in a mouth opening through the outer end of the spout, a flexible closure diaphragm spaced inwardly of the spout from said mouth and extending in a radial plane across said bore, said diaphragm being integral with said spout and peripherally connected with the inner wall of the bore along a weakened marginal tear line contiguous to its junction with the wall, a rigid lever integrally connected to said diaphragm for fulcruming about an axis provided by and extending chordally of the said diaphragm, at the juncture of the base of said lever with said diaphragm, on the radially inward side of the lever, said lever being spaced radially inwardly of the adjacent inner wall of the bore and projecting toward the said mouth of the bore, a closure cap removably disposed in the mouth of the bore and having an annular sealing rib snugly received in said bore, said rib extending between said wall and said lever and being spaced above said diaphragm, said lever including a radially outwardly projecting lever arm rigidly affixed to its lower end and projecting therefrom radially outwardly beneath said rib to said tear line with its free outer end integrally secured to the diaphragm immediately adjacent the tear line at a location radially spaced from said fold line, whereby fulcruming of the lever about its said axis will initially exert a localized tearing force on said tear

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line adjacent the free end of said lever arm, in combination with a resiliently flexible pull tab constituting an integral extension of the free end of said lever and normally aligned with said lever to project out of said mouth with the closure cap removed, said tab being disposed for flexing in a generally radial plane into and from said mouth of the bore.

2. In a spout type container closure, a generally tubular pouring spout formed with a bore of circular cross-section therethrough terminating in a mouth at the outer end of the spout, a flexible sealing diaphragm spaced inwardly of the bore from said mouth and extending thereacross, said diaphragm comprising a central body of relatively strong flexible sheet material encircled by a weakened zone of material defining a tear line, a rigid lever fixedly secured to said central body for fulcruming about a fold line provided by and extending chordally of the central body, said lever being spaced radially inwardly of the wall of said bore and projecting outwardly from the diaphragm toward said mouth, a closure cap removably disposed over the mouth of the spout and having an annular sealing rib snugly received in said bore between said wall and the lever, said lever including means responsive to its radially inward tilting for exerting a localized tearing action on said tear line to initiate tearing away of the diaphragm, in combination with a pull tab resiliently foldably connected to the free end of said lever, and normally projecting outwardly through said mouth, said pull tab being foldable into said mouth for retention therewith by said closure cap, and its resiliency serving to automatically project it through said mouth upon removal of the cap.

3. In a spout type container closure, a generally tubular pouring spout formed with a bore of circular cross-section therethrough terminating in a mouth at the outer end of the spout, a flexible sealing diaphragm spaced inwardly of the bore from said mouth and extending thereacross, said diaphragm comprising a central body of relatively strong flexible sheet material encircled by a weakened zone of material defining a tear line, a rigid lever fixedly secured to said central body for fulcruming about a fold line provided by and extending chordally of the central body, said lever being spaced radially inwardly of the wall of said bore and projecting outwardly from the diaphragm toward said mouth, said lever including a radially outwardly projecting arm rigid therewith and having its radially outer end secured to said central body contiguous to said tear line at a location radially spaced from said fold line, said outer end being of sufficiently small circumferential dimension at the tear line to exert a localized tearing action on said tear line to initiate tearing away of the diaphragm, and a pull tab resiliently foldably connected to the free end of said lever, and normally projecting outwardly through said mouth, said pull tab being foldable into said mouth for retention therein by a closure cap, and its resiliency serving to automatically project it through said mouth upon removal of the cap.

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