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SPOUT-TYPE CONTAINER CLOSURE

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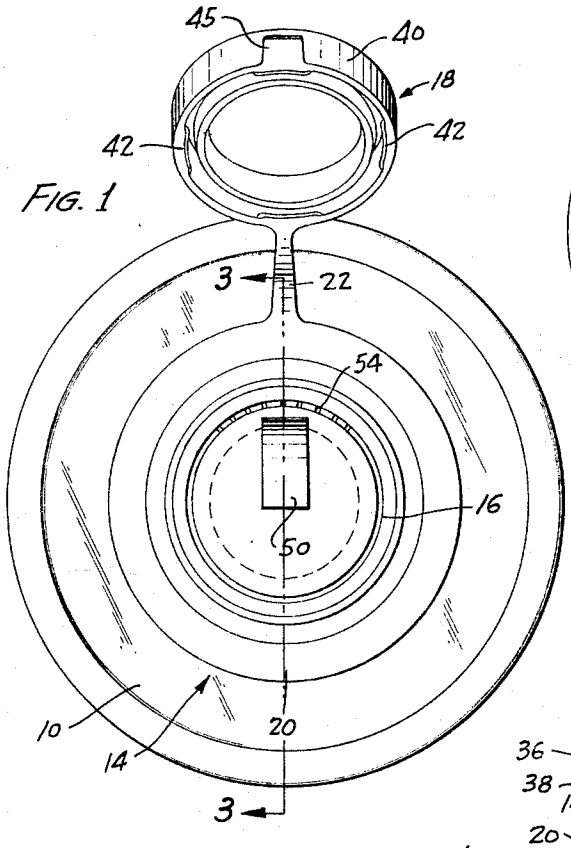

FIG. 1

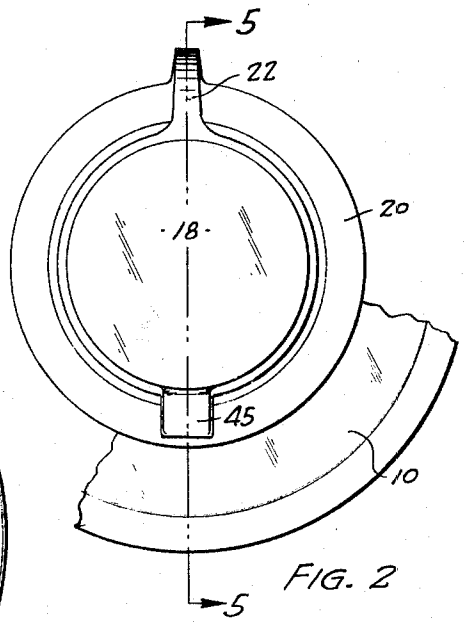

FIG. 2

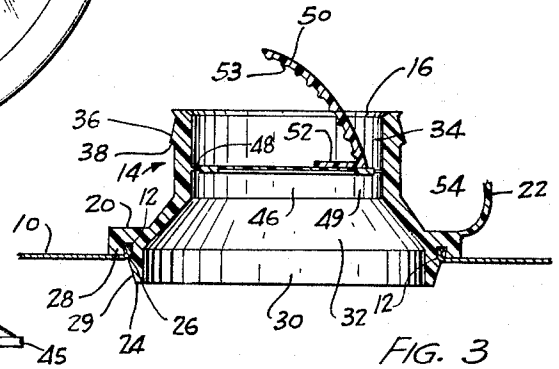

FIG. 3

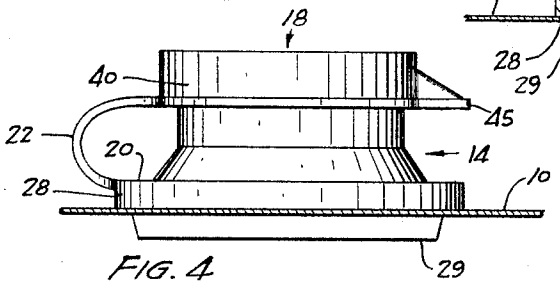

FIG. 4

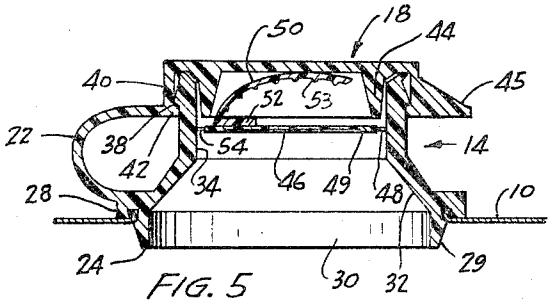

FIG. 5

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SPOUT-TYPE CONTAINER CLOSURE

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This invention relates to a spout-type container closure for disposition in an opening through a container wall, and embodying a removable tear-out diaphragm or shipping seal. It has been a primary object of the invention to provide such a closure or spout which is especially adapted for use with containers holding caustic drain-cleaning compounds or other caustic or corrosive granular solids, though it should be understood that the invention hereinafter described is by no means restricted to this particular field of use.

In the packaging of such compounds and other granular chemicals or substances, it has been heretofore known to provide the container with a dispensing spout incorporating both a removable inner diaphragm and a replaceable outer cap. The inner diaphragm normally serves as a shipping seal and is covered and protected by the outer cap, which provides a secondary seal, as well as providing a removable and replaceable closure means for use after the diaphragm has been removed.

Frequently, the spout structure is formed of a resiliently deformable or other plastic, as, for instance, polyethylene. It is customary to form the outer cap with a generally tapered annular sealing skirt or ring adapted to depend axially into the open mouth of the spout, with the tapered exterior surface of the skirt in wedging sealing engagement with the inner periphery of the mouth, to thereby protect the container contents from moisture and foreign substances after the primary seal or diaphragm has been removed. The presence of such a sealing skirt within the mouth of the spout requires that the diaphragm be displaced inwardly from the mouth. Since the mouth is normally of relatively small diameter, this makes it difficult to manually grasp and remove the diaphragm preparatory to dispensing of the container contents. Thus, normally, it is usual either to utilize a suitable tool for puncturing or cutting away the diaphragm, or else to merely exert finger pressure on the seal of diaphragm to push it inwardly of the neck of the spout.

Such procedure is clearly undesirable in a container for caustic granular materials, for the following reasons:

First, if the seal is merely punctured and not removed, the outflow of granular material is obstructed by the inturned edges of the seal around the puncture and, even if the seal is cut away and completely removed, the disposition of the seal or diaphragm within the spout involves inherent difficulty in grasping and removing this seal. Obviously, if it is attempted to insert the fingers into the spout to remove the seal, whether it is cut away or merely pushed into the spout neck, there arises danger of caustic burns through contact with the container contents. Also, if the seal is merely pressed into the spout neck and/or the container, and left there, it tends to be carried outwardly with the container contents, to thus obstruct the spout.

Even though the provision of a pull tab on the diaphragm has been suggested for applications wherein the diaphragm is at the level of the container mouth, such a tab becomes inaccessible when the diaphragm is displaced inwardly from the mouth of the spout. Furthermore, the inward displacement of its root or point of attachment to the diaphragm, and the resulting necessity for exerting merely an outward pull on the tab, for initiating and completing the tearing away of the diaphragm, normally requires an undue amount of force for initiating this tear-away action, even though the diaphragm be formed with conventional score lines or weakening lines for tear-away purposes.

The present invention has been made with all of the foregoing considerations in mind. Thus, in accordance with an important aspect of the invention, the tear-out diaphragm of the spout is disposed inwardly thereof from the mouth of the spout and provided with a normally erect, but resiliently flexible, pull tab, which is maintained collapsed or folded into the spout by the outer cap, but which, upon removal of the cap, is self-erecting to project itself outwardly through the mouth of the cap to a position wherein it projects substantially from the mouth of the spout with its free end generally centered relatively thereto, so that it may be readily grasped and manipulated, without danger of caustic burns to the user, to completely remove the diaphragm. Moreover, the pull tab in its normal erected position projects, or extends, out of the mouth of the spout diagonally to the axis of the spout, so that application of the cap in a generally axial direction will automatically flex or fold the tab toward the diaphragm and into the mouth of the spout.

In accordance with a further important aspect of the invention, the diaphragm is normally connected to the inner wall of the spout along a weakening line or score line, which facilitates its tearing under the action of the tab. Due to the flexibility of the tab, initiation of the tearing action must be accomplished by straight, outward pull thereon, and without the benefit of leverage, such as is available where the tab is of rigid material. However, it has been found that the initiation of the tearing action may be greatly facilitated by the provision of a series of closely spaced perforations along the score line, or a continuation thereof, closely adjacent the root of the tab. Moreover, it has been found that such perforations serve the further useful function of venting the container to release any vapor pressure which might arise therein, without permitting rupture of the diaphragm.

It is a further feature of the invention to provide a closure spout incorporating the foregoing features, which may be readily molded as a unitary structure from a resiliently deformable plastic, such as polyethylene, by conventional processes.

The preferred exemplification of the invention is shown in the accompanying drawing, in which:

FIGURE 1 represents a plan view of the upper end of a conventional cylindrical container having the spout of the invention applied thereto and with the outer cap open;

FIGURE 2 is a fragmentary view similar to FIGURE 1, but with the outer cap closed;

FIGURE 3 represents a fragmentary diametrical cross section along the line **3—3** of FIGURE 1, but with the outer cap removed;

FIGURE 4 is a side elevation of the structure shown in FIGURE 2; and

FIGURE 5 is a sectional view on the line **5—5** of FIGURE 2.

Referring now in detail to the accompanying drawings, the preferred embodiment of spout-type closure of the invention is shown in the several views in its application to the end closure of a usual cylindrical metal container or can, the base of the spout being suitably secured within the dispensing opening of the end closure, which opening is defined by the upwardly curled rim **12** of the container end **10**. The spout **14** is of generally tubular construction and circular in cross section, having at its upper end an upwardly opening mouth **16**, normally closed by the removable snap-on cap **18**. The cap **18** is preferably of the captive type, secured to the base or collar **20** of the spout by means of an integral flexible band **22**. The particular manner of securing the spout

within the opening defined by the rim **12** of the container end is immaterial to the invention, though by way of exemplification, there is shown one practical manner of accomplishing this. In accordance with this, the lower end portion of the spout, which is of relatively large diameter, is provided with a depending annular pilot or plug portion **24**, having a downwardly converging exterior conical surface **29**. The lower end of the plug portion **24** is of somewhat smaller external diameter than the opening **12** to be readily received therein and to function as a pilot for guiding the rest of the plug into said opening. However, the maximum diameter of the plug portion **24** slightly exceeds the diameter of opening **12**, and the plug portion is provided externally with an upwardly presented annular shoulder **26** adapted for locking engagement beneath the minimum diameter portion of the curled rim **12** defining the opening to prevent withdrawal of the plug portion **24** after the maximum diameter portion thereof has been forced through the opening. The resilient deformability of the closure spout material will readily permit this. It will be seen that the radially outwardly projecting collar **20** of the spout extends outwardly over the top of the beading **12** and carries a depending annular skirt **28**, having its lower edge in abutting sealing engagement with the surface of the container end **10** around the rim **12**.

In the present embodiment, the opening or bore through the spout **14** is defined by the inner cylindrical surface **30** of the plug **24**, and the upwardly converging surface **32**, which acts as a funnel during inversion of the container, to direct the container contents into the relatively smaller diameter outer end portion **34** of the bore.

For the purpose of cooperating with the snap-on cap **18**, the spout is formed externally adjacent its outer end portion with an annular rib or projection **36** of downwardly diverging conical shape, terminating at its lower end in a downwardly directed locking shoulder **38**. The cap **18**, in turn, is provided with a cylindrical skirt **40** adapted to encircle the rib **36** and formed interiorly with radially inwardly projecting circumferentially spaced lugs **42**, arranged with their inner peripheries lying on a circle of normally smaller diameter than the maximum diameter of the circular rib **36**. Thus, as the cap **18** is pressed down over the mouth **16** of the spout, the resiliently deformable material of which the cap is formed permits the lugs **42** to be cammed radially outwardly by the downwardly diverging surface **36**, to then snap beneath the locking shoulder **38** as shown in FIGURE 5, and thus releasably secure the cap in its applied position.

Since the closure spout of the present invention is particularly intended and adapted for use on containers for caustic drain-cleaning elements, or the like, which react with water, it is particularly desirable that the cap **18** be capable of efficiently sealing the mouth of the spout against entry of moisture, as well as other foreign substances. At the same time, it is desirable that the cap be capable of being released responsive to internal vapor pressure, all to the end that it might function as a safety valve in the event water should accidentally be admitted into the container, with resulting creation of steam or evolution of gases.

For such sealing purposes, the cap **18** is shown as formed with a more-or-less conventional annular sealing skirt, or rib, **44** radially inwardly spaced from its outer skirt **40**, and of downwardly converging conical exterior conformation, to function as a stopper in the mouth of the spout. However, the arrangement is preferably such that the sealing rib **44** and the relatively spaced lugs **42** jointly secure the cap in position over the spout with but a nominal gripping force, such as may be readily overcome by vapor pressure within the container considerably less than that required to rupture the container walls.

Disposed across the portion **34** of the spout bore is a diaphragm **46**, which is preferably molded integrally with the remaining spout structure. This diaphragm **46** is shown in the form of a circular disc having its external periphery connected to the inner wall of the spout bore **34** along an annular score line or weakened zone **48**, to facilitate tearing away and removal of the diaphragm when desired. Also, there may be provided an annular thickened zone or reinforcement **49** adjacent zone **48**. To facilitate tearing away and removal of the diaphragm, there is provided a pull tab **50** of the same resiliently flexible polyethylene or other plastic material forming the rest of the spout structure. This tab **50** in its preferred form includes an integral reversely bent flat base **52**, which is formed integrally with, cemented or otherwise fixedly secured to, the flat upper surface of the diaphragm **46** in such manner that the root of the tab **50** is positioned just inwardly of the weakened zone or score line **48**. The tab **50** normally extends at an acute angle to its base **52** and to the plane of diaphragm **46**, and preferably lies in a radial plane of the spout, so that its free end portion, which normally projects substantially outwardly through the mouth of the spout, is substantially centered with respect to the spout when in its normal erected or projected position, as shown in FIGURE 3. It is to be noted that the free end of the tab **50** extends beyond the axial center of the spout so as to assure the deflection thereof towards the interior of the spout and thereby avoid interference by the tab with the seating of the cap **18** on the spout. In such position, the free end of the tab may be readily grasped and pulled outwardly when desired to tear away the diaphragm **46** along the score line **48** and remove the diaphragm **46** completely from within the spout. If desired, the tab **50** may be formed on its under or inner surface with a series of transverse ribs **53** to present a frictional gripping surface.

Since the inception of the tearing action will normally require a considerably greater pull on the tab **50** than will its subsequent continuation, it is desirable to facilitate such initiation or inception of the tearing. This is accomplished in the present invention by the provision of a multiplicity of relatively closely spaced perforations **54** along that portion of the weakened zone or score line **48** which extends immediately past the root of the pull tab **50**, all as is best shown in FIGURE 1. Normally, these perforations **54** will be extremely small in size, preferably smaller than the grains of material in the container, to prevent inadvertent escape therethrough of the granular contents of the container. In addition to facilitating the inception of the tearing out of the diaphragm, such perforations function as venting means to permit escape of any vapor pressure which may accumulate within the interior of the container, without rupture of the diaphragm.

In the operation of the invention, it will be readily apparent that, when the outer cap **18** is applied over the mouth of the spout, as in FIGURES 4 and 5, it will (as an incident to its application) engage and bend or deflect downwardly the normally upwardly projecting pull tab **50**, so that, as the cap is applied, the tab **50** moves or is folded downwardly from its position shown in FIGURE 3 to substantially the position shown in FIGURE 5. In this position, the folded or retracted tab is shown as being in engagement with the inner face of the cap **18** internally of the annular sealing skirt or rib **44** of the cap. As thus applied, the sealing engagement between the rib **44** and the mouth of the spout positively seals the spout against entry of moisture such as might penetrate to the container contents through the perforations **48** in the diaphragm.

It will be noted, of course, that the diaphragm **46** is located beneath the lower or inner edge extremity of the sealing skirt **44**, and thus is spaced substantially inwardly of the mouth of the spout. In the event of any excess vapor pressure within the container, same is free to pass through the diaphragm perforations **48** without

rupture of the diaphragm as above mentioned. The grip of the cap is such that it will be blown off of the mouth responsive to an internal vapor pressure less than that required to rupture the container. In normal use the cap may be manually removed by upward finger pressure beneath its push-off tab **45**. The diaphragm **46** serves as an effective shipping seal and will positively prevent removal of or tampering with the container contents without rupture of the seal. When it is desired to open the container to commence use of its contents, the cap **18** is first removed in obvious manner, whereupon the resiliently downwardly folded pull tab **50** beneath the cap will immediately spring outwardly by its own resiliency through the mouth of the spout to the position shown in FIGURE 3. In this position, it may be readily grasped and pulled outwardly to tear away the diaphragm **46** and effect its complete removal from the spout, all without the necessity for the insertion of the user's fingers into the spout or container. The inception of the tearing away of the diaphragm will obviously be facilitated by the line of dual functioning perforations and vents **54** as aforementioned.

As has been indicated earlier, the invention is by no means restricted to use with granular solids, but may be readily adapted for use with liquids, simply by omitting the perforations **54**. In such case, the weakened tear line **16** will be continuous and imperforate. Also in such event, the lugs **42** may be extended and interconnected to provide a continuous annular seal when engaged beneath the locking shoulder **38**.

In this application, there is shown and described only the preferred exemplification of the invention simply by way of illustration of the preferred mode of carrying out the invention. However, it will be readily apparent that the invention is capable of other and different embodiments, and that its several details may be modified in various ways, all without departing from the invention as defined in the accompanying claims.

Having thus described our invention, we claim:

1. In a spout-type container closure, generally tubular pouring spout of resiliently flexible material formed with a bore terminating in a mouth opening through the outer end of the spout, a closure diaphragm spaced inwardly of the spout from said mouth opening and extending in a radial plane across said bore, said diaphragm being integral with and constituting a homogeneous portion of the material forming the spout, said diaphragm being peripherally connected with the inner wall of said bore along a weakened tear line spaced inwardly of the spout from its mouth, a resiliently flexible pull tab having a root portion connected with said diaphragm closely adjacent said wall and said weakened tear line, said tab, except for its root portion, being disconnected from said wall and said diaphragm, and having a free end normally projecting outwardly through and beyond the mouth of the spout, and being normally disposed at an angle to said diaphragm and being disposed for resilient flexing toward said radial plane of said diaphragm into the mouth of the spout, said angle being an acute angle materially less than 90 degrees and said tab extending over the medial portion of said diaphragm with the free end of said tab extending beyond the axial center of the spout to facilitate and assure the movement of said tab towards the interior of said spout when said tab is deflected towards the plane of said diaphragm, the resiliency of the tab, upon being released, causing it to resume its normal position with its free end outward of and beyond the mouth of the spout.

2. The combination of elements defined in claim **1** wherein said tab root portion includes an integral reversely bent flat base overlying said diaphragm.

3. A spout-type closure as defined in claim **1**, in which said weakened zone includes a line of perforations extending between the root of said pull tab and a relatively adjacent portion of said inner bore wall to thus both provide for the venting of an associated container and facilitate initiation of the removal of said diaphragm, the major portion of said weakened zone being imperforate to afford relatively greater resistance to accidental tearing.

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