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CLOSURES FOR FLUID CONTAINERS

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FIG. 1

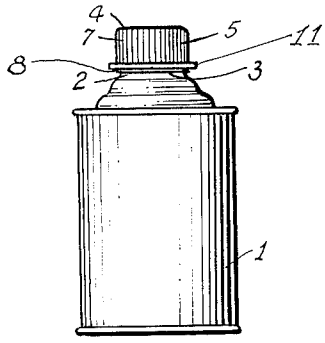


FIG. 2

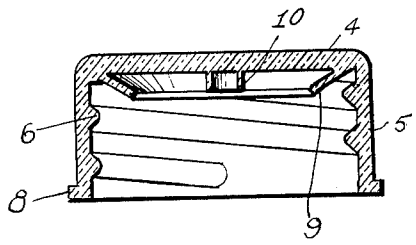


FIG. 4

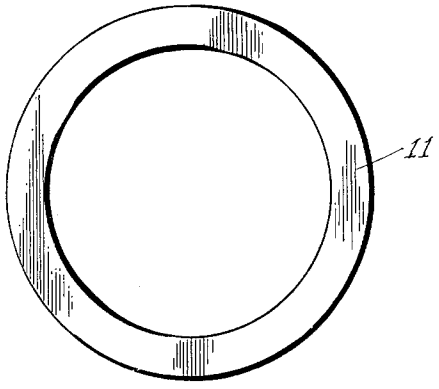


FIG. 3

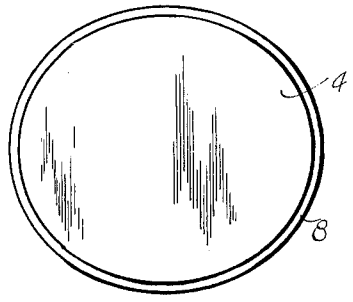


FIG. 5

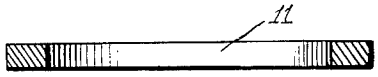
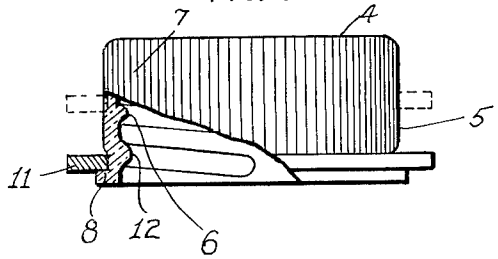


FIG. 6



INVENTORS
LEON ADLER
ELWOOD E. PONATH
KARL K. KERBER
By: Ben T. Fillman
ATTORNEY

United States Patent Office

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CLOSURES FOR FLUID CONTAINERS

Leon Adler, Clayton, and Elwood E. Ponath, Ferguson, Mo., and Karl K. Kerber, East St. Louis, Ill., assignors to The Dykem Company, St. Louis, Mo., a corporation of Missouri

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This invention relates to closures, and more particularly to such devices that are adapted for use with containers intended for storing liquids used in the commercial arts, especially in metal-working, as for example colored lay-out fluids that are brushed onto metal parts that are thereafter scribed for subsequent working operations.

Such cans of fluid are generally provided with a brush that is carried by the closure cap, so that brushings may be made from time to time, as required, and the can re-closed each time until the next brushing. Layout fluid that unavoidably gets onto the neck of the can or on its cap sets or dries out overnight, causing the cap to stick or "freeze" to the neck of the can, requiring a relatively high degree of torque to be applied in order to loosen the cap; the required gripping of the cap with pliers in order to exert the needed torque invariably damaging the cap and the neck of the can.

One of the main objects of our invention is to construct a pliable, non-brittle, good-sealing closure that is readily mounted, and tightened to a higher degree than ordinary pliable caps, and within wider limits of torque that can be applied to rigid closures, and yet, if over-tightened, is removable without cracking or breaking when a tool must be applied to the closure for applying the necessary high-turning torque for loosening.

Another object of the invention is to construct a closure that maintains proper sealing against leakage, even when the container contents are of organic substances whose liquids or vapors can be absorbed by and cause swelling of the closure material.

An added object of our invention is to construct a closure that maintains suitable sealing engagement when the container is exposed to a wide range of temperatures likely to occur in normal storage.

A further object of the invention is to construct a closure of such non-brittle, pliable and thermoplastic resin, that has been injection molded, and assumes at its open end a slightly oval or non-circular shape in transverse cross-section due to the closure cap having been extracted from the mold while still warm, and thereafter press-fitting a constricting ring or band onto the cap to the chime section or portion of the latter, or to the edge of the open end of the cap, to thereby change said non-circular portion to a truly circular one, and at the same time bulge the inner peripheral wall of the cap radially inwardly adjacent said chime or edge at said open end, causing thickening of the cap wall and increasing its density at said section.

Another added object of our invention is to construct a closure of the kind described, of a polyethylene cap, with a rigid thin metal washer ring forcibly pressed onto the cap to the chime or edge of the open end of the cap, to become a permanent and unitary part of the closure device and be movable therewith at all times.

To this end, the invention consists in the novel form, arrangement and combination herein shown and described, the uses thereof, and the method of making the same, all as will be more clearly pointed out in the claims hereunto appended.

In the drawings, wherein like reference characters represent like or corresponding parts throughout the view,

FIGURE 1 is an elevation of a container with the closure in sealing position thereon;

FIGURE 2 is an enlarged section of the cap after its extraction from the mold;

FIGURE 3 is a top plan view of the extracted cap;

FIGURE 4 is a top plan view of the compression ring;

FIGURE 5 is a diametral cross-section of said ring; and

FIGURE 6 is a view, partly in elevation and partly in section showing the cap after the ring has been fully positioned thereon.

Referring more particularly to the drawings, wherein we have illustrated a preferred embodiment of our invention, there is shown a container such as the tin-plated sheet-metal 8 oz. can **1**, now standard in the commercial arts, and in this instance having an approximately 1" O.D. neck **2** that is provided with the usual rather coarse screw threads **3**, say, about 7 threads per inch.

Although we have heretofore used such a receptacle to contain colored lay-out or marking fluid or liquid that is intended to be brushed onto pieces of metal and left to dry to produce a non-glare surface upon which scribing may be performed preliminary to machining operations, it is to be understood that the instant invention is not to be limited to such application, inasmuch as the closure may be employed for containers of any sort and for storing any kind of fluid.

A cap forms the principal part of the device, said cap being made of a non-brittle, pliable, tough type of plastic, and we have found that a polyolefin resin, and especially a linear polyethylene resin of .950 specific gravity, is highly suitable for such use. Said resin is also thermoplastic and can be used to produce caps through injection molding, permitting of extracting the caps while they are still warm if so desired, and in which condition they assume the slightly oval or non-circular shape in transverse cross-section, as indicated more particularly in FIG. 3.

That is, the cap will be with major and minor diameters in transverse cross-section, and especially so adjacent the open end of the cap. Even though such eccentricity varies in practice from .020" to .050" on the approximately one-inch diameter cap, yet the drawing shows an exaggeration of the dimensions.

The cap has a closed end or top **4**, with a skirt **5** depending therefrom to its chime portion adjacent the open end of the cap, the inside of the cap provided with screw threads **6** of such proper size and shape to co-act with those of the neck of the can. If desired, the exterior surface of the skirt may be scored or ribbed as indicated at **7**, to insure better grasp of the cap, and there may be a flange **8** extending a slight distance radially outwardly from the cap at its open end adjacent said chime, and serving as an abutment stop if desired, and also providing reinforcement for the skirt thereat.

Most liquids do not have a tendency to adhere to such glossy and waxy-type surfaces, so that there is a minimum of waste of liquid and less tendency to build up layout fluid on the parts.

Also, and in order to provide a better seal with the open end of the can, at the neck, a flexible gasket ring **9** may be formed integral with the cap adjacent the inside of the closed end, and extending inwardly at an angle toward the axis of the cap, to give flexibility to such gasket or liner.

Although when our closure is to be used for brushing liquids from the can, a brush is arranged to be carried by the cap, but as we do not claim such brush as part of our present invention, the same has been omitted, although a short brush-handle holding socket **10** has been shown as integral with the cap.

In one method of molding, said resin is fed into the mold, and after molding, the cap is extracted from the

latter or "bumped" therefrom, because of molding with the gasket integrally therewith, while the cap is still warm, whereupon the cap will assume the non-circular or slightly oval form shown. It is to be understood however, that other type of molding may be done, whereby the molded cap is unscrewed from the mold, rather than being bumped therefrom.

A ring, as for example the washer **11**, preferably of a rigid, substantially inexpandible strong material such as of cold-rolled steel, and with its inner peripheral wall portion properly de-burred to remove roughness thereat and thus insure that the ring will not act to "shave" the cap when forcing the ring thereonto, is to perform a highly important member of the closure structure.

The opening through the ring is slightly smaller than the average outside diameter of the cap skirt, say by about .010", and then this ring is thereupon forced or pressed relatively downwardly, on said cap to the chime portion of the latter until it seats against the abutment **8** of the flange, as shown most clearly in FIG. 6. The dotted lines in said FIG. 6 indicates an intermediate point in the seating advancement of the ring, while the full lines indicate the ring fully seated in its permanently fixed position on the cap.

Said ring is relatively thin, about .118" as now used, which is more than sufficient in tensile strength to reshape the cap to a truly circular cross-section thereat, has the additional necessary strength to insure that such re-shaping remains permanent and constant, and will maintain effective tightness of sealing of the cap adjacent its open end.

The skirt portion of the cap at its chime or edge or open end has thus been compressed to increase its density, and there is formed an inwardly extending projection or bulge **12** for tighter yieldably resiliently compressible engagement with the exterior of the can neck. It has also been found from experiments that such pre-stressing of the cap improves the elastic memory of the cap. It has also been found that the torque applied to the closure during tightening or loosening, measured in inch-pounds, can be much greater than when using the same cap without such ring.

Such thickening of the cap bounding wall is due to the same having been constricted without buckling or wrinkling, and the chime portion or edge portion at the open end of the cap is permanently maintained under compression during all further movements of the closure relatively of the can.

The same plastic cap, without the ring, withstands only a comparatively small degree of turning torque without jumping its threads, but a closure made as herein set forth has been tested to as high as 28 inch-pounds without damage or jumping of threads (this reading being the limit of the tester being used at the time), and then further torque was applied, to an unknown greater amount without damage or thread-jumping.

Certain fluids stored in the container will affect the material of the plastic cap, and even of this one, through

absorption of the fluid or its vapor, thereby causing swelling of the cap. Although the major portions of the cap, having the ring thereon, might be adversely affected so as to swell or otherwise deform the same and perhaps loosen its seal at some areas, yet our closure having said compression ring thereon will continue to maintain an effective and true sealing relationship with the neck of the container at said compressed, inwardly bulged portion, and it has been found that here too, that the seal is so good that a relatively high degree of torque will be required to loosen the closure that was originally tightened with high torque.

Repeated use of the closure will not materially loosen the sealing effectiveness. This action is quite different from the seal between a cap of the same material and the container, wherein there is a constant-sized and shaped mating seating portions, for it is obvious that repeated use thereof necessarily wears the mating portions to thereby result in loosening the seal.

Thus, the use of our improved closure insures that almost any kind of fluid can be stored in containers, such fluids even including flammable ones and solvents, and there will be no leakage past the area of sealing adjacent the open end of the cap, nor any break in the continuity of such sealing.

What is claimed:

1. A closure cap for controlling the successive alternate opening and closing of the access opening to the flow of fluid contents from within a container, said cap being of slightly yieldably resilient plastic and tubular with only its top end wall closed and having an annular open skirt depending therefrom, and an inexpandible rigid ring having its opening sufficiently smaller than the external diameter of the chime portion of said skirt to thereby initially distort and constantly compress the material of the skirt radially inwardly thereat, said skirt having a peripherally extending radially projecting flange at its open end to serve as an abutment stop that is engageable by said ring to limit axial advancement of the latter onto the skirt.

2. A cap as set forth in claim 1, further characterized in that said ring is of much greater width radially than its height so as to thereby deformably compress only a minimum portion of said skirt.

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THERON E. CONDON, *Primary Examiner.*

G. T. HALL, *Assistant Examiner.*