May 28, 1935. F. WESTERBECK 2,003,025

CLOSURE

Filed April 8, 1933

FIG. 1.

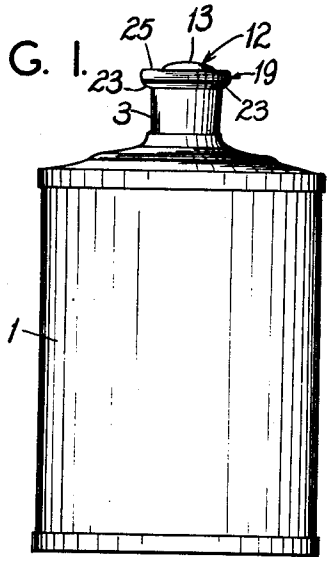


FIG. 3.

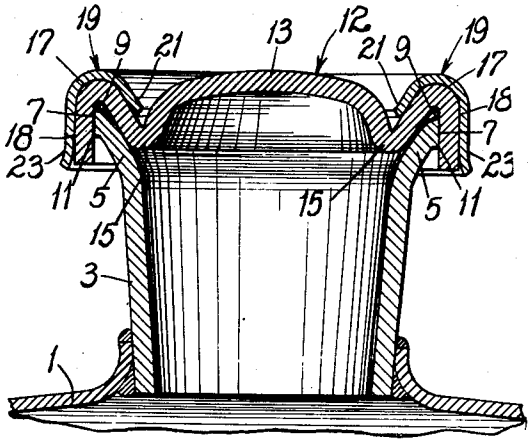


FIG. 2.

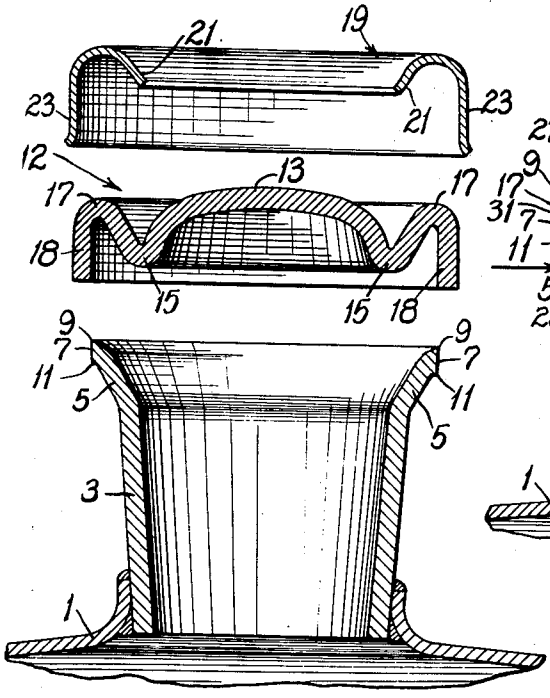
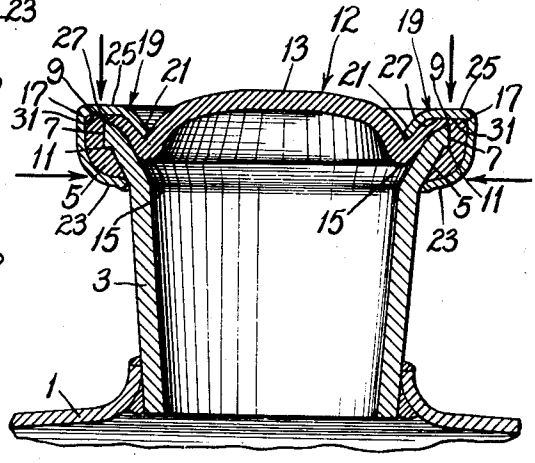


FIG. 4.



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CLOSURE

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Application April 8, 1933, Serial No. 665,219

4 Claims. (Cl. 220—27)

This invention relates to closures, and with regard to certain more specific features, to closures for effecting hermetic seals for containers for volatile fluids such as ether and the like.

This invention is an improvement upon the structure set forth in my United States Patents 1,370,865, dated March 8, 1921 and 1,714,996, dated May 28, 1929.

Among the several objects of the invention may be noted the provision of a closure which, under varying temperature conditions of the container to which the closure is applied, more positively seals against escape of fluid from the container; the provision of a closure of the class described which substantially eliminates relative motion between certain parts thereof under gradually varying temperature conditions; the provision of a closure of this class which provides for non-deleterious relative motion between certain parts under conditions where the temperature varies at a more rapid rate; and the provision of such a closure having instead of one, a plurality of effective sealing edges. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a side elevation of a container showing the completed closure thereon;

Fig. 2 is a fragmentary view, similar to Fig. 1 but showing the parts of the container and closure in seriatim;

Fig. 3 is a side elevation showing the parts of Fig. 2 assembled but not pressed into final position; and,

Fig. 4 is an enlarged cross section of the nozzle of the container of Fig. 1 showing the parts pressed into sealing position.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Referring now more particularly to Fig. 1, there is shown at numeral 1 a sheet metal container for ether. It is to be understood that ether constitutes one example of any of the fluids including liquids and/or gases which are difficult to seal in the ordinary manner.

Ether has the property of being quite mobile and thus of passing through the smallest openings and thus effecting leakage through the ordinary seal, except such seals as are inordinately difficult to make, open and/or maintain. Ether also has a low boiling point, that is to say, it will develop a substantial vapor tension under ordinary warm weather conditions. Thus the seal must be proof against a super normal pressure of gas. It should also be safe and easy to make and thus distinguish from former solder seals. Furthermore, ether is sometimes admixed with oily ingredients or the like which facilitate escape and which stain or otherwise render labels unsightly.

Referring now more particularly to Fig. 1, the container 1 is composed of tinned sheet metal and has a nozzle 3. In my said Patent 1,370,865, the material composing the nozzle was disclosed as being relatively thin and yieldable under pressure so that it would deform substantially upon applying the closure. One of the improvements herein consists in forming this nozzle of relatively thick material which is non-yieldable under the pressure engendered in applying the other closure parts to be described. The nozzle 3 is flared at its upper end as shown at numeral 5, the flared portion also being of a rigid character. The rigid flare 5 is cylindrically sheared as shown at numeral 7 to effect and provide an upper, sharp, raw edge 9, the sides of which are an acute angle and a lower raw edge 11, the sides of which are at substantially a right angle, due to the drawing down of the metal which would otherwise effect an obtuse angle. There is thus effected between the raw edges 9 and 11 the cylindric portion 7 which is axially positioned.

Over the edge 9 is placed a lead or other soft metal cap 12, the initial conformation of which is as shown in Figs. 2 and 3, the same having a dome 13, a peripheral depression 15 and a peripheral raised bead 17 having a skirt 18 adapted to enclose or surround the cylinder 7 between the edges 9 and 11 and overlapping the same downwardly. The fact that the cap is made of soft metal (lead) permits of readily puncturing the same and removing of the central portion so as to open the container.

Applicable above the bead 17 of the cap 13 is a sheet metal binding band 19 having an initially depressed inward periphery 21 and an outer skirt 23, the latter covering the corresponding skirt of the cap 13.

To apply the closure to the nozzle 3, the lead cap 12 is placed in position with the bead 17 substantially resting upon the raw edge 9. The band 19 is placed in position over the bead 17. Then forming dies are applied simultaneously to apply axial and radial forces in the directions illustrated by the arrows in Fig. 4, thus forming the skirts 23 and 18 of the band 19 and cap 12 inwardly beneath the raw edge 11, and at the same time forcing the upper portion of the band 19 to assume a flat contour 25. At the same time that the flat contour 25 is formed, the underside of the sheet composing the band 19 will also assume a relatively flat contour 27 against the lead of

the cap which assumes a flat shape upon its top surface. Also, the raw edge 9 will seat into the lead.

The band 19 and the nozzle 3 are composed of the same material, namely, tinned sheets of steel, the thermal coefficients of which are substantially the same. Thus if the completed closure be subjected to gradually varying temperature changes, the nozzle 3 and the band 19 will expand and contract at substantially the same rate and there will be substantially no relative motion between the two at the regions embracing the bead 17 of the lead cap 13. Thus the raw edges 9 and 11, in turn embraced by the lead, and upon which the seal depends primarily, are not worked loose. It is to be understood that although the nozzle 3 and band 19 are composed of the same material, they need not be of the same thickness.

Should the temperature change at a rapid rate, the equality of thermal coefficients of expansion will be of small help, because the band 19 may become heated before heat flows to the nozzle 3, or vice versa, thus causing relative motion between the two and, under the conditions of the prior art, a slight working of the lead at the raw edge 9. This condition is met by the present improvement because the band 19 is flattened as at 25 and consequently also on the underside as at 27, the lead cap 12 also having the upper flat surface 31 presented against the lower flat surface 27. These flat surfaces, not being interlocked, permit the infinitesimal motion required to relieve any possible loosening strain at the raw edges 9 and 11.

Unlike the structure in my Patent 1,370,865, when the cap 12 and band 19 are forced around the nozzle 3, the nozzle 3 being heavy does not expand, and the same is rigid instead of flexible as in the structure of said patent. Therefore the nozzle 3 retains its original condition in which the raw edge 9 is presented endwise, or to put it in other words, is presented at the top of the container. In my said former construction (Patent 1,370,865), the flexibility of the nozzle permitted the bending down of the upper edge when the cap and ring were applied so as to present the raw edge 9 substantially radially and on a flange. By presenting the raw edge as herein, that is, axially, instead of radially as in said former patent, and permitting said relative motion between the surfaces 27 and 31, I avoid substantially all relative motion at the raw edge 9 under all temperature conditions, whether changing slowly or quickly. This is the advantage of this construction over that shown in my said patent, wherein the radial presentation of the edge, while effective for most conditions, did permit of relative motion between the lead cap and the nozzle at the raw sealing edge under quick changes of temperature. Thus, this improvement makes my former closure effective under any and all temperature conditions, and materially extends its usefulness.

It should also be noted that the relatively thick nozzle 3, in contradistinction to the relatively thin and flexible nozzle of my said patent, also permits of the formation of the distinct raw edge 11 presented endwise. Also, two raw sealing edges are obtained instead of the single one as heretofore. The lower raw edge 11, the result of the thickness of the nozzle 3, is formed at an angle of substantially ninety degrees, as shown.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A container, a substantially rigid nozzle on said container, said nozzle having a cylindric end, said cylindric end having an upper and axially presented sharp sealing edge having an acute angle and an axially presented lower edge at least as great as a right angle, a soft metal cap seating on said end and having a depending soft metal flange surrounding said cylindric portion, and a binding band closely fitted to said soft metal cap and surrounding the flange thereof opposite the said sharp edge and having its margin turned inwardly to confine the soft metal against the sealing edges and about said cylindric portion.

2. A container, a nozzle on said container, said nozzle having a cylindric end and a pair of axially presented sharp sealing edges one of which has an acute angle, a soft metal cap seating on the end of said nozzle and having a depending soft metal flange surrounding said cylindric portion, and a binding band closely fitted to said soft metal cap and surrounding the flange thereof opposite the said sharp edges and having its margin turned inwardly to confine the soft metal against the sealing edges and said cylindric portion, said band and said cap having a relatively flat contacting conformation adjacent the outer sealing edge, said conformation being located substantially at right angles to said axial cylindric portion.

3. A container, a nozzle on said container, said nozzle having a cylindric end and an upper axially presented sharp sealing edge of an acute angle, a soft metal cap seating on the end of said nozzle and having a depending soft metal flange surrounding said cylindric portion, and a binding band closely fitted to said soft metal cap and surrounding the flange thereof opposite the said sharp edge and having its margin turned inwardly to confine the soft metal against the said sealing edge and said cylindric portion, the band and cap being adjacently deformed to form a flat contact portion at right angles to the cylindric end and also with respect to the direction of presentation of said sealing edge, said nozzle being of such rigidity that the force effected upon and in applying the band and cap does not expand said nozzle.

4. A container, a nozzle on said container, said nozzle having a cylindric end and a pair of sharp sealing edges, a soft metal cap seating on the end of said nozzle and having a depending soft metal flange surrounding said cylindric portion, and a binding band closely fitted to said soft metal cap and surrounding the flange thereof opposite the said sharp edges and having its margin turned inwardly to confine the soft metal against the sealing edges and said cylindric portion, the band and cap being deformed to form a relatively flat adjoining portion at right angles to the cylinder end, said nozzle being of such rigidity that the effect upon pressing on the band and cap does not substantially deform said nozzle, the nozzle and band being formed of materials having approximately equal thermal coefficients of expansion.

FREDERICK WESTERBECK.