Aug. 2, 1966 A. B. MOJONNIER ETAL 3,263,724

CONTAINER CAP FINISH AND CAP

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Fig. 1.

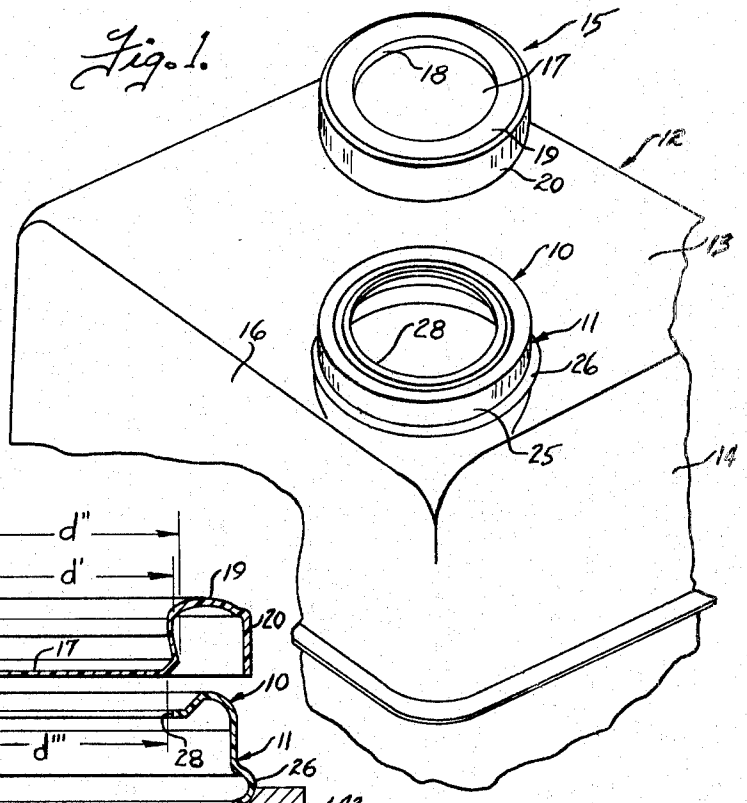


Fig. 2.

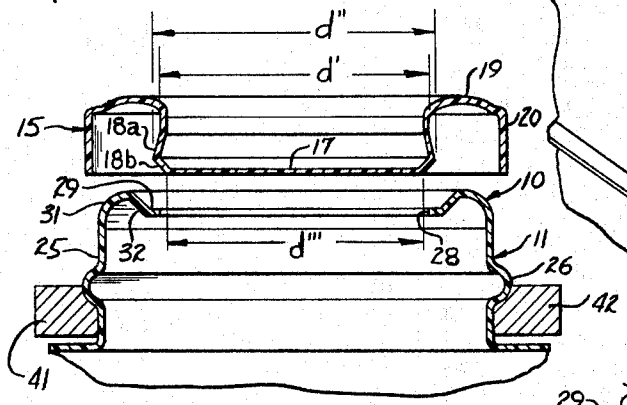


Fig. 3.

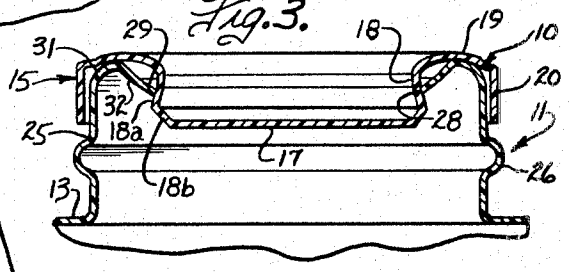
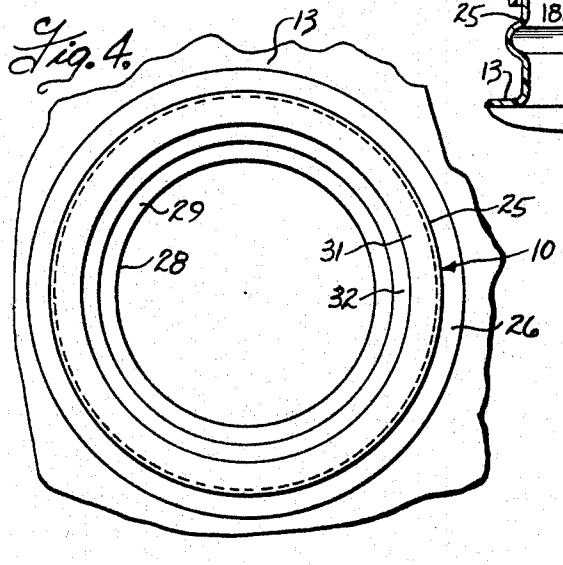


Fig. 4.



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Fig. 7.

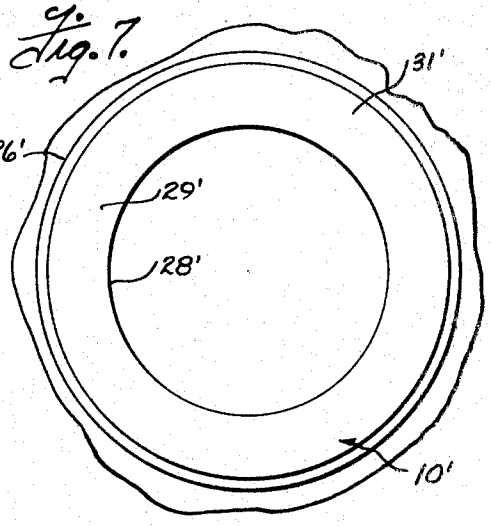


Fig. 8.

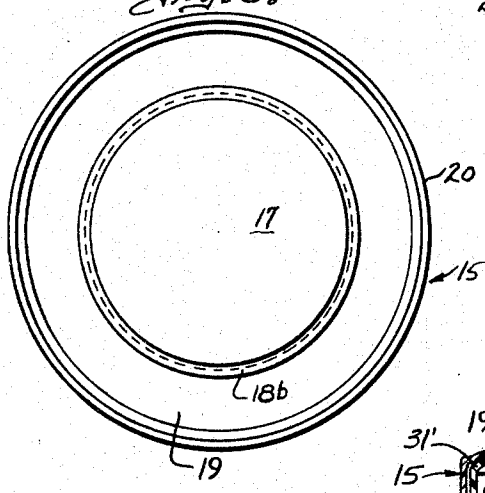


Fig. 6.

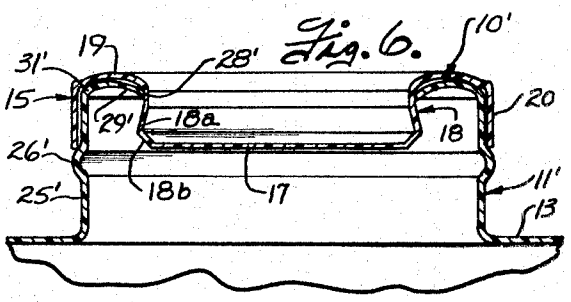
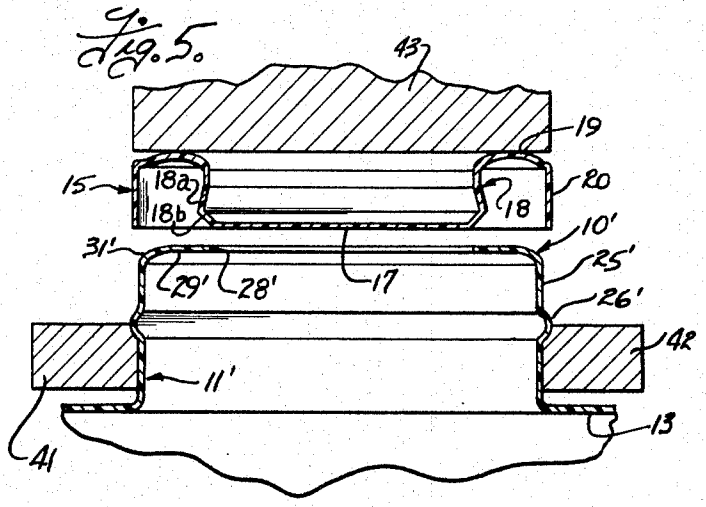


Fig. 5.



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3,263,724

CONTAINER CAP FINISH AND CAP

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6 Claims. (Cl. 150—.5)

This invention relates to a cap and cap finish for plastic containers.

An important object of this invention is to provide a cap and cap finish for plastic containers which will form a reliable seal for the container and in which the cap will not become loose or dislodged during normal handling and transportation of the filled container.

Another object of this invention is to provide a cap and cap finish for a plastic container which requires only moderate pressure to apply the cap to the container and simplifies the problem of capping the thin walled plastic containers without permanently deforming the same.

A further object of this invention is to provide a cap and cap finish for a plastic container in which the cap can be removed and manually reapplied to the container to enable reclosing of the container after each dispensing operation.

Still another object of this invention is to provide a cap and cap finish for a plastic container which can be easily and economically formed.

These, together with other objects and advantages of this invention will be appreciated as the invention becomes better understood by reference to the following detailed description when taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary perspective view of a container and cap prior to application of the cap to the container;

FIG. 2 is a sectional view through the cap and cap finish of FIG. 1 illustrating the cap in position for application to the container;

FIG. 3 is a sectional view through the cap and cap finish of FIG. 1 illustrating the cap applied to the container;

FIG. 4 is a plan view of the cap finish of FIG. 1;

FIG. 5 is a sectional view through a cap and a modified form of cap finish illustrating the cap in position for application to the container;

FIG. 6 is a sectional view through the cap and cap finish of FIG. 5 illustrating the cap applied to the container;

FIG. 7 is a plan view of the cap finish of FIG. 5; and

FIG. 8 is a bottom view of the cap.

The cap and cap finish of the present invention are generally adapted for containers formed out of resilient plastic material such as polyethylene, polystyrene, polypropylene, etc. The cap finish designated generally by the numeral **10** is provided on a spout **11** formed integrally with the plastic container **12**. The spout **11** extends laterally from one wall **13** of the container and, as shown in FIG. 1, the spout **11** is located adjacent one corner of the container so that the adjoining side walls **14** and **16** provide some support for the spout during capping, it being understood that the location of the spout may vary for containers of different size and shape. The container and spout may be formed in various different ways such as by injection molding, blow molding or by thermoforming of thermoplastic sheet material.

The cap finish **10** is designed for use with caps designated generally by the numeral **15** of the type having a depressed mouth spanning portion. While the cap finish can be employed with caps formed of an absorbent material such as paper and the like which swell when contacted by liquid, the cap finish is so arranged as to also

form a reliable seal with smooth non-absorbent materials and the cap is preferably made of resilient plastic material such as polystyrene or polyethylene. The cap includes a central mouth spanning portion **17**, a peripheral sealing wall **18** that surrounds the mouth spanning portion and an outwardly extending cap rim **19**. A peripheral skirt **20** is preferably provided on the outer edge of the cap rim and extends downwardly to a level adjacent the mouth spanning portion. The rim may conveniently be knurled or corrugated to facilitate manual removal of the cap. For reasons pointed out hereinafter, the sealing wall **18** of the cap is preferably formed with an upright generally frusto-conical intermediate section **18***a* that flares downwardly and outwardly from the rim **19**, an inverted generally frusto-conical lower section **18***b* that tapers downwardly and inwardly from the intermediate section to the mouth spanning portion **17**. As indicated in FIG. 2, the sealing wall has a minor outer diameter *d'* adjacent the point where the intermediate section **18***a* connects to the rim **19**, and a major outer diameter *d''* at the point where the lower edge of the intermediate section joins the lower section **18***b*. Advantageously, the diameter designated *d'''* at the point where the lower section **18***b* joins the mouth spanning portion **17**, is made somewhat less than the minor diameter *d'*.

The container spout **11** includes an annular outer wall **25** formed integrally with one of the walls **13** of the container and extending laterally thereof. For reasons set forth hereinafter, the outer wall is preferably formed with a peripheral bead or shoulder **26** intermediate the ends of the spout and spaced from the side wall **13** of the container. The cap finish **10** is formed on the outer end of the spout and includes a thin inwardly extending rim having a central dispensing opening **28** and a planar ledge portion **29** which extends around the opening **28**. The opening **28** is dimensioned slightly smaller than the minor diameter *d'* of the sealing wall on the cap so that the opening **28** must be expanded slightly to receive the cap to thereby provide resilient seal therebetween. In plastic containers formed of high impact polystyrene and polyethylene having spout openings of about one inch in diameter, it has been found that spout openings which are from .010 to .020" smaller than the minor diameter *d'* of the cap provide suitable seals. The major diameter *d''* of the cap is made somewhat larger than the minor diameter *d'* to enhance resistance to accidental dislodgement of the cap from the cap finish. In the cap illustrated which is shown at about twice size, the major diameter is about .04" larger than the minor diameter. The planar ledge portion is made sufficiently thin and preferably of the order of .010 to .030" to form a diaphragm like structure which deflects axially when the cap is pressed onto the spout.

In general, the thickness of the ledge portions should be correlated with the stiffness of the particular plastic material used in forming the container so that the ledge portion can be distended to receive the cap without requiring high capping pressure. The frusto-conical lower section **18***b* of the cap sealing wall is shaped so that the diameter *d'''* at the periphery of the mouth spanning portion is smaller than the opening **28** in the spout, so as to aid in guiding the mouth spanning portion and sealing wall of the cap into the opening. Since the spout opening **28** has a diameter slightly smaller than the minor diameter *d'* of the cap, the planar ledge portion **29** of the spout remains deflected inwardly of its normal plane when the cap is on the spout so as to engage the cap as shown in FIG. 3 and mechanically grip and restrain the cap from accidental withdrawal.

In the embodiment of FIGS. 1–4, the ledge portion **29** on the cap finish is offset below the outer face of the cap finish and the latter is shaped so as to facilitate guid-

ing of the cap into the opening. In particular, the cap finish includes an outer rim portion **31** which curves upwardly and inwardly from the outer wall **25** of the spout, and an inner rim portion **32** which is inclined downwardly and inwardly from the outer rim portion to the ledge portion **29**. As will be seen from FIG. 2, the inner rim portion **32** functions as a guide which cooperates with the lower frusto-conical portion **18***b* of the cap sealing wall to guide the cap into the opening **29**. In addition, this transversely arched configuration of the cap finish formed by the inner and outer rim portions has been found particularly advantageous for the relatively softer plastic material such as polyethylene, since it tends to confine inward flexing of the cap finish to the ledge portion **29**.

As previously noted, to assure proper sealing and holding of the cap on the spout, it is necessary that the size of the opening **28** be maintained slightly smaller than the minor diameter *d'* of the cap. The cap can be formed by conventional injection molding or thermoforming of sheet materials to maintain the cap dimensions within relatively narrow limits. In order to minimize changes in shape and size of the spout opening **28**, due to shrinkage and cooling of the container after forming of the same, the container spout is preferably initially formed with a continuous web extending thereacross in the plane of the ledge **29**, and the opening **28** thereafter punched in the web to form the aforementioned ledge portion **29**. With this arrangement, the size of the spout opening can also be maintained within relatively narrow limits.

A spout having a modified form of cap finish is illustrated in FIGS. 5–7. In this embodiment, the spout **11'** has an annular outer wall **25'** and a peripheral bead **26'** intermediate the ends of the spout. The cap finish **10'** is formed on the outer end of the spout and comprises a thin inwardly extending rim having a central opening **28'** therein. The rim has a planar ledge portion **29'** which surrounds the opening and which is joined to the outer wall of the spout by an arcuate outer rim portion **31'**. As in the preceding embodiment, the opening **28'** is made slightly smaller than the minor diameter *d'* on the sealing wall of the cap so that the ledge forms a tight seal with the cap. In this embodiment, the planar ledge **29'** is relatively wider than the corresponding ledge **29** of the previous embodiment and the ledge **29'** deflects inwardly from its normally planar configuration as the cap is pressed onto the spout. Since the opening **28'** in the cap finish is smaller than the minor cap diameter *d'*, the ledge **29'** remains dished inwardly from its planar configuration at all times while the cap is on the spout to mechanically lock the cap in position and restrain the same against accidental dislodgement. The wider ledge portion **29'** enhances the flexing and distention of the ledge when the cap is applied to the spout, and this form of cap finish is best suited for use with relatively stiffer plastic material such as polystyrene. When polystyrene is used to form the container, it is preferable to form the caps out of relatively softer plastics such as polyethylene to improve the seal therebetween.

The containers and spouts formed of thin plastic material are readily distortable under the pressures applied during capping. In order to avoid distortion of the container and spout, the spout is preferably supported during capping as by a pair of opposed clamping jaws such as indicated at **41** and **42** and which are shaped to closely surround the outer wall **25** of the neck and at least the underside of the bead **26**, to radially and axially support the neck during capping. The cap can be pressed on the spout by any suitable means such as a capping head **43** (FIG. 5). Moreover, the caps can be removed and reapplied many times in the home, without necessitating special tools.

From the above, it will be seen that the cap finishes and caps of the present invention provide a resilient seal between the container spout and the cap and firmly lock the cap to the spout to prevent accidental dislodgement. The normally planar ledge portion **29** of the embodiment of FIGS. 1–4 and the normally planar ledge portion **29'** of the embodiment of FIGS. 5–7 have an opening therein which is slightly smaller than the minor diameter *d'* of the cap sealing wall, and these normally planar ledge portions are made relatively thin, of the order of .015" to .030" to form a diaphragm like structure which deflects inwardly as the cap is pressed into the opening, to thereby allow the opening to expand sufficiently to receive the cap. The planar ledge portions tend to return to their normally planar condition after the major diameter *d''* of the cap has passed through the opening. However, since the spout opening is smaller than the minor diameter *d'* of the cap, the ledge portions remained dished inwardly at a shallow angle to their normal plane and engage the sealing wall of the cap at an acute angle to a plane normal to the spout axis. This provides a tight resilient seal between the cap finish and the cap to seal against leakage, and also provides a firm mechanical lock. Since the ledge portions dish inwardly when the cap is applied to the cap finish, the ledge portions permit movement of the cap into the opening with somewhat greater ease than the cap can be withdrawn from the opening. This facilitates mechanical capping of the container without damaging the thin walled containers and spouts, and yet provides a seal which is highly resistant to dislodgement from the spout due to internal pressure. By reason of the resilient seal between the ledge on the cap finish and the sealing wall of the cap, minor irregularities in the shape and size of the opening in the cap finish and the sealing wall of the cap are accommodated. The rim portion **19** of the cap overlies the outer face of the cap finish and controls inward movement of the cap, and the peripheral skirt extends downwardly around the outer periphery of the spout to provide a protective enclosure. In addition, the skirt also provides a convenient hand grip to facilitate removal and reapplication of the cap. Since the skirt extends down to the level of the mouth spanning portion of the cap, the skirt also controls spacing of the caps and facilitates stacking of the caps prior to application to the container.

We claim:

1. In combination with a container having an integral spout formed of thin flexible plastic material,

a cap having a peripheral rim; a depressed mouth spanning portion offset below the peripheral rim; and an annular sealing wall connecting the mouth spanning portion to the peripheral rim;

said spout having an annular outer wall and an inwardly extending rim at the upper end of the outer wall; the spout rim having a central opening therein and a thin flexible ledge portion extending around the periphery of the opening and forming the free edge of the rim; said ledge portion being offset below the outer face of the spout rim a distance substantially less than the axial length of said sealing wall on the cap, said spout rim having an annular portion surrounding said ledge portion; said ledge portion extending angularly downwardly from said annular portion and angularly related thereto and in gripping relation with the sealing wall of the cap; said annular portion extending downwardly and inwardly to said ledge portion when in an unstressed state, said central opening being dimensioned slightly smaller than the outer diameter on said sealing wall of said cap and said ledge portion being disposed generally perpendicular to the spout axis when in an unstressed state.

2. The combination of claim **1** wherein said sealing wall of said cap flares outwardly in a direction away from the cap rim.

3. The combination of claim **1** wherein said sealing wall on said cap has an intermediate portion that flares outwardly in a direction away from the cap rim and a

lower portion that tapers inwardly from said intermediate portion to said mouth spanning portion.

4. The combination of claim 3 wherein said cap is formed of a resilient plastic material.

5. In combination with a container formed of plastic material and having an upwardly extending integral spout,

a closure cap having a peripheral rim; a depressed mouth spanning portion offset below the peripheral rim, and an annular sealing wall connecting the mouth spanning portion to the peripheral rim,

said spout having an annular outer wall and a rim on the upper end of said outer wall; said spout rim including an annular outer rim portion on the upper end of said outer wall and extending inwardly therefrom to form a spout end face and an annular inner rim portion extending downwardly and inwardly from said outer rim portion; said spout rim having a thin flexible ledge portion at the lower end of said inner rim portion forming the free edge of said rim; said ledge portion being offset below the spout end face a distance substantially less than the axial length of the sealing wall on the cap and having a central opening; said ledge portion extending angularly downwardly from said inner rim portion and in gripping relation with the sealing wall on the cap; said annular inner rim portion extending downwardly and inwardly from the outer rim portion when in an unstressed state; said central opening being dimensioned slightly smaller than the outer diameter of said sealing wall of said cap and said ledge portion being disposed generally perpendicular to the spout axis when in an unstressed state; said ledge portion being sufficiently thin to flex in a direction axially of the neck when the cap is pressed onto the spout to allow the annular sealing wall on the cap to enter the opening in the spout.

6. In combination with a container with a container formed of plastic material and having an upwardly extending integral spout,

a closure cap having a peripheral rim; a depressed mouth spanning portion offset below the peripheral rim, and an annular sealing wall connecting the mouth spanning portion to the peripheral rim,

said spout having an annular outer wall and a rim on the upper end of said outer wall; said spout rim including an annular outer rim portion on the upper end of said outer wall and extending inwardly therefrom to form a spout end face and an annular inner rim portion extending downwardly and inwardly from said outer rim portion; said spout rim having a thin flexible ledge portion at the lower end of said inner portion forming the free edge of said rim; said ledge portion being offset below the spout end face a distance substantially less than the axial length of the sealing wall on the cap and having a central opening; said ledge portion extending angularly downwardly from said inner rim portion and in gripping relation with the sealing wall on the cap; said annular inner rim portion being generally frusto-conical in shape and extending downwardly and inwardly from the outer rim portion when in an unstressed state; said central opening being dimensioned slightly smaller than the outer diameter of said sealing wall of said cap and said ledge portion being disposed generally perpendicular to the spout axis when in an unstressed state; said ledge portion being sufficiently thin to flex in a direction axially of the neck when the cap is pressed onto the spout to allow the annular sealing wall on the cap to enter the opening in the spout.

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