Aug. 25, 1959 A. ISELE-AREGGER 2,901,139

SEALING DISC FOR METALLIC CAP CLOSURES, CROWN CLOSURES, OR THE LIKE

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Fig. 1.

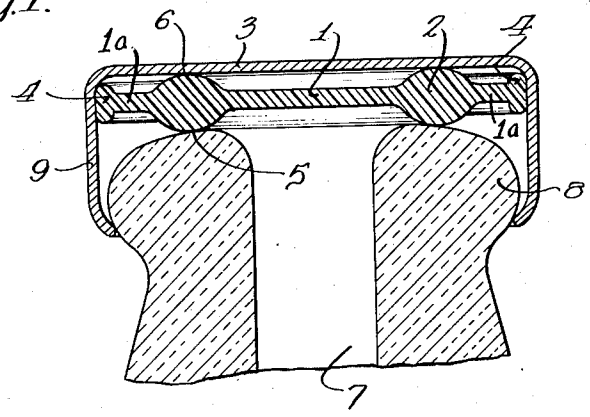


Fig. 2.

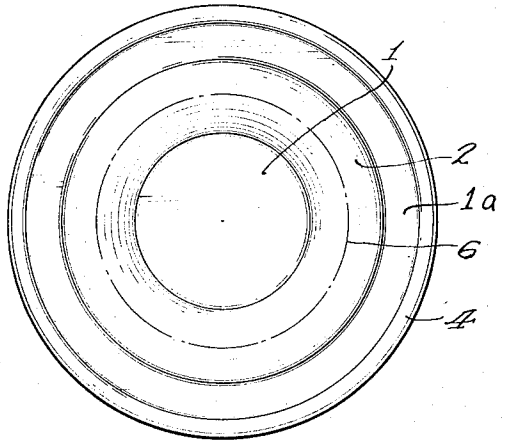
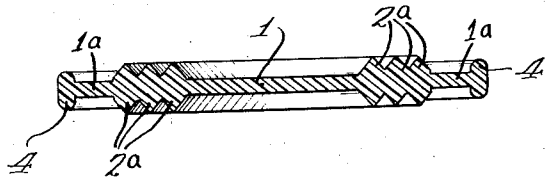


Fig. 3.



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SEALING DISC FOR METALLIC CAP CLOSURES, CROWN CLOSURES OR THE LIKE

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Claims priority, application Germany January 26, 1955

5 Claims. (Cl. 215—40)

The present invention relates to closures, particularly to closures for food and beverage containers, such as crown closures, metallic cap closures, screw-on closures and the like, and especially, to sealing means therefor.

The present application is a continuation-in-part of my prior copending application Serial No. 365,842, filed July 3, 1953, on "Bottle Closures."

The problem of replacing the well-known cork sealing disc in metallic cap closures, crown closures, or the like by other materials has, since the development of the plastic industry, been the subject of a great many considerations. Many proposals have found expression in patent literature of remarkable importance, but nevertheless, a really practical sealing disc meeting with full success has not heretofore been afforded.

In the case of food products, the material of the seal must meet the absolute requirement that the seal may in no way affect the smell and taste of the contents of the bottle or jar. Materials which fully satisfy this condition are, for example, certain plasticizer-free artificial substances, especially polyethylene. Polyethylene, however, has the disadvantage that it is to a certain extent permeable to gas, which normally would render the material unsuitable for sealing vacuum and pressure packed foods and beverages, particularly the latter.

According to the present invention, a polyethylene seal, suitably a sealing disc, is effectively rendered impermeable to gas by the provision of contact surfaces on the disc engageable with the top face of the bottle and with the inner surface of the metallic cap which are kept as small as possible, the mutual contact of these parts prior to pressing of the cap onto the container being substantially linear. By virtue of this relationship, after the cap has been pressed onto the container, a high specific pressure will be obtained in the narrow contact zone. The sealing material, accordingly, is compressed to a very substantial extent in the contact zone, thus to prevent passage of gas therethrough.

In practice, the linear seal above defined may be obtained by providing a sealing disc having a thin central portion with an annular pad surrounding the same, the pad preferably being circular, elliptical, or square in cross-section, or if desired, comprising a plurality of concentric annular pads. It has been found that a pad of elliptical cross-section is particularly capable of withstanding extremely high pressure within a container.

Inasmuch as the seal according to the invention takes place in a small area or region at high specific pressure, the sealing disc need include only a small portion of predetermined thickness in the region of the sealing zone, dependent on the species and properties of the selected material. For this reason it is possible in the remaining regions of the seal to maintain the sealing disc relatively thin, since the central portion of the disc serves only to prevent contact of the contents of the container with the metallic cap, and since the marginal portion of the disc need serve no more than to assist

in retaining the seal in the cap and, in certain cases, to prevent the metal cap from bearing directly on the mouth or lip of the container. Accordingly, the sealing inserts or discs may be manufactured in an extremely economical manner.

Special attention is directed to the arrangement of the annular pad. Heretofore, those skilled in the art have been of the opinion that the seal on bottles with crown closures must take place in the outer region of the mouth or lip of the bottle, and preferably at the point where the mouth or lip is inclined, as defined by the inclination of the tangent of that surface toward the horizontal, at an angle of about 45° or more, the seal being effected over a large area commencing at the point indicated and extending inwardly approximately to a diameter corresponding to the inner diameter of the mouth of the bottle plus twice half the thickness of the wall defining the mouth or lip of the bottle.

Extensive tests have shown that this generally prevailing opinion is erroneous and that an appreciably better seal in cap closures of all kinds will be obtained if the sealing area is maintained small and the diameter of the line of sealing engagement, as provided according to the invention, is at most equal approximately to the inner diameter of the mouth of the bottle plus twice 75% of the thickness of the wall of the mouth or sealing lip. Sealing discs designed in accordance with the present invention withstand pressures which are approximately twice as high as those obtained with sealing discs of conventional forms.

A further feature of the invention is the provision of sealing discs formed in such manner as to be quite symmetrical with respect to the horizontal median plane of the seal. Thus, insertion of the sealing discs into metallic caps is appreciably simplified, inasmuch as both surfaces of the disc are identical, and it is therefore immaterial how the discs are inserted in a cap. The defined symmetry permits of simplified handling of the seals on crown cap assembly machines and the like particularly as compared to the unsymmetrical discs proposed heretofore.

In the industry concerned, it has heretofore been a problem to assemble a sealing disc with a metallic cap in such manner that the seal does not fall out of the cap during handling. Attempts have been made to glue the discs into the caps, but substantial difficulties are encountered in gluing when thermoplastic sealing discs are employed. In the case of my improved seal, gluing is entirely excluded, because a hollow space exists between the metallic cap and the sealing disc in the central area of the seal due to the symmetry of the relatively thick sealing pad. The disc of the invention must therefore be anchored in the closure in another manner, and to this end, I employ the edge of the seal as a lateral contact surface for engagement in the metallic cap. In order to attain the desired adhesion, the outer diameter of the sealing disc must, on one hand, be somewhat greater than the inner diameter of the metallic cap and must, on the other hand, be given a special shape for effecting a tension and friction grip in the cap. The stated object is suitably achieved by thickening or corrugating the outer marginal zone of the sealing disc, or providing it with serrations.

The present invention lies consequently in the combination of the features that the sealing disc is quite symmetrical with respect to the median plane, has a thin central portion with an annular pad surrounding the same, and has a marginal rim surrounding the pad, the pad having linear contact with respect to the mouth of the bottle and the metallic cap prior to the pressing of the cap onto the bottle, the contact line of the disc

with the mouth of the bottle being at most of a diameter equal approximately to the inner diameter of the mouth of the bottle plus twice 75% of the thickness of the wall defining the mouth, the rim being of a diameter greater than the inner diameter of the metallic cap and being corrugated, serrated, or thickened.

By bringing these combined features together, an optimum effect is obtained. Among other things, it will be possible to have the metallic cap designed thinner, whereby substantial savings of material are made.

Other objects and advantages of the invention will be apparent to those skilled in the art, and will become apparent in the following description of a preferred embodiment of the invention, wherein reference is made to the accompanying drawings showing, by way of example, preferred embodiments of the invention.

In the drawings:

Figure 1 is a cross-sectional view of the neck or mouth of a bottle, a crown closure, and one embodiment of the improved seal of the invention, the closure and seal being shown as set on the bottle, but not secured thereto;

Figure 2 is a plan view of the sealing disc of Figure 1; and

Figure 3 is a cross-sectional view of a second embodiment of my improved sealing disc.

As shown, the sealing disc comprises a thin circular central portion **1**, an annular pad **2** surrounding the central portion, and a rim **4** surrounding the pad **2**, the rim **4** being separated from the pad **2** by a thin annular flexible portion **1***a* of the disc. The pad **2** is shown in Figures 1 and 2 as being elliptical in cross-section, but the same may suitably be of circular or square cross-section, or may suitably comprise a plurality of concentric ridges, beads or pads, as shown at **2***a* in Figure 3. When positioned as shown in Figure 1, wherein the seal is rested on the mouth of the bottle, and the cap is rested on the seal, the pad **2** contacts the mouth of the bottle along the circular line **5** and contacts the cap along the circular line **6**, the contact line **5** lying nearer to the opening **7** in the bottle than to the lip **8** of the bottle. To insure a firm frictional, adhesive fit of the disc within the metallic cap **3**, the rim **4** of the disc has an outer diameter greater than the inner diameter of the closure, and the rim is beaded.

When the closure **3** is secured to the lip **8** of the bottle, the sealing disc of Figures 1 and 2 is compressed to a substantial extent in the area of the pad **2** thereof to define small area annular sealing surfaces on the opposite sides of the pad engaging respectively against the mouth of the bottle and the inner surface of the closure. Due to the small area of contact, sealing pressure per unit area is high and the pad **2** is compressed to render the same impermeable to gas even though the seal is formed of plasticizer free polyethylene. In like manner, the sealing disc of Figure 3 is compressed in the area of the pad thereof with each of the ridges or beads **2***a* defining a very small area annular sealing surface for the purposes stated. The ridges are inherently more flexible than a solid pad and thus are optimumly suited for sealing against irregular surfaces such as the mouth of a glass bottle.

In both embodiments, the bead or rim **4** is of a diameter greater than the inner diameter of the rim portion of the closure to be fitted frictionally therein, the thin annular portion between the rim and pad flexing, and the rim itself having a relatively large peripheral surface area, to insure a retentive fit of the disc in the closure. Moreover, the rim **4**, upon attachment of the closure to the bottle, is forced into small surface area sealing engagement with the outer portions of the mouth of the bottle to afford a secondary seal and a secondary area of high compression acting as a safeguard to the seal effected at the pad **2** or **2***a*.

As thus formed, the sealing disc of the invention is far superior to the conventional cork disc seal, since the seal of the invention is capable of withstanding higher internal pressures. Moreover, the present invention affords a sealing disc formed of plastic materials which satisfies all the requirements as to tastelessness, gas impermeability, tightness, saving in material, and firm attachment of the disc within the cap or closure.

While I have shown what I regard to be the preferred embodiments of my invention, and have described these and other suitable embodiments of the invention, it is apparent that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A sealing disc for bottle closures and the like, comprising a generally planar polyethylene disc, said disc being symmetrical in relation to the median plane thereof and including a thin circular central portion, an annular pad encircling said central portion, said pad being of elliptical shape in cross-section and defining a line contact on opposite sides thereof for engagement, respectively, with the mouth of a bottle and the inner surface of a closure prior to attachment of the closure to the bottle, the line contact on said pad for engagement with the mouth of the bottle being at most of a diameter equal approximately to the diameter of the bottle opening plus twice 75% of the thickness of the wall of the bottle defining the opening, a thin annular portion encircling said pad, and an annular marginal rim encircling said last-named portion, said rim being of an outer diameter greater than the inner diameter of the closure and being beaded to define on said disc a marginal edge of substantial area, said rim being adapted to be fitted frictionally within the closure and to engage the closure over a substantial area detachably to secure the seal within the closure.

2. A sealing disc for bottle closures and the like, comprising a generally planar polyethylene disc, said disc being symmetrical in relation to the median plane thereof and including a thin circular central portion, an annular pad encircling said central portion, said pad on the opposite sides thereof having a plurality of concentric beads defining a plurality of circular sealing surfaces for engagement, respectively, with the mouth of a bottle and the inner surface of a closure, said sealing surfaces on one side of said disc being spaced apart from the sealing surfaces on the opposite side of said disc a distance greater than the thickness of said central portion, the outer sealing surface on said pad for engagement with the mouth of the bottle being at most of a diameter equal approximately to the diameter of the bottle opening plus twice 75% of the thickness of the wall of the bottle defining the opening, a thin annular portion encircling said pad, and an annular marginal rim encircling said last-named portion, said rim being of an outer diameter greater than the inner diameter of the closure and being beaded to define on said disc a marginal edge of substantial area and to define the outer margin thicker than the thin annular portion, said thin annular portion further spacing said beaded marginal rim from the outermost of said concentric beads, said rim being adapted to be fitted frictionally within the closure and to engage the closure over a substantial area by the action of said thin annular portion and said beaded marginal edge detachably to secure the seal within the closure.

3. A seal for crown type bottle closures and the like, comprising a generally planar imperforate polyethylene disc, said disc being symmetrical in relation to both its median plane and its axis and including a thin circular central portion, annular sealing means encircling said central portion and defining circular sealing surfaces on

the opposite sides thereof for engagement, respectively, with the mouth of a bottle and the inner surface of a crown closure, said sealing surfaces on each side being spaced apart in the form of concentric ridges, a thin flexible annular portion encircling said annular sealing means, and an annular marginal bead encircling said thin flexible annular portion, said thin annular portion having a radial width at least equal to the radial width of said annular marginal bead, said bead being of an outer diameter greater than the inner diameter of the closure and being of a thickness greater than the thickness of the thin annular portion, and having an outer edge of substantial area to fit frictionally within and engage the side wall of the closure, said thin flexible annular portion and said edge of said bead cooperating to assist in accomplishing a retentive fit of said disc in the closure.

4. A seal for a closure comprising a disc including a thin circular central portion, an annular sealing pad encircling said central portion, a thin flexible annular portion encircling said pad, and an annular marginal bead encircling said thin flexible annular portion, said annnular sealing pad being of greater thickness transversely of said disc than said annular marginal bead, said bead being of an outer diameter greater than the inner diameter of the closure and having an outer edge of substantial area to fit frictionally within and engage the side wall of the closure, said thin flexible annular portion and said edge of said bead insuring a retentive fit of said disc in the closure.

5. A seal for crown type bottle closures and the like, comprising a generally planar imperforate plastic disc, said disc being symmetrical in relation to both its median plane and its axis and including a thin circular central portion, an annular sealing pad encircling said central portion and defining circular sealing surfaces on the opposite sides thereof for engagement, respectively, with the mouth of a bottle and the inner surface of a crown closure, a thin flexible annular portion encircling said pad, and an annular marginal bead encircling said thin flexible annular portion, said annular sealing pad being of greater thickness transversely of said disc than said annular marginal bead, said bead being of an outer diameter greater than the inner diameter of the closure and having an outer edge of substantial area to fit frictionally within and engage the side wall of the closure, said thin flexible annular portion and said edge of said bead insuring a retentive fit of said disc in the closure.

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