July 9, 1963 J. B. GRANT 3,096,903

CONTAINERS AND CLOSURES THEREFOR

Filed May 11, 1962

2 Sheets-Sheet 1

FIG. 1

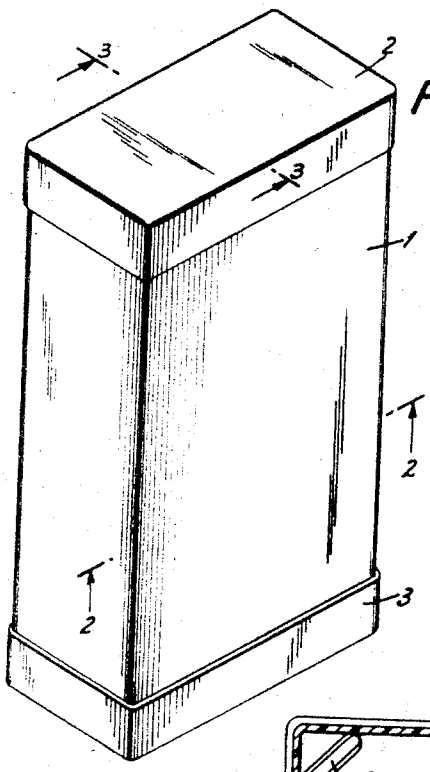


FIG. 3

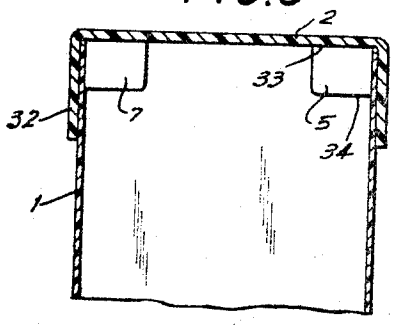
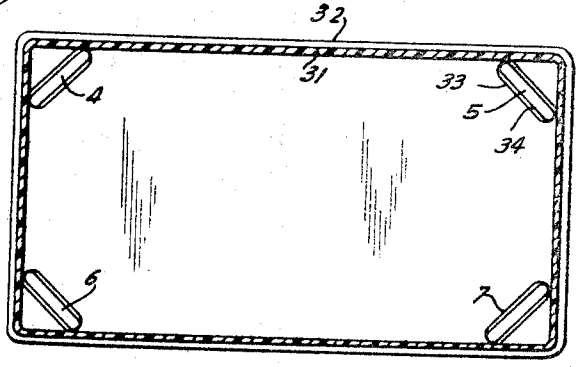


FIG. 2



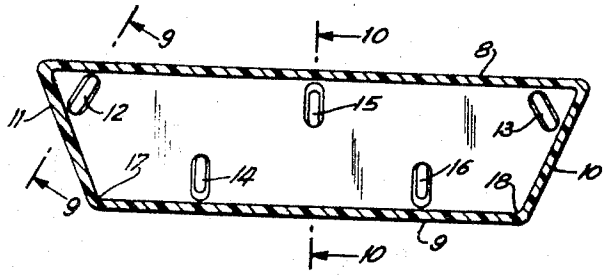


FIG. 4

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FIG. 5

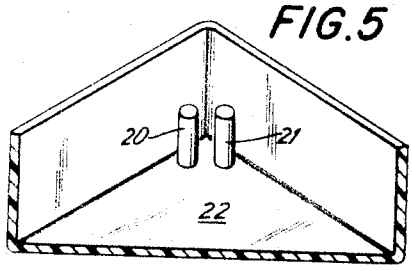
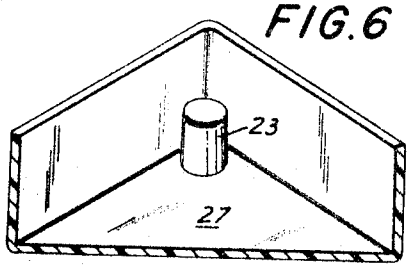


FIG. 6



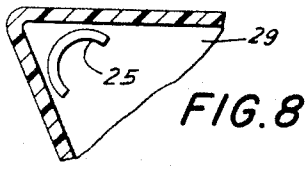


FIG. 8

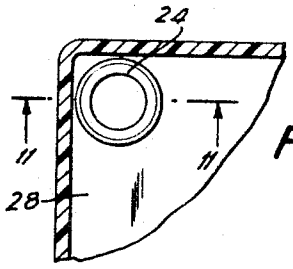


FIG. 7

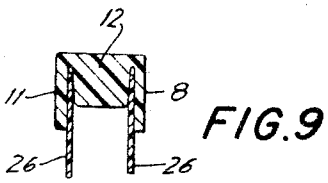


FIG. 9

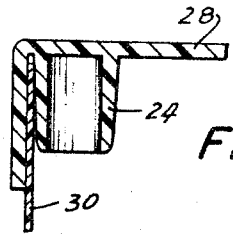


FIG. 11

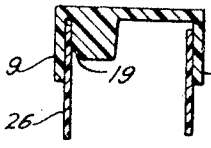


FIG. 10

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3,096,903

CONTAINERS AND CLOSURES THEREFOR

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Filed May 11, 1962, Ser. No. 193,922
5 Claims. (Cl. 220—42)

This invention relates to containers and closures therefor, particularly of plastic, and to structures and methods utilizable for their production.

Ordinarily in the manufacture of round containers, the fitting of a closure is a simple matter, merely requiring a press fit either on the inside or outside of the container. Problems arise, however, in the manufacture of rectangular, triangular and other odd shapes, particularly in large sizes where the wall thickness is relatively thin. If one attempts to press fit an outside-fitting closure to a relatively large rectangular shape, the pressure of the fit causes the side walls of the container to buckle inwardly. The result is that the closure will not stay on, particularly if the container is used to package items of any appreciable weight. Using an inside-fitting closure for containers of such types is also often unsatisfactory because of a tendency of the plastic to stretch or "flow" under continual pressure.

A principal object of the present invention is to provide tight fitting closures for thin walled containers which are firmly held to the top rim of the container without, however, exerting any substantial outward or inward pressure on the thin wall top and which may be easily fitted to said thin walled container by automatic machinery even though there may be some buckling or irregularity in the top wall of the container. The closures of the present invention are particularly adapted to fit containers of polygonal cross section of various irregular shapes. Ordinarily, the body of the container will be of extruded plastic material of from 0.010 to 0.030 inch in thickness.

Other and further objects and advantages will appear from the more detailed description set forth below, it being understood that such more detailed description is given by way of illustration and explanation only and not by way of limitation since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In the drawings:

FIGURE 1 is a perspective elevation of a container with closures in accordance with the present invention.

FIGURE 2 is a transverse section on line 2—2 of FIGURE 1.

FIGURE 3 is a horizontal section on line 3—3 of FIGURE 1.

FIGURE 4 is a horizontal section of another closure.

FIGURE 5 is a fragmentary detailed view, in perspective, of a corner of a cap closure showing another means for holding the cap on the container.

FIGURE 6 is likewise a fragmentary perspective view showing still another form of depending projection for holding the cap to the container.

FIGURES 7 and 8 are fragmentary horizontal sections of corners of two types of cap showing other depending projections for holding the cap in place.

FIGURE 9 is a vertical section taken along line 9—9 of FIGURE 4.

FIGURE 10 is a vertical section taken along line 10—10 of FIGURE 4.

FIGURE 11 is a vertical section taken along line 11—11 of FIGURE 7.

In accordance with the present invention, covers are provided for containers produced from tubular plastic or sheet plastic cemented or otherwise fastened into a form useful as a container component. The cover or cap, therefore, is an outside fitting closure there being at least one such cap on the plastic container member, the cap carrying projections or prongs preferably of plastic inside the cap and spaced from the inner side wall thereof at a distance to grip the end of the plastic wall section securely between the projections and the cap walls.

Preferably the projections are thin enough to yield slightly and provide such flexibility as is desired, and are so placed from the inner walls of the cap that the end of the tubular plastic member is held between the projections and said cap inner walls. Flexibility in the projections is not necessary but may be used if desired in some applications.

While such closures may be used with any shaped tubular containers including those that are circular or oval in cross-section, they are particularly useful in making containers of polygonal cross-section, e.g. tubular extrusions the faces of which are polygonal. The cap then desirably has a depending flange which is polygonal in cross section to fit the end of the tubular extrusion being used as a container member, the cap carrying projections as described above. The prior art problems heretofore experienced with closure caps for polygonal containers are solved by the present invention, since in this way a rigid closure is produced which fits perfectly the outer dimension of the container without either external or internal pressure to cause undesired distortion of the container walls while still gripping such walls to provide a tight fit over the entire end of the tubular extrusion.

Any type of plastic or other flexible materials subject to the conditions stated above can be utilized for the container member and for the caps particularly where the member is cut to desired container length while the cap is desirably molded, cast, stamped or drawn from plastic stock or other materials.

Where the tubes for the containers are produced from extruded stock they will in general be made from a thermoplastic material. Any of the thermoplastic materials utilized in producing extruded tubular stock may be employed for these purposes, and particularly synthetic resinous material may be used including for example, cellulose derivatives such as the esters and ethers, particularly cellulose acetate, cellulose nitrate, cellulose acetate butyrate, ethyl cellulose, benzyl cellulose, etc.; vinyl polymers and copolymers including polymerized vinyl acetate, polymerized vinylidene chloride and copolymers of vinyl chloride and vinyl acetate; polymerized styrene; methacrylate and methyl methacrylate resins; acrylate and ethyl acrylate resins; polyethylenes; nylon type resins; etc. Where the tubes are made from plastic stock which is not extruded, the materials may be of character set forth above. And as pointed out above, for some purposes many of the operations herein set forth may be carried out on tubes or other container components made from other than plastic such as metal, paper or cardboard, etc.

The cross-sectional contour of the tubing or components employed may be varied as desired and may take any configuration such as square, hexagonal, or otherwise polygonal, etc., and containers may be produced from any stock of any configuration desired. The plastic materials lend themselves to the use of color and colored stock of any desired character may be employed whether dyed, pigmented, striated, etc.

The projections or prongs may be formed on the caps in any desired way. They may be molded, cast, or stamped out of the cap body when the cap is being produced from sheet material if the projection lends itself to such formation or the projections may be separately formed or cemented in place, or any other method may be employed.

In order that the invention may be more clearly under-

stood, reference is made to the accompanying drawings in which FIGURE 1 illustrates a container having a rectangular cross section. As there shown, the container member, which is straight walled and of extruded plastic, carries closures 2, 3 at each end. At least one of these closures is made in accordance with teachings of the present invention. The second closure may be of any conventional type. The closures have a contour to fit the cross section of tubular member 1 closely, but without exerting external or internal pressure on the thin walls of the container.

FIGURE 2 is a cross sectional plan view looking upwardly in the direction of the arrows 2—2 of FIGURE 1 and shows the inner construction of a preferred species of the novel closure of the present invention. As will be seen, the closure has a number of projections, 4, 5, 6 and 7, which in this view are substantially rectangular and plate-like, depending from the lower face of the cap top and diagonally spanning the angle of the corner of the closure. The vertical free edges of these projections are spaced from the inner faces of the outer peripheral flange of the closure a distance approximately equal to the thickness of the side walls 31 of the container. In order that the cap be held firmly in place, the space formed between the inner face of the peripheral flange and the outermost free edge of the spanning member is about 0.001 of an inch less than the thickness of the side walls of the container. This securely holds the side walls of the container between the peripheral flange 32 of the closure cap and the depending projection member, but does not exert either an outward or inward force on the walls of the container.

FIGURE 4 is a plan view, with the peripheral flange sectioned, showing the inner construction of another species of the closure of the present invention. In this case, the closure has two relatively long parallel sides 8, 9 and two shorter sides 10, 11 which form acute angles with the longer sides of the closure. In this construction the closure may have two depending projections 12, 13 spanning the acute angle of the closure as shown. Flat, plate-like projections 14, 15 and 16 which extend downwardly to support the side walls of the longer side walls of the container on which the cap fits may be provided if desired. In this particular construction, support for the container corners at 17, 18 is unnecessary.

Although the vertically depending projections which support the inner walls of the container may be flat and plate-like, it is preferred that the faces thereof be tapered slightly as indicated by the parallel lines 33, 34 in FIGURE 2, indicating where the projection joins the inner face of the cap and the lowermost part of the closure, respectively (see FIGURE 3, also), so as to make it easier to remove the plastic caps from the mold when it is formed. This degree of taper is preferably about 1°, but it is to be understood that these projections need not be tapered at all. Also, it is preferred that the leading, or lowermost edges, of these projections be slightly rounded so as to help guide the thin edge of the container wall into the narrow space that is provided by the outermost edge of the projection of the inner wall of the peripheral flange of the closure. This is shown to good advantage in FIGURE 11.

The intermediate depending projections 14, 15, 16 of the style cap of FIGURE 4 should have a considerably greater radius 19 (FIGURE 10) on their innermost edges because of the tendency of the thin wall of the container to deviate from a straight line when of substantial length. This larger radius makes it much easier to place the cap over the container with automatic machinery.

Instead of having a relatively flat, plate-like projection as shown in FIGURES 2 and 4, I may secure substantially the same results by providing various other forms of projections such as are shown, for instance, in FIGURES 5, 6, 7 and 8. In FIGURE 5 the projections 21, 22 are small pins which may be molded on the inner face 22 of the closure and so positioned as to span the angle of the corner and provide support for the thin wall of the container at these points. If desired, one large pin 23 depending from the inner face 27 of the closure as shown in FIGURE 6 may be used to accomplish this same purpose. In order to save material, the large pin may be modified by making it in the form of a tubular member as shown in FIGURES 7 and 11 at 24. A still further modification is shown in FIGURE 8 in which the member 27 spanning the angle of the closure is semicircular.

As will be obvious from the foregoing, various other forms of these projections may be provided to accomplish the same result. It will be noted, however, that in each case the depending projection is so constructed as to span the angle of at least two of the corners of the closure and provides contact with the inner wall of the container along lines parallel with the axis of the container. Obviously, the distance between the outermost edge of the projection and the inner wall of the peripheral flange of the container will depend upon the thickness of the walls of the container. The space thus provided between the inner face of the peripheral flange and the outermost edge of the depending projection is thus parallel with the axis of the container and of substantially the same thickness as the wall of the container.

FIGURE 9 is a vertical cross section taken through a section along line 9—9 of FIGURE 4 in order to show how the depending inner flanges spanning the acute angle hold the side walls 26 of the container. The side walls 26 of the container are not illustrated in FIGURE 4. FIGURE 10 is a vertical cross section through line 10—10 of FIGURE 4 and is intended to illustrate the depending flange 15 which has a larger radius 19 than is usually the case with the depending corner flanges.

FIGURE 11 is a vertical cross section taken on line 11—11 of FIGURE 7 and also shows how this depending projection which spans an angle of the container corner grips and holds a thin wall 30 of a container without either external or internal pressure being exerted thereon.

This is a continuation-in-part application of my application Serial No. 744,708, filed June 26, 1958.

I claim:

1. A thin-walled open-top plastic container of polygonal horizontal cross-sectional configuration and a plastic cap of the same horizontal configuration as the said horizontal configuration of said container, said cap including a depending peripheral flange closely engaging over said open end of the container for a substantial distance to form a closure, said closure having internally thereof adjacent each of at least two angles of its peripheral flange a substantially rectanguar flat plate-like projection depending from the lower face of the cap top and diagonally spanning said angle, said projection having its vertical free edges spaced from the inner faces of the walls of said angle a distance to grip the end of the container wall securely between the said projection and the said inner faces of said angle of the cap over a substantial depth.

2. A thin-walled open-top plastic container of polygonal horizontal cross-sectional configuration and a plastic cap of the same horizontal configuration as the said horizontal configuration of said container, said cap including a depending peripheral flange closely engaging over said open end of the container for a substantial distance to form a closure, said closure having internally thereof adjacent each of at least two angles of its peripheral flange a tubular projection depending from the lower face of the cap top and diagonally spanning said angle, said projection having its vertical free edges spaced from the inner faces of the walls of said angle a distance to grip the end of the container wall securely between the said projection and the said inner faces of said angle of the cap over a substantial depth.

3. A thin-walled open-top plastic container of polygonal horizontal cross-sectional configuration and a plastic

cap of the same horizontal configuration as the said horizontal configuration of said container, said cap including a depending peripheral flange closely engaging over said open end of the container for a substantial distance to form a closure, said closure having internally thereof adjacent each of at least two angles of its peripheral flange a semi-tubular projection depending from the lower face of the cap top and diagonally spanning said angle, said projection having its vertical free edges spaced from the inner faces of the walls of said angle a distance to grip the end of the container wall securely between the said projection and the said inner faces of said angle of the cap over a substantial depth.

4. A thin-walled open-top plastic container of polygonal horizontal cross-sectional configuration and a plastic cap of the same horizontal configuration as the said horizontal configuration of said container, said cap including a depending peripheral flange closely engaging over said open end of the container for a substantial distance to form a closure, said closure having internally thereof adjacent each of at least two angles of its peripheral flange two rod-like projections depending from the lower face of the cap top having their axes substantially parallel to the vertical axis of the container and said rod-like projections having their vertical free edges spaced a short distance from the inner face of the walls of said flange to grip the end of the container walls securely between the said projections and the inner face of the flange over a substantial depth and spanning the angle of the container corner.

5. A thin-walled open-top plastic container of polygonal horizontal cross-sectional configuration and a plastic cap of the same horizontal configuration as the said horizontal configuration of said container, said cap including a depending peripheral flange closely engaging over said open end of the container for a substantial distance to form a closure, said cap having discontinuous projections depending from its inner face adjacent to at least two angles of the peripheral flange, the said projections having free edges substantially parallel with the axis of the container and the walls of the peripheral flange and spaced apart from the inner surface of the peripheral flange a distance approximately equal to the thickness of the walls of the container, the free edges making contact therewith over a substantial depth whereby the cap is held firmly in place by the contact provided by walls of the container engaging the inner surface of the peripheral flange and the outermost edges of the discontinuous depending projections without substantial external or internal pressure being exerted on the walls of the container, the contact provided by the free edges of the depending projections being along a line parallel to the vertical axis of the container, close to the angles formed by the peripheral flange and spanning said angle, and extending into the inner wall of the container a substantial distance.

References Cited in the file of this patent

UNITED STATES PATENTS

2,695,115	Roop	Nov. 23, 1954
3,032,939	Andersen	May 8, 1962