Feb. 13, 1968 R. T. JOHNSON ET AL 3,368,707

DIFFERENTIAL PRESSURE FORMED PLASTIC CONTAINER CAP OR CLOSURE

Filed Aug. 25, 1966 2 Sheets-Sheet 1

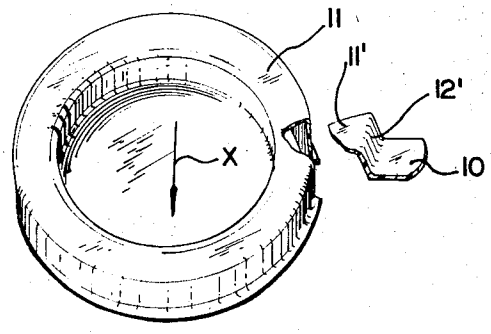


FIG 5

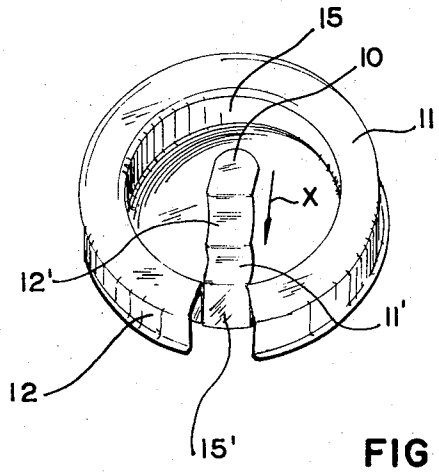


FIG 1

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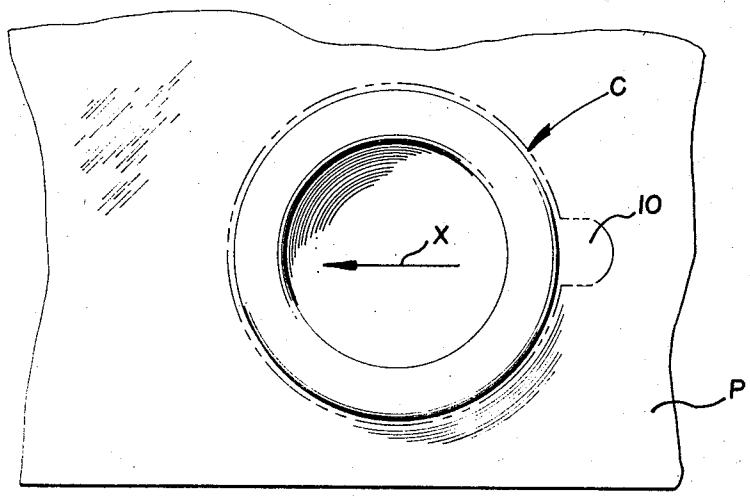


FIG 3

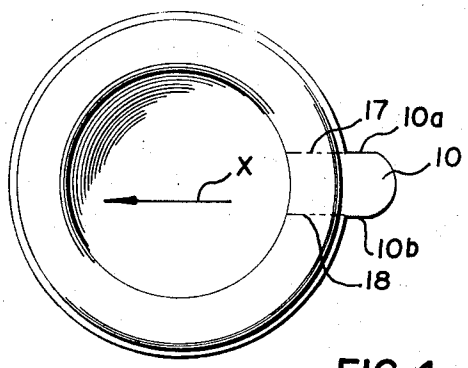


FIG 4

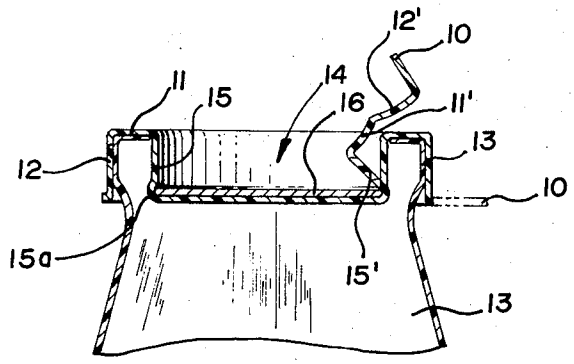


FIG 2

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United States Patent Office 3,368,707 Patented Feb. 13, 1968

3,368,707

DIFFERENTIAL PRESSURE FORMED PLASTIC CONTAINER CAP OR CLOSURE

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Filed Aug. 25, 1966, Ser. No. 575,045
8 Claims. (Cl. 215—46)

This invention relates to differential pressure formed synthetic plastic caps with integral lifting tabs and more particularly to caps which are particularly adapted for use on throwaway milk containers and the like and which require no score lines to insure that, when the tab is torn in the body of the cap, it will not be torn away from the cap and so be ineffective to lift the cap from the container. So far as we are aware, no one has successfully differentially pressure formed container caps having lifting tabs formed in part by tearing, although caps having tear tabs have been formed of metal. Such metal caps have employed score lines or portions where the material was decreased in thickness to insure that the tab would tear in the proper manner and along desired lines.

One of the prime objects of the present invention is to provide a plastic cap of this nature which may be thermo-formed from a thermoplastic material and which requires no scoring. As those versed in the art will appreciate, it would be extremely difficult and, in fact, impractical to attempt to form score lines of reduced thickness in a differential pressure formed plastic cap. Briefly, the invention is concerned with our discovery that if the cap formed is so oriented in the sheet that the projecting side edges of the tab extend from the container enclosing skirt of the cap substantially in alignment with the direction in which the plastic sheet was extruded, a portion of the tab will be torn from the cap when the tab is pulled upwardly which has substantially paralled edges extending substantially in alignment with the direction of sheet extrusion and forming a continuation of the edges of the originally projecting tab. We have further discovered that if the direction of tear is not so oriented with respect to the flow of material during extrusion the lifting tab will simply be torn away from the cap without performing its cap-lifting function and the cap is thereby rendered useless for repetitive use.

One of the prime objects of the invention is to provide a suitable cap for throwaway milk containers wherein an insert disk serves as a stop for the tear tab and the cap may be replaced on the container until the supply of liquid in the container is depleted and the container is discarded.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIGURE 1 is a perspective plan view illustrating the plastic container cap of my invention, with the lifting tab being shown in raised position;

FIGURE 2 is a sectional elevational view of a cap mounted on the upper end of a typical container;

FIGURE 3 is a top plan view of a container cap which has been formed in a sheet of plastic material, the arrow indicating the direction in which the extrusion of the material occurred and the diagrammatic lines indicating the tab which will be punched out with the cap;

FIGURE 4 is a top plan view showing the cap punched or cut from the plastic web in which it was thermoformed;

FIGURE 5 is a perspective plan view illustrating what

occurs when the direction of tear is not in alignment with the direction of extrusion.

Referring now more particularly to the accompanying drawings, a letter P generally illustrates a plastic sheet in which a container cap generally designated C has been differentially pressure formed. A number of differential pressure forming machines are presently on the market and may be employed to form such caps in sheets of thermoplastic material such as polystyrene, polyethylene, and polypropylene. In the present instance and by way of example, it will be assumed that the sheet P is polystyrene of about .015 inch in thickness intially which during forming is stretched out so that it is about .010 inch in thickness. Sheets in the thickness range .010–.030 of an inch will be acceptable for our purposes to form a flexible cap. A suitable differential pressure forming machine is disclosed in the present assignee's copending application Ser. No. 293,959, filed July 10, 1963, and entitled, Differential Pressure Forming Machine, and a machine of the general character which may be used to punch out caps C from the plastic sheet P is disclosed in the present assignee's Martin Patent No. 3,217,576, issued Nov. 16, 1965. Of course, if the Martin trimming machine were to be used for this purpose, the dies would have to be altered to the extent that provision was made for punching out the projecting tab portion **10** which is formed when the cap C is punched from the sheet P.

As indicated particularly in FIGURES 1 and 2, the cap includes a top wall **11** which is provided with an outer surrounding skirt **12** adapted to snugly enclose the neck portion of the milk container which is shown at **13** in FIGURE 2. At a spaced distance inwardly from the dependent skirt **12**, the top wall **11** is recessed as at **14** and the inner marginal wall **15** so formed is provided with a slightly undercut portion of increased diameter **15***a* to receive and retain an insert disk **16** which may be formed of heavy gauge paper or another suitable material and upon which the identity of the dairy and identity of the contents of the container may be printed in the usual manner. The disk **16** may be inserted before or after the cap C is severed from the sheet P.

As the figures indicate, the lifting tab **10** which is formed has parallel side edges **10***a* and **10***b* and it is desired, when the lifting tab is raised, that the top wall **11** and wall **15** be torn along parallel imaginary lines **17** and **18** which continue from the lines **10***a* and **10***b*, respectively. With the side edges **10***a* and **10***b* so oriented with respect to the direction *x* in which the sheet P was extruded and in which the flow of material occurred, the material of the walls **11** and **15** will be parallelly torn when the tab **10** is lifted from the position shown in diagrammatic lines in FIGURE 2 to the raised position in which it is shown in solid lines. Since the insert disk **16** prevents further tearing of the plastic cap, further upward pulling on the lifting tab **10** will lift the entire cap C from the neck of the container **13**. As shown in FIGURE 2, the portions of the cap C which are torn away when the tab **10** is lifted are respectively indicated at **12'**, **11'** and **15'**, and these numerals refer to the portions of the walls **12**, **11** and **15** which are torn away and become in effect a functional part of the lifting tab **10** when the tab **10** is initially raised to remove the cap C. After a portion of the contents of the container have been dispensed, the cap C may be very simply replaced on the container and the tab **10** restored to the position in which it is shown in broken lines in FIGURE 2. To again remove cap C it is, of course, merely necessary to lift the tab **10** as before and exert the upward pull which again removes the cap C from the container. While, in the present instance, we have formed what might be termed a thin-walled cap for throwaway containers out of thin gauge polystyrene sheet, it is to be understood that other

synthetic plastic materials will be suitable for our purpose.

It is to be understood that the drawings and descriptive matter are in all cases to be interpreted as merely illustrative of the principles of the invention rather than as limiting the same in any way, since it is contemplated that various changes may be made in the various elements to achieve like results without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. A method of making a thin-walled plastic container cap comprising: differential pressure forming a cap, with a surrounding skirt adapted to fit on a container top, in a heated, deformable, extruded plastic sheet portion; and severing the cap from the sheet to provide a tab portion extending from the skirt, the tab being so oriented with respect to the sheet portion that its projecting side edges extend from the skirt substantially in alignment with the direction in which the plastic sheet was extruded and, when the cap is applied to a container and the tab is lifted with respect to the skirt, the tab tears a portion from the skirt having substantially parallel edges extending substantially in the said direction of sheet extrusion.

2. The combination defined in claim 1 in which the cap is differentially formed with a recess in its top and a disk insert is placed therein to function as a stop limiting tearing of the cap.

3. The combination defined in claim 1 in which the plastic sheet portion is polystyrene.

4. A thin-walled plastic container cap thermoformed in an extruded plastic sheet comprising: a top wall having a surrounding dependent unscored skirt adapted to fit on the neck of a container; and a projecting tab portion extending from said skirt with its side edges extending substantially in alignment with the direction of extrusion of said sheet so that the tab portion, when lifted from the skirt, tears a portion from the skirt having substantially parallel edges extending substantially in the said direction of sheet extrusion.

5. The combination defined in claim 4 in which said top wall is recessed to receive a disk insert which functions as a tear stop for said tab portion.

6. The combination defined in claim 5 in which the bottom of said recessed top wall is undercut to receive and retain a disk of slightly greater diameter than the recessed portion.

7. The combination defined in claim 6 in which said plastic material is polystyrene in the thickness range .010–.030 inch in thickness.

8. The combination defined in claim 4 in which stop means is integrated with said cap to halt tearing thereof at a predetermined location thereon spaced inwardly from said projecting tab portion.

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