United States Patent [19]

Nughes

[11] **3,709,399**

[45] **Jan. 9, 1973**

[54] FOOD STORAGE CONTAINERS

[75] Inventor: **Giovanni Nughes, Milan, Italy**

[22] Filed: **July 21, 1971**

[21] Appl. No.: **165,246**

[30] **Foreign Application Priority Data**

Aug. 11, 1970 Italy 69772A/70

[52] **U.S. Cl.** **220/67**

[51] **Int. Cl.** **B65d 7/42**

[58] **Field of Search** ..... 220/67, 42 B, 42 C; 150/.5

[56] **References Cited**

UNITED STATES PATENTS

2,382,378	8/1945	Bloedorn	220/67 X
2,816,589	12/1957	Tupper	150/.5
3,073,478	1/1963	Henchert	220/67
3,341,059	9/1967	Schild et al.	220/67
3,524,568	8/1970	Nughes	220/67
3,543,963	12/1970	Heisler et al.	220/67

FOREIGN PATENTS OR APPLICATIONS

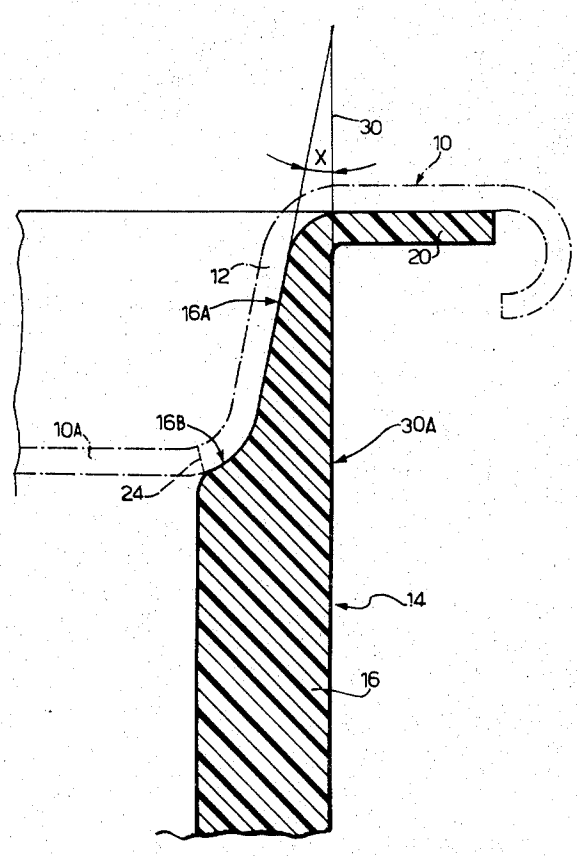
563,775	9/1958	Canada	220/42 C

Primary Examiner—Joseph R. Leclair
Assistant Examiner—James R. Garrett
Attorney—Richard C. Sughrue et al.

[57] **ABSTRACT**

A food container having an injection moulded polypropylene body with an open end around which extends a circumferential flange to which a metal lid having a frusto-conical annular wall is attachable. The walls of the container are tapered in thickness near the open end to accommodate the outwardly flaring frusto-conical wall so that the wall can provide suitable support for the container wall during a seaming operation where the lid is seamed to the flange by means of a conventional tin can seaming machine.

6 Claims, 6 Drawing Figures



PATENTED JAN 9 1973

3,709,399

SHEET 1 OF 4

Fig. 1

PRIOR ART

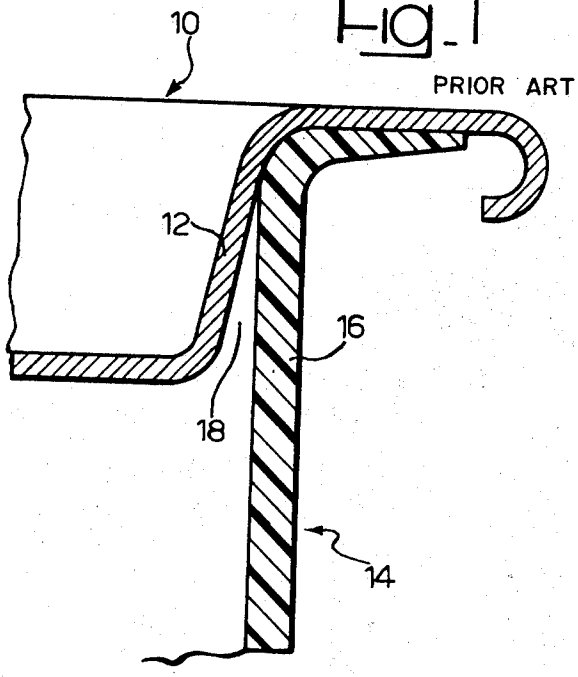
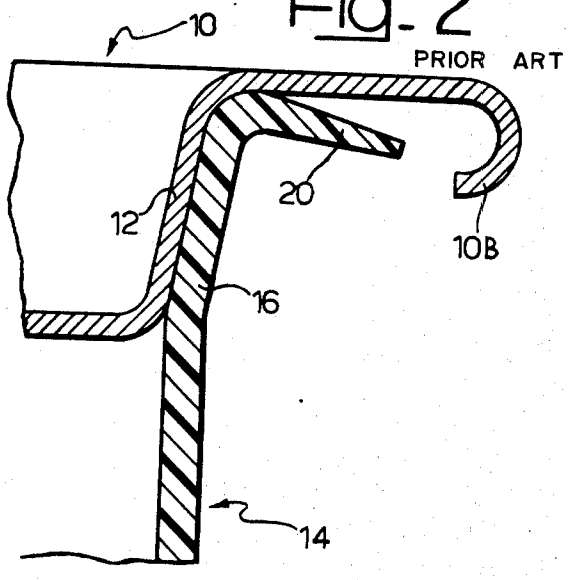


Fig. 2

PRIOR ART



INVENTOR
GIOVANNI NUGHES

BY Sughrue, Rothwell, Mion, Zinn & Macpeak
ATTORNEYS

Fig. 3

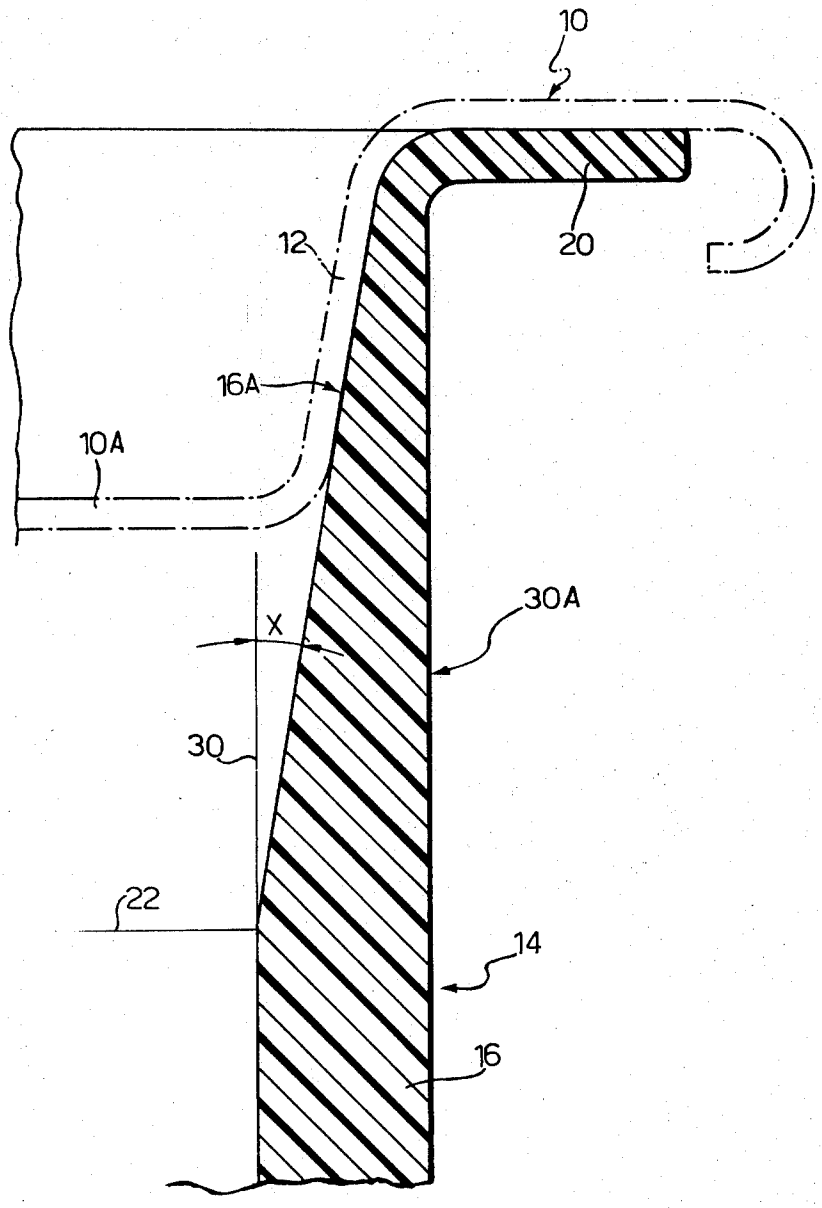


Fig. 5

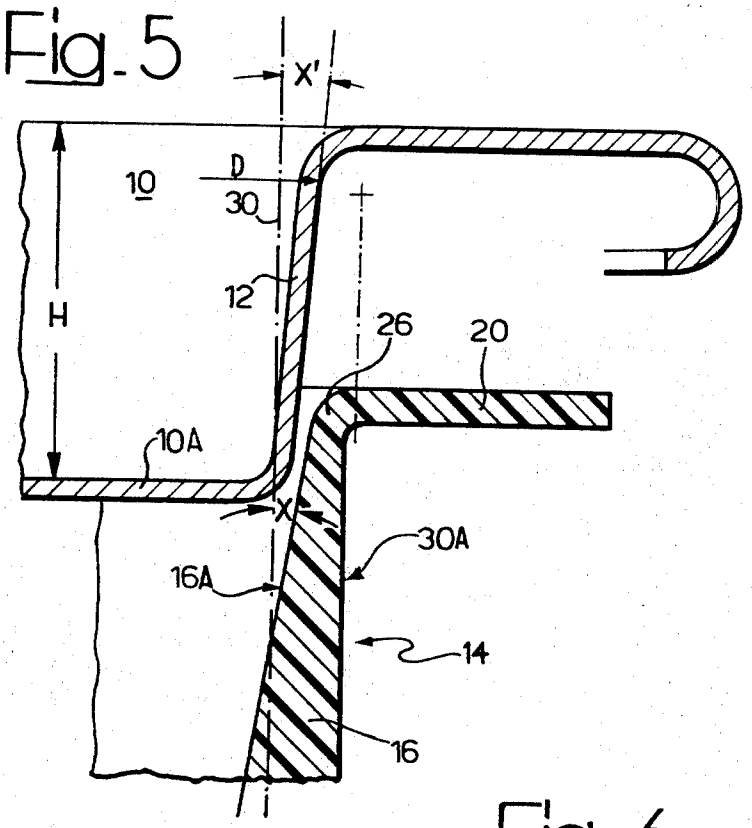

X'
10
D
30
12
H
26
20
10A
X
30A
16A
14
16

Fig. 6

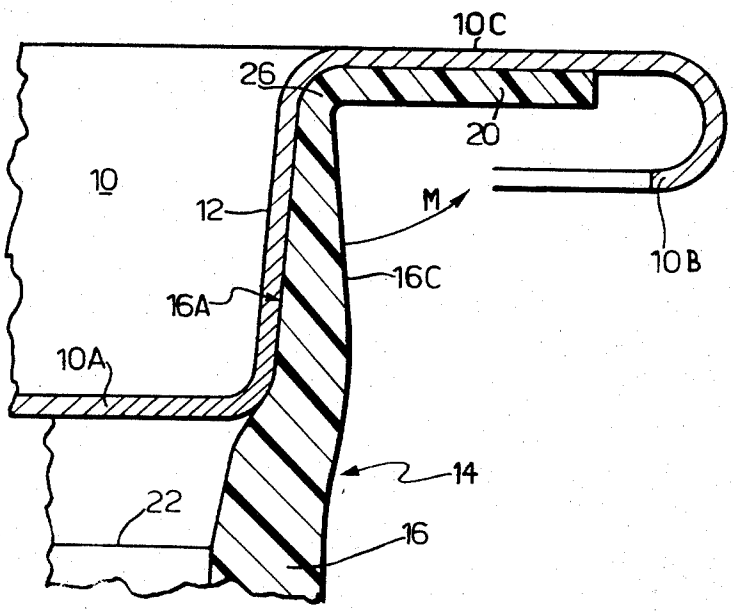
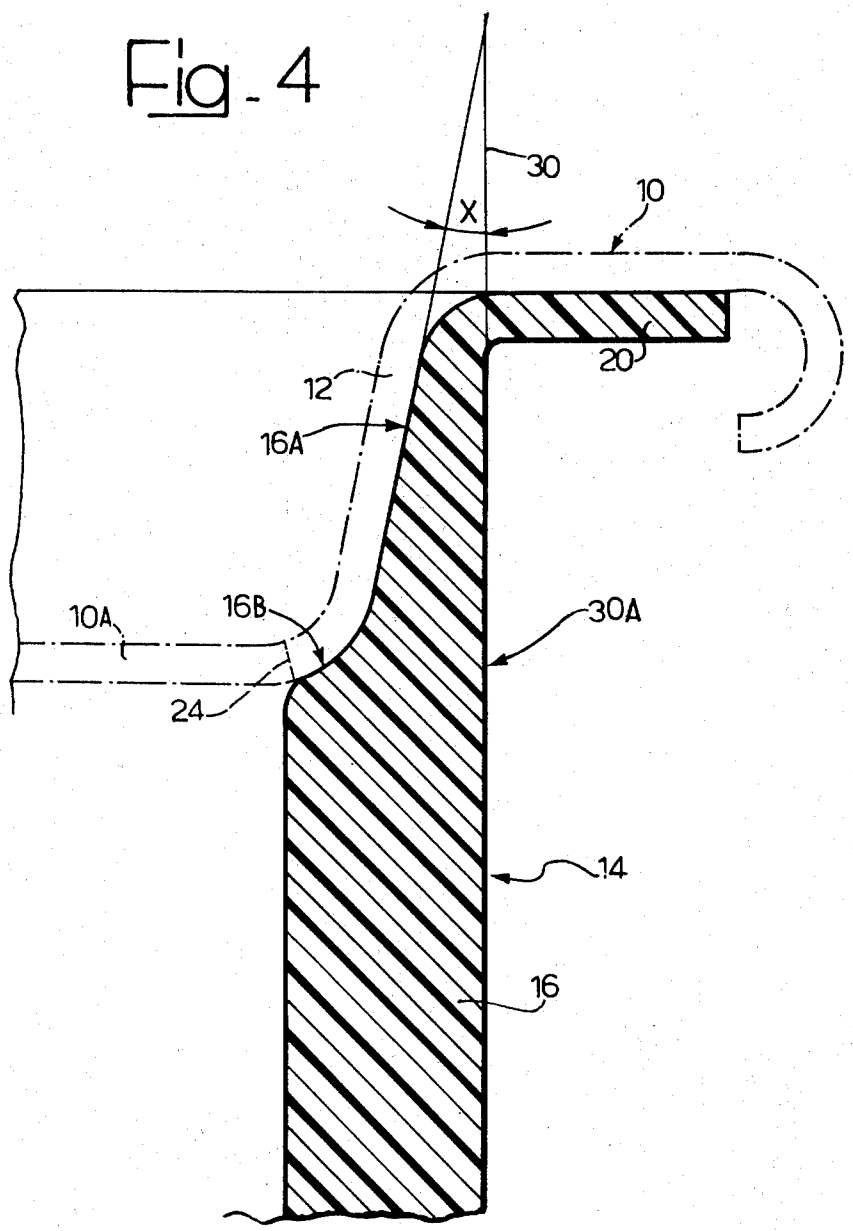

10C
26
20
10
12
M
10B
16C
16A
10A
14
22
16

Fig. 4



FOOD STORAGE CONTAINERS

The present invention relates to food storage containers having a substantially rigid polypropylene body of low yieldability.

The body of such containers is conveniently injection moulded and has a circular cylindrical shape similar to that conventional "tin can" although a variety of other suitable shapes may be employed. As described in my earlier U.S. Pat. No. 3,524,568 the body of the container is formed with an outwardly directed circumferential flange at the open end and a metal lid can be seamed to the flange of the body by means of a conventional double hook seam. In this way it is possible to use the novel polypropylene can body in conjunction with conventional metal lids and to join the body and the lid together by means of a conventional seam on a conventional seaming machine operating on the so-called seam spinning principle. For this purpose the metal lids are formed with a peripheral flange parallel to the general plane of the lid axially displaced from this plane by a small amount and joined to the main disc of the lid by an axially extending wall.

Storage containers of this type are particularly suited for the manufacturing of food produce in view of various problems such as sterilization, longitudinal seaming, transference of metallic taste and susceptibility to acid and hydrogen sulphide attack, encountered with the use of metal cans which are explained in greater detail in U.S. Pat. No. 3,524,568. Many of these problems are overcome, or at least minimized by the use of the polypropylene container body; for example, a polypropylene body can be injected moulded and thus does not have a longitudinal side seam as do conventional metal cans. There is thus no risk of the side seam weakening and no weak points where the side seam and the lid seam meet.

The importance of the detailed configuration of the outwardly directed circumferential flange for satisfactory seaming to a metal lid is also discussed in U.S. Pat. No. 3,524,568. It has previously been considered essential for the circumferential flange to be formed with a progressively tapering cross section reducing from the region where the flange meets the body of the cam to a minimum at the periphery of the flange in order to ensure a satisfactory seam with the metal lid.

It has now been found however, that, irrespective of any tapering of the flange, the seaming operation is strongly influenced by the relative configuration of the can and the lid in the region of the wall of the lid. In particular, it has been found that the support which the wall of the lid is able to offer the body of the container, in the region of the opening, during the seaming process greatly affects the efficacy of the seaming process. It has also been found that, once the problems connected with this phenomena are overcome, the thickness of the flange can be constant without deleteriously affecting the efficacy of the seaming process.

Considering, for example, a cylindrical container (of the type of the common "tin can"), it is known that the small axially extending wall portion of the lid which forms the above mentioned wall is never truly cylindrical, but has a slightly conical shape due to the conditions under which the lid is formed. This conical shape varies from case to case; for example, in lids made of tin plate, the angle between the shoulder forming wall and the longitudinal axis of the lid (the cone angle) is typically between about 5° and about 6°30′, while in lids of aluminum the cone angle varies in the range from about 3°30′ to about 4°30′. It will be seen that the angles under consideration are very small and, until now, they have never been given particular importance in regard to the seaming process, particularly because the variation of the diameter of the shoulder wall from the narrowest part to the widest part due to such a small cone angle appeared to be insignificant.

It has now been found, however, that polypropylene containers as described in the patent mentioned above are very sensitive to this small deviation from a true cylindrical shape. In particular it has been found that as a lid is pressed into the opening of a polypropylene container the taper of the lid wall causes a radially outward pressure on the container walls which has a maximum value at the end of the wall where the outwardly turned flange is situated. As a result of this pressure, and as a result of the difference between the taper of the lid wall and the shape of the container wall there is a lack of radial support from the inside of the container wall during the seaming operation, and this deleteriously affects the efficacy of the seaming operation. To avoid this defect the diameter of the lid wall could be increased slightly so that the lid would enlarge the container wall when pressed into the opening of the container body. However, it is possible, in this case, for the circumferential flange to warp and therefore to miss the hook formed by the flange during the seaming operation thereby forming an incomplete seal between the body and the lid.

According to the present invention a container for food comprises a polypropylene body of low yieldability having an open end with a circumferential flange and a metal lid seamed to the circumferential flange, in which the lid has a frusto conical annular wall and the container wall is tapered in thickness toward the said open end, the length of the tapered portion being at least equal to the depth of the said frusto-conical wall.

This tapered portion of the container wall extends to the arcuate transition region between the container wall and the circumferential flange, beginning from which the thickness of the flange may be constant or, if desired, may still taper towards the outer edge of the flange in the known way. Preferably the container wall is bevelled internally, the bevelled portion being at an angle to the axis of the can which is at least equal to the angle of the wall of the lid. Typically, the angle of bevel is in the range from about 3° to about 10°, depending on the angle of taper of the wall of the lid.

In one embodiment of this invention, the angle of bevel of the inside of the container wall is slightly greater than the angle of taper of the wall of the lid so that the pressure between the lid wall and the container wall is greatest at the region of contact between the lid and the wall remote from the flange. The lid wall thus deforms the container wall as the lid is pressed into the opening, and this deformation is such as to ensure intimate contact between the flange of the lid and the circumferential flange of the container.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a partial axial section of part of a wall of a known type of polypropylene container showing a lid in position but before seaming;

FIG. 2 is a partial axial section of a part of a wall of a known type of polypropylene container in the same position as FIG. 1 but showing a lid of larger diameter in position;

FIG. 3 is a partial axial section of part of a wall of one embodiment of the invention;

FIG. 4 is a partial axial section of part of a wall of a second embodiment of the invention;

FIG. 5 is a partial axial section of part of the wall of a third embodiment showing a lid immediately before it is pressed into the opening; and

FIG. 6 is a partial axial section of the embodiment of FIG. 5 showing a lid after it has been pressed into position but before a circumferential seam has been formed.

Referring now to FIGS. 1 and 2 these illustrate the disadvantages discussed above, of a lack of radial support for a container wall **16** by a wall **12** of a lid **10** pressed onto a container **14**. As will be seen in FIG. 1, due to the slight taper of the wall **12** (shown exagerated in FIG. 1) there is a gap **18** between the wall **16** and the wall **12** extending the length of the wall **12** with the exception of the end where it meets the flange. The presence of this gap means that the wall **12** cannot provide the required support to hold the wall **16** rigidly during the seaming operation and this results in frequent failures and difficulties in the seaming operation. The proposed attempt to provide suitable radial support by increasing the diameter of the lid **10**, however, frequently leads to buckling of the circumferential flange **20** as shown in FIG. **2**. This in turn results in the flange **10B** of the lid **10** failing to make a satisfactory seal with the buckled portion of the flange.

In the embodiment illustrated in FIG. **3** the wall **16** of the container body **14** is progressively reduced in thickness from the inside, from a level **22** lower than that of the central disc **10A** of the lid **10** when the lid **10** is in position. This reduction in thickness is effectively in the form of a bevel the angle of which is substantially the same as the angle of the wall **12** so that the wall fits snugly into the frusto-conical opening formed by the bevel **16A**. Thus, during the seaming operation, the bevelled portion **16A** of the wall **16** is supported radially by the wall **12**.

The embodiment illustrated in FIG. **4** is similar to that of FIG. **3**, except that the frusto-conical opening formed by the bevel **16A** has a step **16B** at the level of the central disc **10A** of the lid **10**. This arrangement has the advantage that when the lid **10** is removed by a conventional can opener which cuts or shears the lid at the line **24** the sharp edge thus produced will not project dangerously from the inside surface of the container.

In the embodiment illustrated in FIG. **5**, the angle X of the bevel **16A** is slightly greater than the angle X′ of the wall **12** of the lid (as seen in cross section). For example, the angle X could be 10° if the angle X′ were 6°. The diameter D of the upper end of the wall **12** adjacent the lid flange **10C** is equal to the diameter of the corresponding part of the opening **16A** of the container body **14**. Consequently, when the lid **10** is pressed onto the container body **14** the bevelled region **16A** of the container wall **16** is deformed by the wall **12** of the lid **10** as shown in FIG. **6**. In this case the greatest pressure between the wall **12** and the container wall **16** occurs at the level of the central disc **10A** of the lid. As a consequence, there is a progressive deformation of the wall **16** of the container body **14** in the direction indicated by the arrow M in FIG. **6**. In this case the container wall in the bevelled region **16A** is firmly radially supported by the wall **12** due to the fact that there is a pressure between the wall **12** and the wall **16**. Moreover, the expansion indicated by the arrow M causes the flange **20** to be pressed against the corresponding part of the flange **10C** of the lid so that the flange **20** is in positive engagement with this flange, and the hooked part **10B** of the flange **10C** readily engages the flange **20** during seaming.

It will be appreciated that the above described invention can be applied not only to containers with circular cross section, which are the most common type of container, but also to containers of any other shape which allow the manufacture of a double hook seam, for example elliptical or rectangular with rounded angles (of the type frequently used for corned beef) and other cross sectional shapes may be used. In such cases the frusto-conical opening will not be that of a circular cone but of some other base shape. The references in this specification to the cone angle of such shapes will be understood to refer to the angle of inclination of the planes of the figure with respect to the axis of the container. Moreover, it should be borne in mind that nominally cylindrical containers made by injection moulding are, in practice, slightly conical to make it possible to remove them from the mould; therefore, the reference line **30** in FIGS. **3**, **4** and **5** should be considered as parallel to the wall of the container (in longitudinal section) rather than parallel to the axis of the container.

Furthermore, it will be appreciated that the thickness of the container wall depends on the size of the container. For example in FIGS. **3–6**, with cylindrical containers with a diameter of 8–12 cm, the thickness of the part **16** may typically be about 1.5 to about **2**mm and decreases to about 0.4 mm at the flange **20**. The maximum value of the deformation of the container wall **16** illustrated in FIG. **6** is practically very small considering that the height H of the shoulder **12** of the lid **10** (FIG. **5**) amounts generally to 2.5–6 mm and that the difference between the angles X and X′ is not more than about 7°.

What I claim is:

1. A container for food, said container comprising a polypropylene body of low yieldability having a side wall defining an open end,

a circumferential flange on said body at said open end,

an outwardly flaring frusto-conical annular wall on said lid,

said side wall having a circumferential portion tapered in thickness towards said open end adjacent said open end, said tapered portion of said container wall is formed by an internal bevel on the inner surface of the container wall, the length of said tapered portion axially of the container being at least equal to the depth of said frusto-conical wall on said lid.

2. The container of claim **1** wherein the angle of said bevel, with respect to the longitudinal axis of said con-

tainer being at least equal to the cone angle of said wall on said lid.

3. The container of claim 2 wherein the angle of said bevelled portion lies in the range 3° to 10°.

4. The container of claim 1 wherein the axial length of said tapered portion is greater than the depth of said lid.

5. The container of claim 1 wherein said tapered portion of said container wall includes an annular step adjacent to and co-operating with said wall on said lid.

6. The container of claim 1 wherein the angle of said tapered portion of said container wall is greater than the cone angle of said frusto-conical annular wall on said lid, said lid deforming said tapered portion of said container wall, when in position in said opening, by an amount increasing progressively away from said open end for the depth of said lid wall.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,709,399 Dated January 9, 1973

Inventor(s) Giovanni Nughes

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In The Heading:

The Assignee's Name was omitted. Should read:

--Assignee: Star Stabilimento Alimentare S.p.A., Milan, Italy--

Signed and sealed this 13th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.