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CONTAINERS

This invention relates to containers.

In accordance with the invention there is provided a container comprising a resilient plastics lid adapted to form a tight seal with the outer surface of the upper rim of a receptacle, the lid having a top wall having a downturned periphery terminating in an outer rim flange for fitting over the receptacle rim, the inner diameter of the rim flange being less than the outer diameter of the receptacle rim and the top wall having such resiliency and beam strength that when the top wall is pressed downwardly at its medial portion the rim flange will flex outwardly and snap over the receptacle rim with an audible click and when released will draw the rim flange radially inward to tighten its sealing engagement with the receptacle rim.

With the advent of plastics food containers a number of lid constructions have been proposed for sealing the contents to keep out ambient air. Difficulties have been encountered in maintaining a tight seal, especially when the closed containers are refrigerated.

The Tupper U.S. Patent No. 2,487,400 discloses a flexible plastics cover for an open mouth receptacle, said lid having a recessed top wall with an inverted U shaped rim for fitting over the lip of the receptacle.

The lid is described as having elasticity and flexibility with a slow rate of recovery to provide a non-snapping and noiseless type of cover. It is applied to the receptacle by pressing down on the rim progressively along its top wall to effect a spreading of the side groove walls and an expansion or compression of the central wall to effect sealing engagement between the lid rim and the inner surfaces of the top and side walls of the receptacle rim. Because of the use of plastics material having high flexibility to obtain a non-snapping cover, this construction does not provide a tight seal, especially under refrigerating conditions. Moreover, the recessed top wall of the lid materially reduces the capacity of the container for containing foods.

The Tupper Reissue U.S. Patent No. 24,889 is said to be an improvement over No. 2,487,400, and is directed to a rectangular receptacle and cover with rounded corners, the major difference being a bead on the upper rim of the receptacle and inclined inner surfaces on the walls of the peripheral rim groove of the cover forming sealing points with the bead. The cover is of flexible material and is designed to be applied by progressive finger pressure along the top wall of the rim of the cover. This construction has the same disadvantages as the cover of Patent No. 2,487,400, including a poor seal and the loss of food capacity of the container due to the recessed top wall of the lid.

U.S. Patent No. 3,111,240 also shows a bead on the receptacle rim which has an inclined surface co-operating with inclined inner surfaces on the interior of a peripheral rim groove to provide secondary seals. However, the primary seal is formed between the smooth inner surface of the receptacle rim and the inner wall of the peripheral rim of the cover and also

the recessed lid decreases the capacity of the container.

U.S. Patent No. 3,692,208 discloses a plastics cover having a downwardly concave or conical central wall encircled by an upwardly directed inverted U-shaped annular rim. The inner wall of the rim makes the seal with the inner surface of the bowl rim; thus it is an inner seal as distinguished from the outer seals of the Tupper patents, and there is no sealing contact between the outer surface of the bowl rim and the outer wall of the rim. The downwardly concave central wall of the cover when pressed downwardly contacts the inner wall of the rim to allow it to pass within the rim of a receptacle, and the material of the cover has an elastic memory to expand when released into sealing contact with the inner surface of the receptacle. However, such a cover tends to shrink radially inward when refrigerated, thus diminishing or weakening the seal, and again there is a loss of capacity of the container due to the recessed lid.

A container constructed in accordance with a preferred embodiment of the invention incorporates an improved lid which overcomes the disadvantages of the foregoing prior art lids. The improved lid increases the capacity of the container when the lid is in sealing engagement with the receptacle and is snapped into sealing engagement with the outer surface of the receptacle rim by applying downward pressure to the medial area of the lid, thus providing an audible signal that the seal is completed, the seal being enhanced when the assembled receptacle and lid are refrigerated.

In order that the invention may be well understood the preferred embodiment thereof, given by way of example, will now be described with reference to

the accompanying drawings, in which:

Fig. 1 is a perspective view, partly broken away and in section, of a container comprising an improved lid in sealing position on a bowl having a smooth upper rim;

Fig. 2 is a top plan view of the same lid;

Fig. 3 is a sectional view on line 3-3 of Fig. 2;

Fig. 4 is a bottom plan view of the same lid;

Figs. 5, 6 and 7 are enlarged partial sectional views showing progressively the coaction between the lid and bowl rim as the lid is pressed down at the centre to complete the seal;

Fig. 8 is an enlarged sectional view of the rim portion of a modified improved lid which is otherwise identical in construction to the embodiment of Figs. 1 - 7; and

Fig. 9 is an enlarged sectional view similar to Fig. 7, showing the completed seal between the lid and the bowl rim.

The improved lid is molded of a semi-rigid plastic material having some resiliency and a substantial amount of beam strength in the span across a diameter between opposite points on the downwardly curved rim. A preferred material is linear low density polyethylene (LLDPE), although other plastic materials having similar physical properties may be used. Preferably, the lid is molded in molds at about 65°C (150°F) which pre-shrinks it so there is minimal additional shrinkage when treated in a dishwasher.

The proportionate diameter and height dimensions of the lid vary somewhat with respect to lids of different diameters for fitting bowls or other receptacles of different sizes, as does the thickness of the material. Thus, for lids of 203.2 mm (8") to 101.6 mm (4") diameter, the thickness may vary from 2.413 mm

(.095") to 1.397 mm (.055"). The lid stiffness is a function of the fourth power of the rim thickness. In order to effect a seal between the inner surface of the arcuate rim and the outer surface of the bowl rim by pressing down on the medial area of the lid, the stiffness of the rim, the height of the curved rim and the beam strength between opposite points on the rim, (which is a function of the third power of the lid span) all must be correlated so that when the lid is pressed down at its medial portion the force transmitted to the rim causes substantially half the rim to first seat on the bowl rim, and the other half of the rim will then progressively move down between diametrically opposite points and finally complete the seal midway between said points with an audible snap or click. The diameter of the sealing surface on the inside of the rim of the lid must be slightly less than the outer diameter of the bowl rim in order to move over the bowl rim and obtain the audible snap at the completion of the seal without requiring excessive pressure at the medial portion of the rim. For a 152.4 mm (6") diameter lid the diameter of its sealing surface should be about 1.778 mm (.070") less than the outer diameter of the bowl rim and this dimension varies with lids of different diameters as follows:

	<u>Overall Lid Diameter</u>	<u>Differential (x) Between Lid I.D. and Bowl Rim O.D.</u>
	203.2 mm (8")	2.286 mm (.090") less
	177.8 mm (7")	2.032 mm (.080") less
30	152.4 mm (6")	1.778 mm (.070") less
	127 mm (5")	1.524 mm (.060") less
	101.6 mm (4")	1.27 mm (.050") less

Referring to Figs. 2 and 3 of the drawings, the improved lid is upwardly bulged and is preferably dome

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shaped, having a substantially horizontal top wall indicated generally at 10 with a slightly downwardly curved medial portion 11 delineating the centre press area. A flat annular area 12 encircles the medial area 11 and is preferably slightly recessed below the outer annular portion 13 of the rim, thus forming a centering area for stacking another bowl such as shown at 15 in Fig. 1 on top of the lid 10.

From the outer periphery of annular portion 13 the lid is preferably downwardly curved as shown at 16,

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terminating in a downwardly directed inverted U-shaped channel having a relatively short inner flange 17 and a relatively long outer flange 18 terminating in an outwardly flared skirt 19. The outer surface of the inner flange 17 of the channel is inclined inwardly downward to match the inclination of the upper rim 20 of the bowl 15 (preferably about 7°) as best seen in Fig. 6. The inner surface of the upper part of outer flange 18 is downwardly inclined inwardly at a somewhat greater angle (preferably about 12°) and the inner surface of the skirt is downwardly inclined outwardly (preferably at angle of about 21°) forming a sharp circumferential shoulder 22 at the base of the channel. The inner surface of the skirt 19 is preferably provided with a circumferential series of nibs or beads 19a for a purpose to be described. Preferably, the bowl 15 has a horizontal exterior stiffening flange 23 slightly below the skirt 19 of the lid when it is in sealing position, as shown in Fig. 7.

As shown in Fig. 5, when the lid is placed over the bowl the upper edge of the bowl rim 20 engages the inner surface of the skirt 19 near the bottom of the lid. Downward pressure applied to the medial area 11 then causes the inner surface of the skirt to slide downwardly over the top edge of the bowl rim 20 as shown in Fig. 6, outwardly flexing flange 18 about its upper end 24 until shoulder 22 rides over the top of bowl rim which audibly snaps into the position of Fig. 7, completing the seal. As previously stated, substantially half of the bowl rim first seats in the channel when center pressure is applied to the lid, and the other half seats progressively until the mid point audibly snaps to the position of Fig. 7, signaling completion of the seal. The nibs or beads 19a allow the compressed air to escape as the lid is pressed down over the bowl.

The stiffness of the lid, together with the depth of the curve and the flexibility and inner diameter of the outer rim flange 18 must all be coordinated so that when a moderate center pressure is applied to the lid with one hand

the lid has sufficient beam strength to transfer the force radially outward and flex the flange 18, allowing it to slide or cam over the bowl rim and audibly snap into final sealing position, and so that when the center pressure is released the radial inward force will draw the flange 18 radially inward to effect a tight seal against the bowl rim. The inner flange 17 is not relied on to seal against the inner surface of the bowl rim as the radial inner force transmitted through the lid when pressure is released detracts from the tightness of its engagement with the bowl. The flange 17 merely acts as a guide to initially position the lid.

Obviously, when a bowl containing food is sealed with the improved lid and placed within a refrigerator the resulting radial contraction of the lid increases the tightness of the seal rather than reducing it.

The modified embodiment of lid shown in Figs. 8 and 9 is identical in construction to the lid of Figs. 1-7, except for omitting the inner flange 17 of the previous embodiment and replacing it with a circumferential bead 25 forming a shallow groove or shoulder 26 under the upper end 24 of outer flange, adapted to engage the top of the bowl rim. It has been found that this modified embodiment produced a tight seal comparable to that produced by the embodiment of Figs. 1-7.

The improved lid combines the convenience of a simple one hand center press application with a tight outside seal on a smooth bowl rim which is enhanced under refrigeration, while at the same time utilizing the full capacity of the bowl. The unique construction provides for an audible click when the lid snaps into place thereby signaling to the user that the seal is complete.



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CLAIMS:

1. A container comprising a resilient plastics lid adapted to form a tight seal with the outer surface of the upper rim of a receptacle, the lid having a top wall having a downturned periphery terminating in an outer rim flange for fitting over the receptacle rim, the inner diameter of the rim flange being less than the outer diameter of the receptacle rim and the top wall having such resiliency and beam strength that when the top wall is pressed downwardly at its medial portion the rim flange will flex outwardly and snap over the receptacle rim with an audible click and when released will draw the rim flange radially inward to tighten its sealing engagement with the receptacle rim.
2. A container as claimed in claim 1, wherein the material of the lid is linear low density polyethylene.
3. A container as claimed in claim 1 or claim 2, wherein the lid rim flange forms an inner shoulder for engaging the top of the receptacle rim.
4. A container as claimed in any of the preceding claims, wherein the inner diameter of the rim flange is substantially 1.27 mm (.050 inches) to substantially 2.286 mm (.090 inches) less than the outer diameter of the receptacle rim on which it fits.
5. A container as claimed in any of the preceding claims, wherein the rim flange forms one side of a groove for fitting over the receptacle rim.
6. A container as claimed in any of the preceding claims, wherein the rim flange terminates in an out-



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wardly flared skirt..

7. A container substantially as herein described with
reference to Figures 1 to 7 or Figures 8 and 9 of the
5 accompanying drawings.

8. For a container as claimed in any of the preceding
claims, a lid substantially as herein described with
reference to Figures 1 to 7 or Figures 8 and 9 of the
10 accompanying drawings.
