A disposable plastic dome-type lid having a primary nesting facility in the skirt which also serves to retain the lid on a container, and a secondary stacking facility in the frusto-conical wall to provide lateral stability when several such lids are nested in a stack.

This invention relates to container lids, and more particularly comprises a new and improved nesting facility for dome-type disposable thin wall plastic lids.

A variety of different nesting facilities have been incorporated into the side wall of plastic cups and lids which make the containers and lids capable of being handled mechanically in such equipment as automatic filling and capping machines and automatic vending machines. Perhaps the most widely used stacking facility is that employing a radial undercut in the side wall, which forms internal and external shoulders that cooperate with the identical stacking facilities in like articles so that the external shoulder of one article sits on the internal shoulder of the next one in the stack. In the nesting of articles such as cups having side walls of substantial axial extent, lateral stability is achieved by the proximity of their side walls over a substantial distance when telescoped together. That is, lateral shifting of one article in a stack is prohibited by the overlapping of the side walls of adjacent articles over a substantial axial distance. However, in the nesting of lids, there is an absence of any substantial side wall to provide the lateral stability, and therefore, the nesting problems are somewhat more difficult. Nevertheless, it is essential that stack stability be achieved to enable a stack of lids to be handled mechanically.

The problem of providing a stable stack of lids in the general class of coverall lids becomes more acute when the lids are of the dome-type as opposed to those that have a shallow central depression used to align filled, stacked, closed containers. In the latter, stability may be derived from the down turned skirt at the periphery and the wall of the depression, but the dome lids do not have both to provide this stability.

One important object of this invention is to provide a stacking facility in a coverall, dome-type lid, which achieves stack stability when a plurality of identical lids incorporating the invention are nested together.

Another important object of this invention is to provide a stacking facility for dome-type lids, which achieves stack stability and which at the same time enables the lids to be separated readily one from the other either in manual or mechanical handling.

Yet another important object of this invention is to provide a relationship between the side walls of dome-type lids which complements the relationship of the primary nesting facility in the lids so as to achieve stack stability.

To accomplish these and other objects, the lid of this invention comprises a top wall and a frusto-conical wall extending outwardly and downwardly from the periphery of the top wall and forming an angle with the vertical of not more than 10° and preferably in the range of from 4° to 7°. A flange extends outwardly from the bottom of the frusto-conical wall, and a skirt extends downwardly from the periphery of the flange. A primary stacking groove is provided intermediate the top and bottom of the skirt, with the lower face of the groove being adapted to rest on the periphery of the flange of an identical lid beneath when the two are telescopically nested one on the other in an upright position. The frusto-conical wall of the lid has a greater axial extent than the pitch of the nest whereby the frusto-conical wall of the lower lid in the nest lies within the frusto-conical walls of the upper lid, and at least spaced portions of the gap between the overlapping frusto-conical walls is in the range of .001"-.004". The close proximity of at least spaced portions of the walls provides lateral stability for the nest of lids. The pitch of the nested lids is of course the radial distance between identical points on adjacent flanges. It is also to be understood that the angle of the conical wall, pitch and stock thickness are all dependent variables, and variations in one of these changes the desired dimensions of the other to achieve the desired relationship.

These and other objects and features of this invention, along with its incident advantages, will be better understood and appreciated from the following detailed description of two embodiments thereof, selected for purposes of illustration and shown in the accompanying drawings, in which:

FIG. 1 is a fragmentary perspective view of a container bearing a lid constructed in accordance with this invention;

FIG. 2 is a fragmentary cross sectional view on an enlarged scale of the lid and container shown in FIG. 1;

FIG. 3 is a view similar to FIG. 1 of a preferred embodiment of lid on a container;

FIG. 4 is an enlarged fragmentary plan view taken from sight line 4—4 in FIG. 3;

FIGS. 5 and 6 are greatly enlarged fragmentary cross sectional views of the embodiment of lids shown in FIGS. 1 and 3, respectively, and particularly illustrating the manner in which each nests with an identical lid in a stack.

In FIGS. 1 and 2 a disposable plastic cup 10 is shown having a side wall 12 and rolled rim 14. The lid 16 used to cap the container 10 is constructed in accordance with this invention. The lid generally includes a dome-type body comprising a dished top wall 18, and a frusto-conical wall 24 which extends outwardly and downwardly from the periphery of the top wall 18. A flange 28 extends outwardly from the lower edge of the frusto-conical wall 24, and a skirt 30 extends downwardly from the periphery of the flange 28. The relationship of these several parts to identical parts of a lid nested with it are described in detail below.

A V-shaped groove 32 is provided intermediate the top and bottom of the skirt 30 and serves several functions. First, the groove 32 defines a bead on the inner surface of the skirt 30, which retains the lid on the cup 10. It will be noted in FIG. 2 that the bead lies beneath the rolled rim 14 of the cup to retain the lid in position. The groove 32 serves as a second function which is more clearly shown in FIG. 5; namely, it serves as an undercut for nesting purposes.

In FIG. 2 the groove 32 is shown composed of a pair of converging faces 34 and 36. The face 36 serves as the inner shoulder of the nesting facility shown in FIG. 5 wherein two lids are shown nested together. The internal shoulder 36 is shown in FIG. 5 to rest on the outer edge 38 of the flange 28 of the next lower lid in the stack. Thus, the periphery 38 of the flange 28 serves as the external shoulder of the nesting facility formed in the skirt 30 of the lid. The limits of the nesting facility of one lid are bracketed in FIG. 5 and identified at 40.
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The particular nesting facility provided in the skirt 30 forms the primary nesting facility in the stack of lids, and is not per se an invention. Rather, such stacking facilities have been incorporated into lids and containers in the past to perform the same function. Rather, the primary nesting facility in combination with the relationship of the side walls of the dome 16 comprise this invention.

While the primary nesting facility 40 provides the axial spacing between the lids in the nest and jamming into the next lid in the nest to form a "sticker," the relationship of the side walls of the dome-shaped portion 16 of the lid provides the lateral stability for the stack. (A "sticker" is one lid in a stack that is difficult to separate from an adjacent lid during mechanical and manual handling.) It will be appreciated that in the absence of any cooperative relationship at the region of the dome, as for example in lids wherein the flange is continued in a horizontal plane to form the top wall, no real stability exists, and the lids can tip or displace laterally one with respect to the others. In fact, such lids are sometimes packed in a preloaded condition so as to increase lateral stability. The inherent flexibility of the material from which the lids are made makes a stack of such lids somewhat resilient, and, therefore, they can readily be preloaded to keep them in stacked relationship. However, such an arrangement is only useful during shipping, and it is not practical to stack such lids in a preloaded condition during mechanical handling.

In the embodiment shown in FIG. 5, the frusto-conical wall 24 is inclined from the vertical approximately 4°, and the target wall thickness is approximately .008 inch. The axial extent of the frusto-conical wall 24 is approximately twice the axial extent of the nesting facility 40, and therefore, when identical lids are nested together, the frusto-conical wall of the upper lid of a stack surrounds the frusto-conical wall of the next lower lid in the stack. This is clearly evident in FIG. 5. The angle of taper of the frusto-conical wall 24 and its thickness determine the spacial relationship between the adjacent walls of two nested containers. In a lid having the angles and wall thicknesses stated, the clearance between the inner surface of the lower lid and the outer surface of the upper lid is approximately .001 to .003 inch. This spacing between the interfitting frusto-conical walls provides substantial lateral stability for the two lids nested in the manner shown, and they do not fall apart or separate with respect to one another when they are arranged in a stack.

The embodiment of this invention shown in FIG. 1 functions most satisfactorily to achieve the ends desired when the wall thicknesses are kept very close to the target dimensions given. However, when the thickness of the frusto-conical wall exceeds .008 inch by any appreciable amount, substantial contact may result between the inner and outer surfaces of the frusto-conical adjacent walls, which produces a significant gripping action between lids and makes separation difficult. It will be appreciated that if there is substantial frictional contact between the adjacent frusto-conical walls, it is difficult to strip or separate the lids, and this makes them unsuitable for use particularly in machines which handle the lids mechanically. As indicated above, the various variables are dependent upon one another, and while the dimensions given are preferred with one another, by changing one dimension, one or more others may be changed and the resulting lid lies within the scope of this invention.

The embodiment of this invention shown in FIGS. 3, 4, 6, increases the dimensional tolerances of the lid and assures ready separation of nested lids. This is achieved without any substantial loss in stack stability. In this embodiment of the invention, the other, such stacking facilities are identical to the embodiment previously described, and the parts bear the same character references. The stack pitch is approximately .15 inch. However, the dome portion of the lid is different. In this preferred embodiment the frusto-conical wall 60 is oriented at an angle of approximately 7° with the vertical. Spaced about the frusto-conical wall 60 are a plurality of ribs 62, which form the preferred embodiment shown in the embodiment illustrated. Preferably the radial extent of the ribs 62 is constant throughout their height so that the outer edges of the ribs are parallel to the surface of the frusto-conical wall 60 between the ribs. The target dimension for wall thickness of the frusto-conical wall is the same as that in the first embodiment, namely .008 inch.

It will be appreciated that because the slope of the frusto-conical wall is greater in the preferred embodiment of FIG. 6 than it is in the embodiment of FIG. 5 and the pitch and stack thickness are the same, a greater spacing will result between the adjacent surfaces of the frusto-conical walls of nested cups and the space will more rapidly increase as two lids are separate one from the other in an axial direction. Consequently, the dimensional tolerances of the side wall are somewhat greater than those provided in connection with the first embodiment. However, the added space between the side walls increases stack instability because more lateral play is permitted between the adjacent frusto-conical walls. This is suggested in FIG. 6 above the upper end of the rib 62 of the lower lid. With a 7° angle, the space between the frusto-conical walls is between .005 and .008 inch. The target radial height of the ribs is .004 inch for the ribs in FIG. 6, and .006 inch for the ribs in FIG. 5, from the outer edge of the rib on the inner lid and the inner surface of the lower lid between .001 and .004 inch, substantially that of the first embodiment. It will be noted in FIG. 6 that the ribs 62 have an axial extent substantially greater than the pitch or nesting height 40, and, therefore, the ribs 62 of the lower lid extend into the frusto-conical wall of the next upper lid in the stack.

Separation of the lids of the embodiment of FIG. 6 is generally easier to achieve than separation of the lids in the other embodiment. One reason for this is that contact between adjacent frusto-conical walls is limited to one contact on the edges of the ribs provided in the wall. Between the ribs, there is substantial spacing of the adjacent frusto-conical walls, which avoids any piston like action between the two. In the embodiment of FIG. 5, the close proximity of the frusto-conical walls to one another may create a condition which approaches a sealed chamber between the end walls 18 of adjacent lids so as to restrain the lids from separation or the lids from falling apart.

Having described this invention in detail it will be appreciated that the relationship of the side walls of the frusto-conical portions of the lids provide a secondary stacking facility which imparts lateral stability to the primary stacking facility defined by the V-shaped grooves 32 in the skirt and the periphery 38 of the outwardly extending flange 28. It will also be appreciated that in the preferred embodiment of this invention, ease of separation is afforded by the ribs 26 in the frusto-conical wall that provide lateral stability. The greater pitch of the frusto-conical wall of the preferred embodiment allows air more readily to enter between the side walls and makes separation easier. It will also be appreciated that lateral stability can only be achieved if there is substantial cooperation between the frusto-conical walls of adjacent containers over a significant axial extent. If the close relationship of the walls at a rather steep angle is present over only a few thousandths of an inch, no appreciable lateral stability will be achieved and the lids will not be suitable for mechanically handling.

While dimensions have been given for the two embodiments illustrated it is evident that other dimensions may be selected, and the primary nesting facility may be satisfactorily in a stack. Generally the dome frusto-conical wall angle should not exceed 10° and the gap between at least portions of the side wall should not exceed .015", with a pitch of .150" and wall thickness of .008".

From the foregoing description, those skilled in the
art will appreciate that numerous modifications may be made of this invention without departing from its spirit. Therefore, I do not intend to limit the breadth of this invention to the two embodiments illustrated and described. Rather, it is intended that the scope of this invention is determined by the appended claims and their equivalents.

What is claimed is:

1. A disposable thin wall plastic snap-on lid having an outside fit comprising
   a. a top wall,
   b. a frusto-conical wall extending outwardly and downwardly from the periphery of the top wall and forming a small angle with the axis of the lid,
   c. a flange extending outwardly from the bottom of the frusto-conical wall,
   and an inwardly extending groove provided in the skirt forming a bead for retaining the lid on the rim of a container and defining an inner shoulder and adapted to engage the periphery of the flange of an identical lid when telescopically nested with said identical lid,
   said frusto-conical wall having a greater axial extent than the pitch of nested lids established by the groove and flange, whereby the frusto-conical wall of one lid lies within the frusto-conical wall of the next lid, and at least a portion of frusto-conical walls being spaced very closely adjacent one another when the lids are nested together to prevent significant lateral displacement of one lid relative to the other.

2. A further disposable thin wall plastic snap-on lid as described in claim 1 further characterized by said frusto-conical walls being spaced approximately .001-.004 inch throughout their entire circumferential extent.

3. A disposable thin wall plastic snap-on lid as described in claim 1 further characterized by axially extending ribs in the frusto-conical wall with the edges of the ribs being spaced approximately .001-.004 inch from the surface of the frusto-conical wall of the immediately adjacent lid.

4. A disposable thin wall plastic snap-on lid as described in claim 3 further characterized by said ribs extending outwardly from the surface of the frusto-conical wall, approximately .004 inch from the surface.

5. A disposable thin wall plastic snap-on lid as described in claim 2 further characterized by said wall forming an angle of approximately 4° with the axis of the lid.

6. A disposable thin wall plastic snap-on lid as described in claim 3 further characterized by said wall forming an angle of approximately 7° with the axis of the lid.

7. A disposable thin wall plastic snap-on lid as described in claim 5 further characterized by the axial extent of said frusto-conical wall being at least substantially twice the pitch.

8. A disposable thin wall plastic snap-on lid as described in claim 3 further characterized by the axial extent of said frusto-conical wall being at least substantially twice the pitch.

9. A disposable thin wall plastic snap-on lid as described in claim 8 further characterized by the space between the ribs in the frusto-conical wall from the wall of the next adjacent lid being approximately .005-.008 inch.

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