This invention relates to improvements in a snug fitting container closure, and more particularly to a closure that may easily be snapped on a temporary container of the character of a paper cup, the closure being highly desirable for use with flush filled containers, and is particularly desirable for use with containers in so-called "carry-out" service, although the closure may have other uses and purposes as will be apparent to one skilled in the art.

More specifically, the closure is especially adapted for use with a temporary cup or container having a rolled or otherwise formed bead around the mouth thereof, the closure snapping over such bead with no part of the closure extending inside the container, thereby permitting filling of the container to the very brim. Closures of this type are highly desirable for use on containers containing sodas, milk, and similar confections or commodities wherein it is desired to consume the commodity during travel or at some location other than where purchased. At the same time, it should be noted that the closures are also highly satisfactory when used with containers for solid and semi-solid hot or cold foods, such as ice cream, cottage cheese, potato salad, etc.

In the manufacture of temporary containers and lids or closures therefor, even though a food product may be packaged in the container and not all of the product used at the first opening, the cap or closure being replaced and the remainder of the product still in the container placed in the refrigerator, it is nevertheless essential that both the container and the closure or lid be manufactured sufficiently economically to warrant disposal after a single usage. At the same time, in the manufacture of paper containers economically, sizing the containers to close tolerances is virtually impossible so that there is a considerable variance in size at the mouth ends of containers of the same capacity. In order to insure a tight closing of the container by the lid, it is highly desirable that the lid be constructed to automatically compensate for those variances in container size. Obviously, at the same time the cover must be easy to apply and remove, effectively grip the container and establish a sufficiently tight seal to prevent leakage.

In the past, many and various types of covers have been provided for use with temporary containers, but in all instances of which I am aware, these formerly known covers or lids did not effectively compensate for variances in container size, and were not as easily applicable and removable as is desired. Also, container lids heretofore known, if stackable in a nested relationship pending use and for packaging purposes, required some postforming for application to the container in the event they were of the flush closure type to cover a container filled to the brim. Further, formerly known closures did not have a desirable "snap-on" characteristic if constructed for automatic compensation of container size variances, and did not tightly engage the rim bead of a container to a desired extent, that is, they failed to make sealing contact over a desired amount of surface of the rim bead.

With the foregoing in mind, it is an important object of the instant invention to provide a simple form of container lid or closure that is fully preformed and possessed of "snap-on" characteristics, rendering the same very easy to apply and equally as easy to remove.

Also, an object of the instant invention is the provision of a container lid or closure that is readily and firmly stackable in nested relationship with other closures for packaging purposes and for storage pending use, and which may be utilized on brim-filled containers without postforming.

It is also an object of this invention to provide a simple type of container lid constructed to provide stable stacking with other lids, compensate for variances in container lid size, and provide a "snap-on" action, the container lid being completely preformed.

Also a feature of this invention is the provision of a lid for a contemporary container which is fully preformed and so shaped as to be stackable in nested relationship with other lids in a stable stack, by virtue of the provision of a stacking surface width on the lid that is many times greater than the thickness of the material forming the lid.

Also a feature of the invention is the provision of a lid for a contemporary container so constructed that there is slight frictional snap-on engagement with adjacent lids when a number of lids are stacked in nested relationship.

A further object of the invention resides in the provision of a flexible lid for contemporary containers so constructed as to be laterally expandable upon application to the container, with resultant inherent contraction to insure positive engagement with the container.

A further feature of the instant invention resides in the provision of a flexible lid for contemporary containers, which lid is so constructed as to tightly engage the rim bead around the mouth end of the container over a major surface portion of the rim bead.

Still another object of the instant invention is the provision of a temporary container lid which is exceedingly thin and flexible and yet constructed to resist crushing when applied to the container, or stacked in nested relationship with other container lids, and which is sufficiently resilient to automatically compensate for wide variances in container size, the lid being transparent if so desired, and of a type to effectively seal a brim-filled container against leakage.

It is also an object of the instant invention to provide a lid for a temporary container, which lid may be readily molded from a thin sheet of thermoplastic material and provided with numerous hollow ribs or corrugations in the skirt portion of the lid, enabling the same to readily laterally expand and contract.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side elevational view of a temporary container with a lid or closure embodying principles of the instant invention in operative association with the container;

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

Fig. 3 is a greatly enlarged fragmentary vertical sectional view of the structure of Fig. 1, showing the lid operatively applied to the container;

Fig. 4 is a greatly enlarged fragmentary vertical sectional view illustrating a pair of container lids in stacked relationship;

Fig. 5 is a greatly magnified fragmentary vertical sectional view illustrating container lids of slightly different construction in stacked relationship;

Fig. 6 is a view similar in character to Fig. 5 illustrat-
ing container lids in stacked relationship, these lids having still another slight variance in construction; and Fig. 7 is a tremendously magnified fragmentary transverse sectional view taken substantially as indicated by the line VII—VII of Fig. 6, but the structure of Fig. 7 is incorporated in all container lids illustrated in the drawings, and this section could be taken in a similar location through a lid of Figs. 4 and 5, as well as that of Fig. 6.

As shown on the drawings:

In the first illustrated embodiment of the instant invention, referring particularly to Figs. 1 and 5, 1 have shown a lid embodying principles of the instant invention in operative association with a container 1 made of paper, with or without a plastic lining, or any other suitable material sufficiently economical to warrant a single usage of the container. As seen best in Fig. 3, the container 1 is preferably provided with a rolled or otherwise formed rim bead 2 around the mouth end thereof. Such rim bead not only strengthens the container, but provides a smooth surface for drinking directly from the container if so desired.

The lid or closure embodied in the instant invention may be made of a substance paper, and lined with a thermoplastic substance which has proven satisfactory, but it is preferably made of a thermoplastic material, transparent if so desired, and one satisfactory substance is a thin polyethylene film, oriented if desired. The lid may readily be molded in a known manner by blowing a heated oriented polyethylene film over a female die or mold. Such operation is very quickly performed, and results in a completely preformed container lid.

The plastic film need be but a few thousandths of an inch thick. In construction, the lid which is illustrated as generally circular since most containers have circular tops, comprises a diaphragm 3 which extends over the mouth of the container. Depending from the diaphragm entirely therearound is a skirt portion, generally indicated by numeral 4. At the junction between the diaphragm 3 and skirt 4 is a transversely arcuate formation 5 shaped to provide an inwardly opening annular groove for the reception of the rim bead 2 of the container. Preferably the diaphragm has an elevated central portion defined by a downwardly and outwardly sloping margin 6 connecting the central portion with the groove formation 5. This margin 6 may slope downwardly at an angle of approximately 30°. The provision of the sloping margin permits greater lateral expansion of the cover when applied to a container, permits expansion without release of the cover of the contents of the container if such should be desired, and also insures greater surface area engagement with the rim bead 2 of the container.

Beneath the arcuate formation 5, the skirt is outwardly flared or outwardly and downwardly inclined in a portion designated by numeral 7. This portion 7 may satisfactorily be at an angle of approximately 45° to the vertical. This portion of the skirt is preferably provided with an integral shaping defining numerous radially extending ribs or corrugations 8. The ribs or corrugations are preferably hollow and alternately open inwardly and outwardly, one of the ribs being seen in greatly exaggerated or magnified view in Fig. 7 of the drawings.

The provision of the ribs or corrugations 8 provide two distinct advantages. First, the provision of these ribs permits a lateral expansion of the cover when applied to a container with resultant contraction of the lid after it has been rim bead of the container. Thus, the ribs effectively compensate for a wide range of variances in container size, and it will be noted that when the lid is engaged on the container, the ribs contract beneath a godly portion of the rim bead 2, and sealing contact is established over the major portion of the rim bead, as is clearly evident from the disclosure in Fig. 3. Secondly, the provision of the ribs or corruga-

tions 8 permits more material to flow into the arcuate formation 5 during the molding of the lid, so that a thinner film may be utilized to manufacture the lid than would otherwise be possible. It will be noted from the showing in Figs. 5 and 6 that there is a slight thinning of the material in the arcuate formation 5 when compared with the diaphragm 3, but the thinning is not as great as it would be without the provision of the ribs 8, and the resultant thickness is amply sufficient for purposes intended.

It should also be noted that if paper or equivalent material were utilized to form the lid or closure, it would be impossible to provide even half as many ribs or corrugations 8 as can be provided when the lid is made of a thermoplastic material.

Still further advantages of the ribs are the provision of added strength and rigidity to resist vertical crushing forces when the closure is applied to the container, and also to provide a definite steadying influence when the lids are in stacked relationship, as will more fully be explained later herein.

Beneath the portion 7 of the skirt, there is an angular formation provided by an inwardly sloping relatively narrow portion and paper and therefore extending relatively narrow flange 10. This angle between the portions 9 and 10 may satisfactorily be between 65° and 75°.

The instant invention, consistent with its being a flush type closure, provides an admirable degree of stackability. With the structure shown in Fig. 4, it will be noted that when the lids are placed in stacked nested relationship, the angular formation 9—10 having an apical line diameter very slightly exceeding the arcuate formation 5, the outwardly sloping or flared portion 7 of an upper lid seats on the arcuate formation 5 of the next lower lid, contact being established at the point 11. The angular formation prevents any material lateral shifting of the stacked lids relatively to each other, and stabilizes the entire stack, even though the apical line of this angular formation may not be in contact with the next lowermost lid. A lateral surface area of stacking contact that is many times wider than the thickness of the lid is thus provided to render stacking easy. It is to be especially noted that stable stacking is obtained with the instant invention with the lids being completely preformed, and no postforming whatever is necessary at the time the lid is applied to the container.

Slight variations may be made in the lid to increase the effective stackability thereof without in any manner detracting from the action of the lid relatively to the container. To this end, in Fig. 5 I have illustrated one of the same construction as above described with the single exception that the angular formation in this instance defined by portions 9a and 10a of the skirt are so sized that the apical line 12 of this formation is of slightly less diameter than the maximum diameter of the arcuate formation 5, as exemplified by the dashed line 13 in this figure. This difference in the apical diameter is sufficiently small as not to interfere with a noticeable extent with the removal of a lid from a stack of lids. When an upper lid is placed over a lower lid in a stack, there will be a slight snap-on action when the apical line 12 passes over the arcuate formation 5 of the lower lid, insuring even more stable stacking than the case with the structure shown in Fig. 4. In this instance again, contact is established between the lids at the point 11 as above described, and it is not necessary for the apical line 12 to contact any portion of the lower lid.

In Fig. 6, I have illustrated a still different shaping of the lids to provide a double contact in the stacking operation if such should be desired. In this instance, the angular formation above described on the skirt is defined by portions 9b and 10b with the portion 9b slightly longer than the equivalent portion 9 in the structure of Fig. 4, so that the apical line of the angular formation will contact
the ribs 8 on the next lower container, as indicated at 14, while contact at the line 11 will also be present. With the structure in Fig. 6, the apical line of the angular formation may either be the one shown in Fig. 4, or the size shown in Fig. 5 as may be most desired. The ultimate in a rigid stack, of course, would be produced with the present invention with the apical line of the angular formation of Fig. 6, slightly less in diameter than the arcuate formation 5, so there would not only be a slight snap-on connection between said lids, but two lines of contact between each upper lid and the one immediately thereunder.

From the foregoing, it is apparent that I have provided a simple and economical form of flexible closure for containers, which closure automatically compensates for wide variations in container size, with easy snap-on action, effectively grips the rim bead of the container both over and underneath the same by an inherent contracting action, and may readily and easily be stably stacked in nested relationship with other closures.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A flexible closure for a container having a bead around the mouth thereof, said closure comprising a diaphragm, a skirt around and depending from said diaphragm, there being a transversely arcuate formation joining said diaphragm and skirt and providing an inwardly open groove to receive the container bead, said skirt having an outwardly inclined portion below said formation, and an angular shaping at the bottom of the skirt below said portion having an inwardly directed apex forming a circumferential apical line, the apical line of said shaping being slightly less in diameter than the maximum diameter of said arcuate formation whereby said skirt will snap over the arcuate formation of another closure when a number of closures are stacked in nested relationship.

2. A flexible closure for a container having a bead around the mouth thereof, said closure comprising a diaphragm, a skirt around and depending from said diaphragm, there being a transversely arcuate formation joining said diaphragm and skirt and providing an inwardly open groove to receive the container bead, said skirt having an outwardly inclined portion below said formation, and an angular shaping at the bottom of the skirt below said portion having an inwardly directed apex forming a circumferential apical line, the apical line of said shaping being slightly less in diameter than the maximum diameter of said arcuate formation whereby said skirt will snap over the arcuate formation of another closure when a number of closures are stacked in nested relationship.

3. A flexible closure for a container having a bead around the mouth thereof, said closure comprising a diaphragm, a skirt around and depending from said diaphragm, there being a transversely arcuate formation joining said diaphragm and skirt and providing an inwardly open groove to receive the container bead, said skirt having an outwardly inclined portion below said formation, and an angular shaping at the bottom of the skirt below said portion having an inwardly directed apex forming a circumferential apical line, the apical line of said shaping being slightly less in diameter than the maximum diameter of said arcuate formation whereby said skirt will snap over the arcuate formation of another closure when a number of closures are stacked in nested relationship, and said angular shaping being such depth relatively to said arcuate formation that the outwardly inclined portion of the closure will rest upon the arcuate formation of the next lower closure in a stack.

4. A closure for a container having a rim bead around the mouth thereof, said closure comprising a removable and replaceable lid molded from a flexible sheet of thermoplastic material and including a diaphragm to cover the top of a container, an outwardly and downwardly extending skirt depending from said diaphragm, an arcuate formation connecting said skirt and diaphragm and defining an inwardly opening groove to receive the container rim bead, and uniform corrugations in said skirt entirely therearound, the upper ends of said corrugations coinciding with the lower edge of said arcuate formation to provide numerous abrupt shoulders for engagement with the underside of the container rim bead, and an angular formation comprising a continuous annular portion depending below the lower ends of said corrugations and terminating in a laterally outwardly extending flange.

5. In a stack of container closures, each of said closures comprising a diaphragm to overlie the mouth of a container, a skirt depending from said diaphragm and having an outwardly inclined portion and a portion adjacent the junction of the diaphragm and skirt, an angular formation in said skirt below said inclined portion having an inwardly directed apex forming a circumferential apical line, and said angular formation in each instance being of sufficient depth for the circumferential apical line of said angular formation to rest upon the outwardly inclined skirt portion of the immediately underlying closure in the stack, each of said closures having a portion thereof adjacent the angular formation resting upon the portion adjacent the junction of the diaphragm and skirt of the underlying closure.

6. In a closure for snap-on and snap-off interengagement with a beaded top container, a member made from self-sustaining thin resiliently flexible plastic material including a diaphragm for overlaying the mouth of a container, an annular downwardly and outwardly sloping margin about said diaphragm joining a transversely arcuate formation providing an inwardly opening annular groove receptive of the container bead in self adjusting snap-on resilient engagement, and an outwardly and downwardly inclined flared skirt extending from the outer and lower side of said arcuate groove formation generally in line with said margin and terminating in an angular continuously annular reinforcing terminal structure having an inwardly directed terminal formation, said margin and said skirt coacting with and through the respective opposite sides of said groove formation to maintain a resilient grip upon the container bead engaged within said groove formation, said groove formation projecting upwardly and outwardly relative to said margin and skirt for engagement thereon of the underside of the skirt of a superimposed closure in a stack of the closures and said angular terminal formation coacting in a stacked closure assembly to oppose the outer side of the groove formation of an underlying closure for stabilizing the stack.

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