April 29, 1969 B. EDWARDS 3,441,173

STACKABLE CONTAINER

Filed Aug. 9, 1967 Sheet 1 of 2

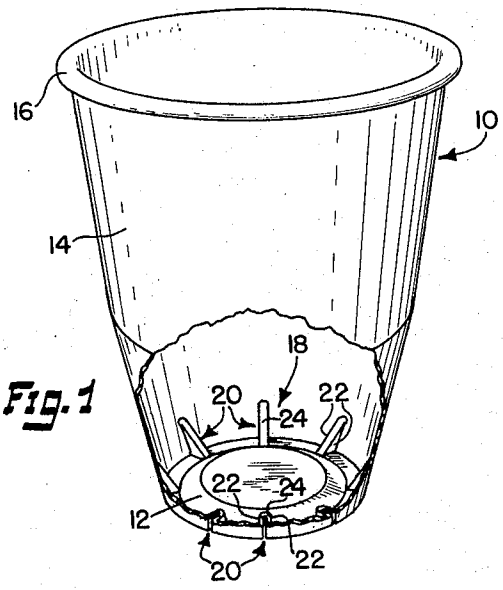

Fig. 1

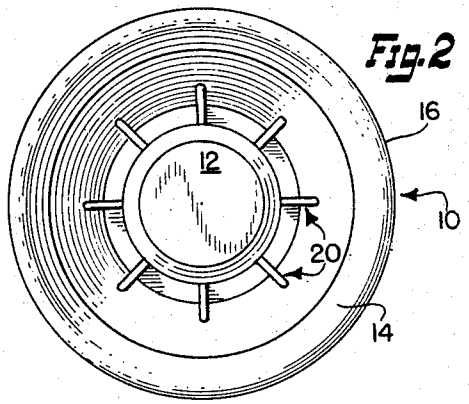

Fig. 2

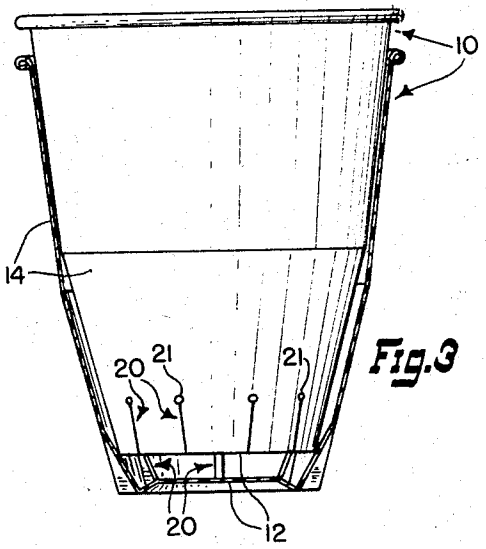

Fig. 3

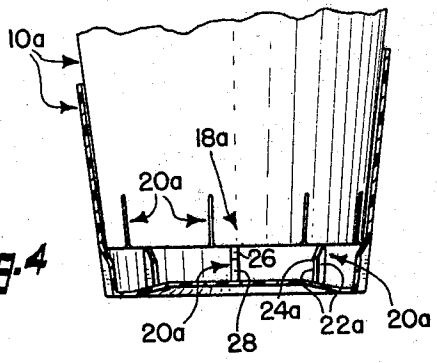

Fig. 4

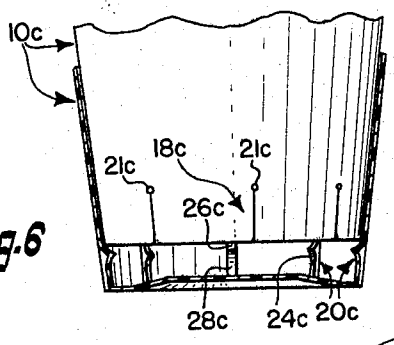

Fig. 6

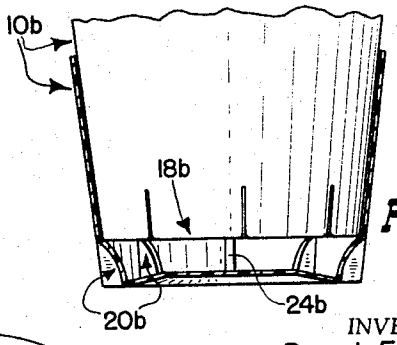

Fig. 5

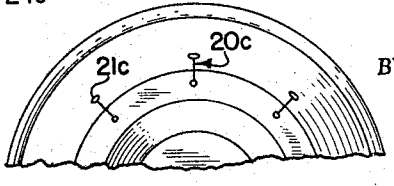

Fig. 6A

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April 29, 1969 B. EDWARDS 3,441,173

STACKABLE CONTAINER

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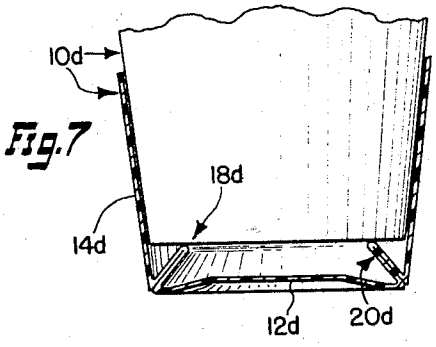

Fig.7

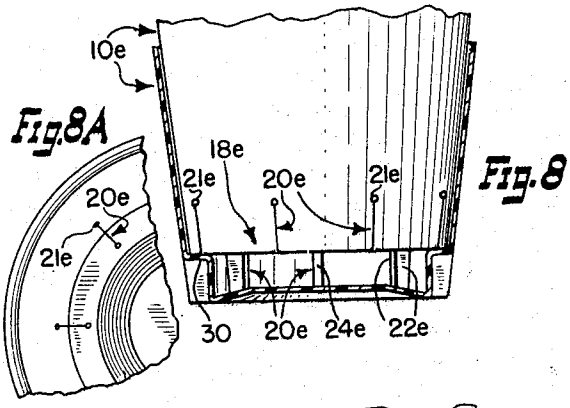

Fig.8A

Fig.8

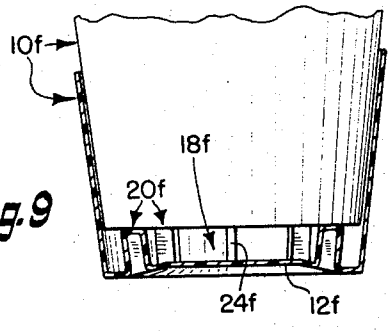

Fig.9

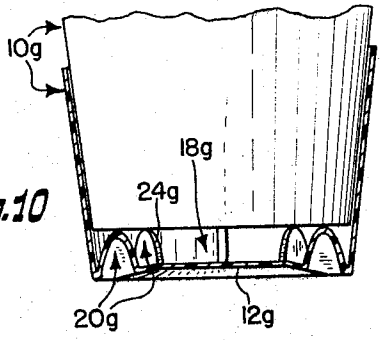

Fig.10

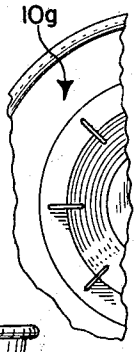

Fig.11

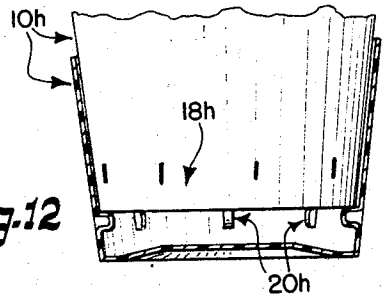

Fig.12

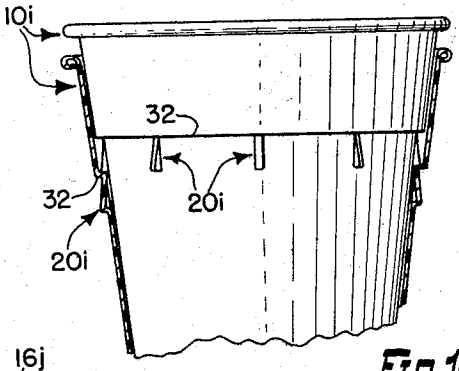

Fig.13

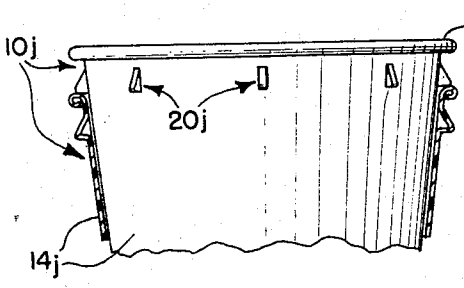

Fig.14

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3,441,173

STACKABLE CONTAINER

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Filed Aug. 9, 1967, Ser. No. 659,406
Int. Cl. B65d 21/00, 3/00
U.S. Cl. 220—97 11 Claims

ABSTRACT OF THE DISCLOSURE

A one-piece nestable thin-walled plastic container of substantially uniform thickness having stacking pleat means of double wall thickness which cooperates with a circumferentially extending stacking surface of the container to positively limit telescoping and thereby prevent jamming between nested containers.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to the stacking of a plurality of similarly configured containers of thin wall plastic construction which are of the disposable variety. Stacking in thin-walled containers of the disposable variety, where upward of 50–75 containers or more are nested together, is imperative to limit the degree of telescoping between nested containers. Failure to include a stacking configuration or the use of an unworkable stacking configuration in such containers will lead to jamming between adjacent nested containers. This is undesirable not only where individual containers are dispensed from a stack by a vending mechanism where the difficulty or possibility of separating containers may result in the malfunctioning of the vending mechanism but also in "over the counter sales" where it is important for the ultimate consumer to be able to remove individual containers from a stack.

Description of the prior art

It is well known that stacking features can be incorporated into either the side wall or bottom wall of a thin wall plastic container of one-piece integral construction. One example of a side wall stacking technique is disclosed in my U.S. Patent No. 3,139,213 in which a stacking ring, reversely directed with respect to the divergence of a container side wall, is provided to limit the degree of telescoping between adjacent nested containers. Variations of a reversely tapered stacking ring incorporated into a thin wall plastic container are shown in my U.S. Patent No. 3,091,360 where the stacking ring is of the interrupted variety, and in my U.S. Patent No. 3,208,631 wherein a plurality of V-shaped stacking protuberances, which may be arranged to cooperate with either the top or bottom margin of the container in a camming arrangement, may be provided. It has also been shown from my U.S. Patent No. 3,223,305 that generally horizontally directed stacking fins or pleats of a double wall thickness may be utilized in a prescribed fashion to limit the degree of telescoping between adjacent nested containers.

In the event one may desire to utilize a stacking facility in the bottom wall of the container, resort may be had to the stacking techniques shown, for example, in U.S. Patents Nos. 2,988,258 or 3,027,596. The bottom stacking techniques disclosed in these last mentioned patents are representative of the two typical forms of bottom stacking approaches from which subsequent developments have been made.

All of the above techniques have not envisioned the use of generally axially directed stacking pleats of double wall thickness in a thin-walled plastic container body which cooperate with a circumferentially extending stacking surface in the container body to positively limit the degree of telescoping therebetween.

SUMMARY OF THE INVENTION

It is one object of the present invention to provide a stacking feature or configuration in a thin-walled thermoplastic nestable container body to positively limit the degree of telescoping between it and adjacent like nested containers.

Another object of the present invention is the provision of a thin wall plastic container having stacking pleat means of double wall thickness which is designed to increase the stacking overlap between adjacent nested containers while at the same time laterally reinforcing or rigidifying the container in the vicinity of the stacking pleat means.

A further object of the present invention is the provision of stacking pleat means in a thin wall seamless thermoplastic container which, in certain forms of the invention, are designed to provide centering between adjacent nested containers when brought into stacking engagement, while in other forms of the invention, incorporate resilient resistance in an axial direction to prevent jamming and damage to the stack of containers.

These and other objects and advantages of the present invention are attained by the provision of a one-piece thin-walled seamless thermoplastic container having stacking pleat means formed therein which cooperate with a circumferentially extending stacking surface of the container, the stacking pleat means in the majority of instances comprising a plurality of generally axially extending and circumferentially spaced stacking pleats of double wall thickness which are formed in the vicinity of the circumferentially extending stacking surface, each of the stacking pleats being radially offset from the container in a direction to cooperate with the circumferentially extending stacking surface of a like adjacent nested container to provide stacking therebetween, the plurality of stacking pleats capable of being located either in the side wall, the bottom wall, or traversing at least both of the bottom wall and side wall of the container. In at least one form of the invention, the stacking pleat means is located within the interior of the container body and angularly disposed relative to the container axis to afford resiliency between adjacent nested containers in the stack.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view, partially in section, showing a seamless thermoplastic nestable container embodying one form of stacking pleat means constructed in accordance with the present invention;

FIG. 2 is a top plan view of the container shown in FIG. 1;

FIG. 3 is a side elevational view showing a pair of nested containers, one of them being sectioned, and which incorporate the stacking pleat means depicted in FIG. 1 of the drawings;

FIGS. 4–8 are fragmentary side elevational views of a pair of nested containers, one of the containers in each of the views being sectioned, and showing modified forms of stacking pleat means provided in the containers in the vicinity of the juncture between the bottom and side walls thereof;

FIGS. 6A and 8A are fragmentary bottom plan views of one of the containers illustrated, for example, in FIGS. 6 and 8, respectively;

FIGS. 9–10 are fragmentary side elevational views each showing a pair of nested containers, one of the containers in each of the views being sectioned, and depicting stacking pleat means incorporated in the bottom wall of the containers;

FIG. 11 is a fragmentary bottom plan view of one of the containers illustrated in FIG. 10;

FIG. 12 is a fragmentary side elevational view of a pair of nested containers, one of them being sectioned, showing stacking pleat means formed in the side wall of the containers adjacent to the bottom wall thereof;

FIG. 13 is a fragmentary side elevational view of a pair of nested containers, one of them being sectioned, illustrating stacking pleat means formed generally in the central portion of the side walls of each of the containers; and

FIG. 14 is a fragmentary side elevational view of a pair of nested containers, one of them being sectioned, which illustrates stacking pleat means formed in the side walls of each of the containers, and cooperating with the upper margin or rim portion of the containers for stacking.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Each of the cups or containers to be hereafter described are made into a seamless, thin-walled construction which is on the order of .002–.034 inch in thickness. Such cups or containers are formed from a thermoplastic material, polystyrene being one preferred example by what has commonly become known as thermoforming techniques wherein a heated sheet of thermoplastic material is drawn to the desired shape by mold members, mold members in combination with fluid pressure either of the positive or negative variety, or pressure forming means solely. It will, of course, be recognized that any of the above thermoforming techniques may be used in producing the various container embodiments which will now be described.

Referring first to the embodiment of the invention illustrated in FIGS. 1–3 of the drawings, there will be seen a one-piece, seamless, thin-walled cup or container **10** of the type referred to above. The cup or container **10** is formed into a frusto-conical shape which includes a bottom wall **12** which is integrally joined at its periphery or margin to a peripherally continuous side wall **14** diverging upwardly and outwardly from the bottom wall **12** and terminating in a rim portion **16** to define the upper margin of the cup in the vicinity of the open mouth or open upper end thereof. The rim portion **16** is preferably of the rolled or curled rim variety in the sense that it is reversely curved from the upper margin of the container back towards the side wall **14** to provide a rim of increased lateral width relative to the thickness of the side walls to afford necessary lateral rigidity at the open mouth or open upper end of the cup while affording a smooth drinking surface. It will, of course, be recognized that any thickened rim which provides the foregoing advantages may be used if desired. The bottom wall **12** is preferably of the indented bottom variety by its being axially concave upwards so that it will prevent sagging or "oil canning" of the cup when filled with a liquid. As will be described in more detail hereafter, the indented bottom construction may be dispensed within certain forms of the invention by reason of the rigidity derived from the stacking facility.

In accordance with the present invention, the cup **10** is provided with stacking pleat means formed integrally into the cup body, and which cooperates with a circumferentially extending stacking surface as will become apparent hereafter to stack adjacent nested or telescoped containers apart from one another a sufficient distance to prevent jamming therebetween which creates the various heretofore noted disadvantages, thereby making the cup acceptable to consumers by reason of their becoming stuck or wedged together. The stacking pleat means **18**, in cooperation with the circumferentially extending stacking surface to be presently described, must space the containers apart from one another an axial direction greater than the axial height of the rim portion **16** so that there will be no interference therewith. This is a common problem which any stacking facility must overcome in order to function effectively.

In the FIGS. 1–3 embodiment, the stacking pleat means comprises a plurality of generally axially extending and

circumferentially spaced stacking pleats **20** which are formed into double wall thickness elements. By this, it is meant that each of the stacking pleats have a thickness which is at least double the thickness of the substantially uniform in thickness cup **10** which will vary a few thousandths, more or less. The stacking pleats **20** in the FIGS. 1–3 embodiment are generally triangular in shape and include a pair of juxtaposed, substantially parallel wall portions **22**, **22** which are joined to each other at the radially innermost ends thereof by an upwardly and outwardly tapering connecting wall portion **24** which diverges from the bottom wall at a different angle than the side wall **14**.

Each of the stacking pleats **20** traverse at least part of the bottom wall **12** and side wall **14** of the cup, and thus extends on both sides of the area of juncture therebetween. By this construction, the stacking pleats **20** will interfere and prevent complete telescoping movement between adjacent nested containers as is readily depicted in FIG. 3 of the drawings. As will be apparent, the stacking pleats of the lowermost cup is designed to engage the bottom margin of the uppermost cup so that there will be stacking interference between each pair of adjacent nested cups. In this respect, the bottom margin of the uppermost cup serves as the circumferentially extending stacking surface which cooperates with the stacking pleats **20** of the lowermost cup to positively limit telescoping movement between adjacent nested cups when such elements are brought into engagement with one another.

It will be noted that since each of the stacking pleats are illustrated as having an opening **21** in the vicinity of the upper portion thereof, and it is from these openings that a tool or pin is extracted after the formation of the stacking pleats **20** as will be apparent. In these instances where side action molds are employed, it is preferable that the maximum space between the substantially parallel, juxtaposed wall portions **22**, **22** of each stacking pleat should have a dimension smaller than the minimum distance or dimension of each connecting wall **24** joining the juxtaposed wall portions **22**, **22**. In this way, any registry or slight telescopic shifting between the pleats **20** of adjacent nested containers will be prevented. It is, of course, recognized that it is possible to either bring the two juxtaposed wall portions **22**, **22** of each stacking pleat into engagement or abutment with one another, or close the gap or space in each of the stacking pleats in the vicinity of the bottom margin of the container so that the bottom margin which forms the circumferentially extending stacking surface will be peripherally uninterrupted.

The connecting walls **24** of each stacking pleat taper upwardly and outwardly so that they can act to center adjacent nested cups when brought into stacking engagement. Thus, as the bottom margin or circumferentially extending stacking surface of an uppermost cup engages the stacking pleats **20** of a lowermost cup, the connecting walls **24**, by reason of their angular disposition, will act to center adjacent containers.

Each of the stacking pleats **20**, by reason of the juxtaposed or abuting wall portions **22**, **22**, whichever may be desired, provide at least double container wall thickness elements which serve as rigid stacking abutmetns providing a positive limit to telescoping between adjacent nested cups due to the elimination of any substantial expansion or contraction of the cup body in the vicinity of the stacking pleats **20**. Also, since the stacking pleats **20** in the FIGS. 1–3 embodiment traverse at least part of the bottom wall **12** and side wall **14** of each container, there will be more positive overlap from a stacking standpoint in adjacent nested containers. As will also be apparent, the stacking engagement between each pair of adjacent nested cups as shown in FIG. 3 of the drawings will provide an air space between the bottom walls **12** of adjacent nested cups, and the spaces between adjacent stacking pleats **20** will provide air channels for venting air into this space. This will prevent the hugging or tendency to resist separation by reason of the introduction of air pressure between adjacent cups, thus enabling cups to more easily

drop from a stack. The slight side wall spacing between adjacent cups which is created by the stacking engagement is further complemented by the centering action between adjacent cups which insures that an air space can be established throughout the entire body of the cup.

It will be further apparent that the stacking pleats **20** due to their construction will laterally rigidify the side wall in the vicinity of their location as well as part of the bottom wall of each cup. It is conveivable that certain forms of the invention may utilize the vertical rigidity of the stacking pleats **20** to strengthen the bottom wall and prevent the sagging or "oil-canning" above mentioned While the stacking pleats **20** of this invention depend upon vertical and lateral rigidity, and thus are distinguished from my prior patents mentioned above which employ axial resiliency in a stacking facility to absorb shock and prevent damage between containers in a nested stack, the stacking pleats **20** are designed to solve stacking problems in thin wall plastic containers by a technique which although not advantageous as the stacking facilities of my prior patents mentioned above, is quite useful and can be employed in this particular field.

Reference is now made to the various other embodiments of the present invention, and in each case, similar reference numerals will be employed with different alphabetical identification to identify corresponding parts in the various figures of the drawing.

Considering FIG. 4 of the drawings, it will be seen that there is a pair of adjacent nested containers **10***a* which conform in all respects to the containers **10** illustrated in FIGS. 1–3 with the exception of the stacking facility **18***a*. In this particular embodiment, the stacking pleats **20***a* have a modified shape in the sense that the connecting wall **24***a* between the juxtaposed wall portions **22***a* of each stacking pleat is subdivided into two sections, an upper section **26** which tapers upwardly and outwardly generally after the fashion of the connecting wall **24** in the FIGS. 1–3 embodiment, and a lower section **28** which is substantially vertically arranged and substantially parallel with the axis of the container.

In the FIG. 5 embodiment, the stacking facilities **18***b* of each of the containers **10***b* is modified to show a slightly curving surface for the connecting walls **24***b* of each stacking pleat **20***b*. In FIG. 6 of the drawings, the connecting wall **24***c* between each pair of juxtaposed wall portions **22***c* of each stacking pleat is similar to the FIG. 4 embodiment in the sense that it is also subdivided into an upper and a lower section designated **26***c*, **28***c*, respectively. However, it will be noted that the upper and lower sections **26***c*, **28***c* of each connecting wall have a slight curvature thereto.

Each of the FIGS. 4, 5 and 6 embodiments will function generally in the same manner as the FIGS. 1–3 embodiment, including the centering action between adjacent nested containers. These embodiments will serve to indicate to those skilled in the art of the various modified constructions or shapes of the stacking pleats **20** which may be used in those instances where a centering action between adjacent cups in addition to the other advantages may be obtained. FIG. 6A indicates an opening **21C** on the bottom wall for each of the stacking pleats **20***c*, and this corresponds to the openings **21** in the FIGS. 1–3 embodiment. This type of construction would be typical for containers of the type illustrated in FIGS. 4 and 6.

Reference is now made to FIG. 7 of the drawings wherein a modified form of stacking pleat means **18***d* is employed in the cups **10***d*. In particular, the stacking pleat means **18***d* of the FIG. 7 embodiment comprises an inwardly directed element which extends from the juncture of the bottom wall and side wall **12***d*, **14***d*, respectively, of each cup **10***d* the stacking pleat element **20***d* is similarly of at least double wall thickness which respect to the thickness of the container body **10***d* as in the other embodiments, but is annularly disposed in a reversely tapering or back tapered manner with respect to the taper of the side wall **14***d* of each container. This stacking pleat element **20***d*, which may be circumferentially continuous or interrupted at selected points as shown by the phantom lines in FIG. 7 as may be desired, functions in a slightly different manner than the embodiments previously described. In particular, the stacking pleat element **20***d* of a lower container, when engaged by the bottom wall **12***d* of an upper container, will deflect downwardly about a point in the vicinity of the juncture of the bottom wall and side wall **12***d* and **14***d* respectively of the lower container, thus providing a degree of axial resiliency to a stack of containers. In this way, it will more nearly act as a shock absorber when a stack of containers is subjected to an axial load, such as by an inadvertent dropping of the stack. In considering the embodiment of FIG. 8, the containers **10***e* there illustrated incorporate a modified form of stacking pleat means **20***e*. In this respect, the connecting wall **24***e* between juxtaposed wall portions **22***e*, **22***e* of each stacking pleat extends first in a substantially vertically oriented direction from the bottom wall **12***e* of each container, and then at a point spaced from the bottom wall **12***e* of the container, proceeds in a direction substantially normal to the axis of the container. This will provide a substantially horizontally directed supporting shelf **30** which cooperates with the bottom margin or circumferentially extending stacking surface of an uppermost container to positively limit telescoping between adjacent containers. There is no centering action between adjacent cups, as in the FIGS. 1–6 embodiments, which although being a desirable feature, is not necessary for the functioning of the present invention. It is to be noted, however, that openings **21***e* are provided in the bottom wall of the containers **10***e* as shown in FIG. 8A adjacent the pleats **20***e* for the reasons previously given.

The two forms of containers shown in FIG. 9 and FIGS. 10–11 and identified **10***f* and **10***g*, respectively, differ from all previous embodiments in the sense that the stacking pleats are located entirely within the boundaries of the bottom wall of each container. Specifically, the substantially rectangular stacking pleats **20***f* in the containers **10***f* in FIG. 9 of the drawings are located entirely within the confines of the bottom wall, and project axially upwards therefrom. In connection with FIGS. 10–11 of the drawings, the stacking pleats **20***g* have a semi-oblong shape, and are located entirely within the confines of the bottom **12***g* of each container **10***g*. In each of the embodiments of FIG. 9 and FIGS. 10–11, it is important that space between each pair of juxtaposed wall portions in each stacking pleat, in the vicinity of the bottom wall of each container, has a dimension less than the connecting walls **24***f* and **24***g* of the stacking pleats **20***f* and **20***g* respectively so that there will be no telescoping movement therebetween in adjacent nested cups.

It is also possible to form the stacking pleats solely within the side wall of each container as is shown by the stacking pleats **20***h* in the container **10***h* of the FIG. 12 embodiment. There, it will be seen that the stacking pleats **20***h* cooperates in the same manner with the bottom margin or circumferentially extending stacking surface of an upper container to limit telescopical movement adjacent nested containers.

While the cups previously discussed refer to the circumferentially extending stacking surface as being the bottom margin of the container, it is also possible that such surface may be incorporated into the side wall or relate to the upper margin of the cups as is illustrated in FIGS. 13 and 14 of the drawings. Specifically, in FIG. 13, the cups **10***i* each are provided with a plurality of outwardly directed stacking pleats **20***i* in the side wall thereof which are designed to engage a circumferentially extending stacking surface **32** provided immediately above the stacking pleats **20***i* in each of the containers. The stacking surface **32** is generally horizontally directed and is radially inwardly offset relative to the stacking pleats **20***i* such that the stacking pleats **20***i* of an uppermost container will be capable of engaging and resting upon the

circumferentially extending stacking surface **32** of a lowermost container. In considering FIG. 14 of the drawings, it will be seen that the outwardly directed stacking pleats **20***j* in each of the cups **10***j* are radially outwardly directed from the side wall **14***j* of each container and are positioned in close proximity to the rim **16***j* which defines the upper margin of each cup **10***j*. Each of the stacking pleats **20***j* are radially outwardly directed from the side wall **14***j* of a respective cup by an amount which causes the lowermost surface of each of the stacking pleats **20***j* to engage and rest upon the upper margin defined by the rim portion **16***j* of each cup.

The stacking pleats in each of the embodiments of FIGS. 12–14 are similar in form to those previously referred to in the FIGS. 1–6 embodiments, with the exception that there is no centering action in the various embodiments illustrated although this could be provided if such were desired. Thus, the stacking pleats in the FIGS. 12–14 embodiments enjoy all of the virtues and advantages which are inherent and which result from the particular stacking pleat constructions, including those virtues and advantages specifically mentioned above.

From the foregoing, it will now be appreciated that the present invention contemplates a stacking facility of new and unobvious character from those which have been shown or contemplated by the prior art. Although various embodiments of the present invention have been shown and described, it is with full awareness that many modifications thereof are possible. The invention, therefore, is not to be restricted except in light of the prior art and the spirit of the appended claims.

I claim:

1. A one-piece nestable seamless container of thin-walled plastic material having a substantially uniform thickness, comprising a bottom wall which is integrally joined at its margin to an upwardly and outwardly tapering side wall which terminates in an upper margin defining an open upper end, said container being provided with a substantially circumferentially continuous stacking surface, a plurality of generally axially extending and circumferentially spaced stacking pleats of double wall thickness being provided in the container in the vicinity of said circumferentially extending stacking surface, each of said stacking pleats being radially offset from the side wall of the substantially uniform in thickness container by at least twice the thickness thereof to permit cooperation of the stacking pleats with the substantially circumferentially continuous stacking surface of a like adjacent nested container to provide stacking therebetween, each of said stacking pleats having a pair of generally parallel, axially directed juxtaposed wall portions which are spaced from each other throughout substantially the entire axial height and at least partially across the radial width thereof by a distance less than the thickness of the substantially uniform in thickness thin-walled plastic container to offer sufficient resistance to deflection of the container in the vicinity of each of said stacking pleats for the continuous presentation of said stacking pleats relative to the substantially circumferentially continuous stacking surface of the like adjacent nested container to positively limit telescoping between containers and thereby preventing jamming.

2. The container as defined in claim **1** wherein there are at least three stacking pleats circumferentially and generally equidistantly spaced from one another about the axis of the container.

3. The container as defined in claim **1** wherein the substantially circumferentially continuous stacking surface is located at one of the margins of said container.

4. The container as defined in claim **3** wherein said stacking pleats project radially outwardly from the container side wall and are located in the vicinity of the upper margin of the container providing the circumferentially extending stacking surface.

5. The container as defined in claim **3** wherein said stacking pleats project radially inwardly from the cup side wall and are located in the vicinity of the bottom margin of the container providing the circumferentially extending stacking surface.

6. The container as defined in claim **1** wherein said stacking pleats are located in the side wall of the container.

7. The container as defined in claim **1** wherein said stacking pleats are located in the bottom wall of said container.

8. The container as defined in claim **1** wherein said stacking pleats traverse at least part of both the bottom wall and side wall of the container.

9. The container as defined in claim **8** wherein each of said stacking pleats includes at least a partial downwardly and inwardly tapering surface connecting said pair of juxtaposed wall portions thereof to aid in centering adjacent nested cups when brought into stacking engagement with one another.

10. The container as defined in claim **1** wherein the juxtaposed wall portions of each of said stacking pleats contact each other at least in the vicinity of the container wall from which said stacking pleats project.

11. A thin wall substantially uniform in thickness plastic container of integral one-piece construction having a bottom wall and a side wall diverging therefrom and terminating in an open upper end, said container having a plurality of generally axially extending and circumferentially spaced stacking pleats of double wall thickness each of which extends radially inwardly from the container side wall and traverse at least part of both the bottom wall and side wall of the container, each of said stacking pleats having a pair of generally parallel, axially directed juxtaposed wall portions which are spaced from each other throughout substantially the entire axial height and at least partially across the radial width thereof by a distance less than the thickness of said container to provide stacking engagement between said spaced stacking pleats and the bottom wall of a similarly configured container to positively limit telescoping therebetween and thereby prevent jamming.

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