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Rump et al.

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[54] **CONTAINER WHICH IS NESTABLE WITHOUT STICKING**

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[52] **U.S. Cl.** **206/520**

[51] **Int. Cl.** **B65d 21/02**

[58] **Field of Search** ..... 220/97 C, 97 F; 229/1.5 B

[56] **References Cited**

UNITED STATES PATENTS

3,091,360	5/1963	Edwards	220/97 C
3,262,626	7/1966	Davis	220/97 C
3,484,018	12/1969	Davis	220/97 C

Primary Examiner—George E. Lowrance

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[57] **ABSTRACT**

A nestable, cup-like container having special circumferentially extending stacking means formed in its sidewall which includes two sets of inwardly extending supporting projections, each set being intermediate the other, one set extending inwardly further than the other and serving as the primary means of support of a similar container when nested therein, whereas the other set serves as a secondary means of support for such a similar container.

6 Claims, 4 Drawing Figures

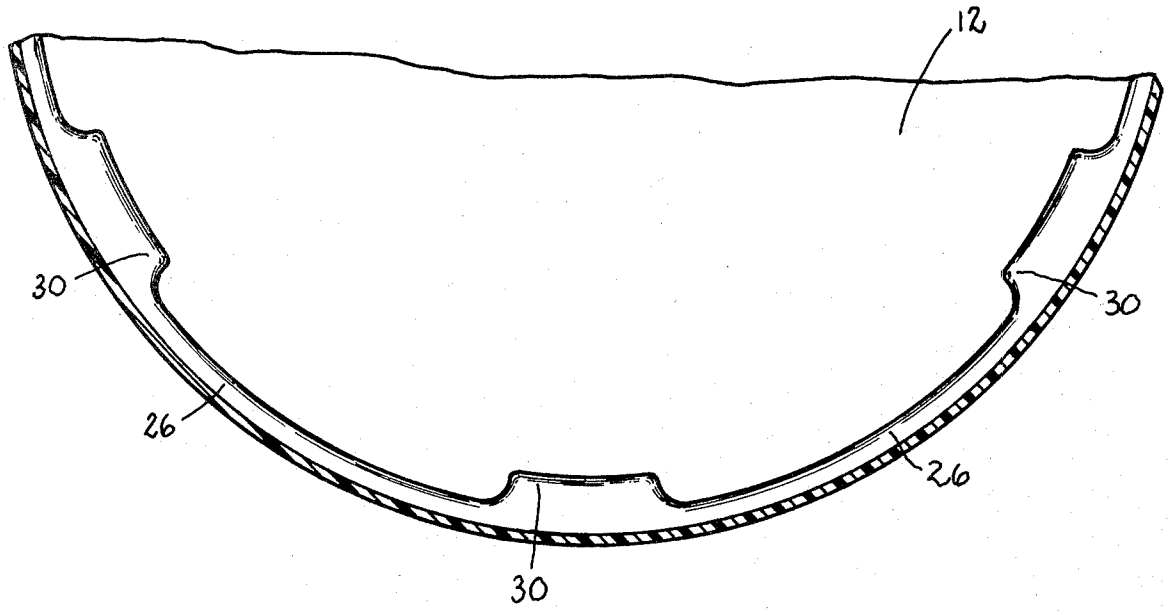


FIG. 1

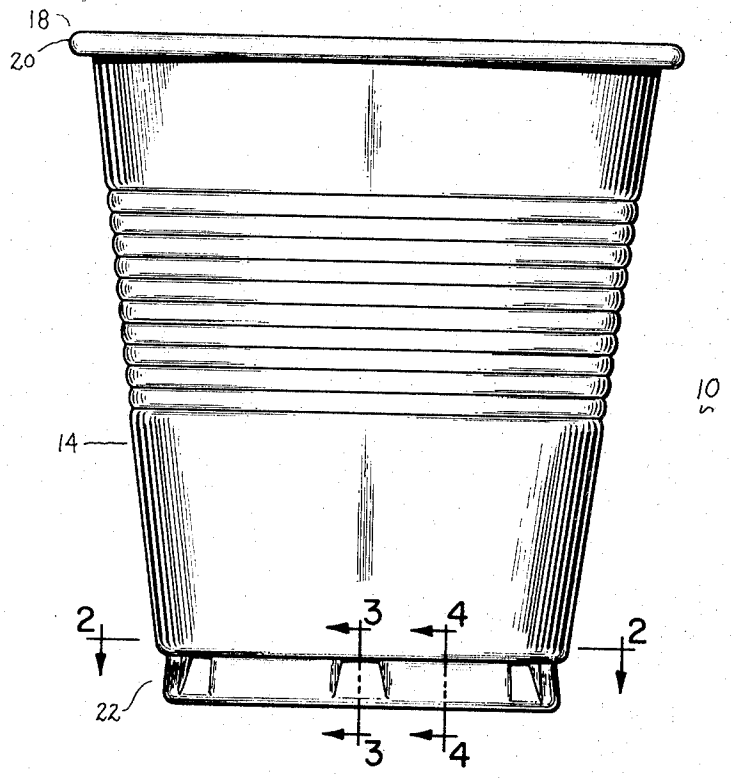


FIG. 2

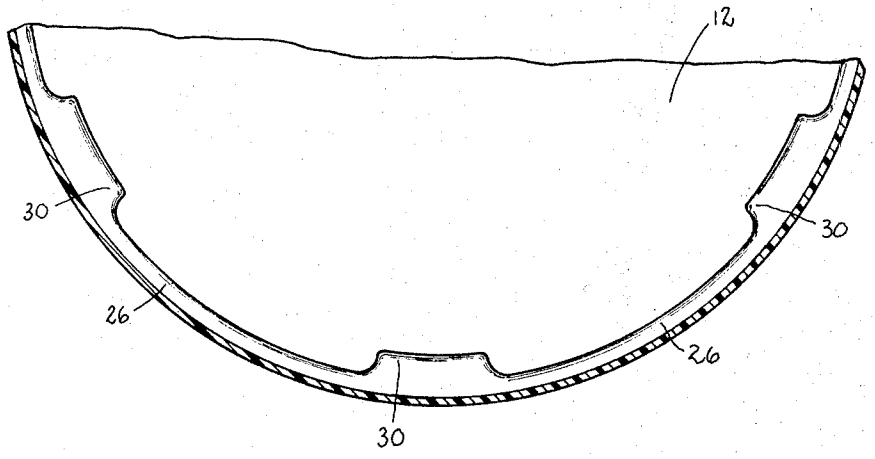


FIG. 3

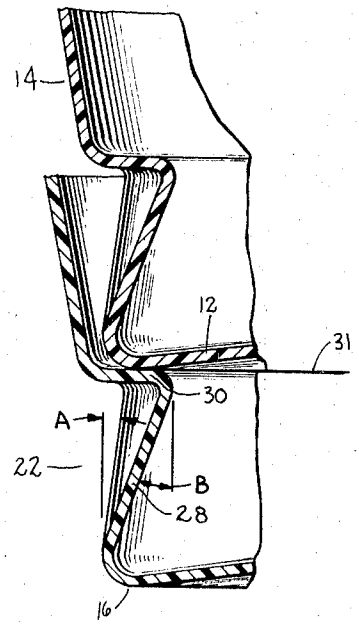
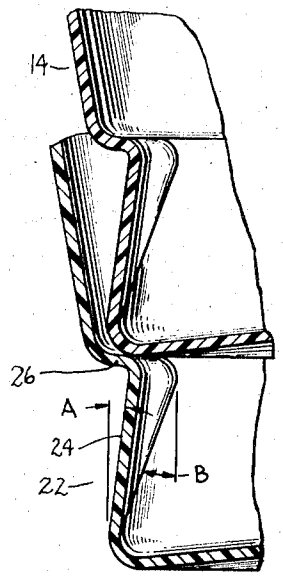


FIG. 4



CONTAINER WHICH IS NESTABLE WITHOUT STICKING

BACKGROUND OF THE INVENTION

This invention relates to plastic containers and more particularly to plastic containers which can be nested within and subsequently freely separated from each other without sticking.

The increase in the sale of beverages dispensed via automatic canteen devices has caused a sharp increase in the demand for single use, expendable containers which are adapted for use in such devices. However, problems have been encountered in designing containers for such a use in that it is necessary for each individual container to consistently readily drop by gravity from the bottom of a stack into vending position when the beverage purchaser puts his consideration into the dispensing device.

In general, these design problems have been overcome by incorporating an annular, horizontally disposed shelf or step in the cup intermediate its top and bottom margins or alternatively at its bottom margin to permit the cups to nest in a relatively friction-free manner. This shelf projects toward the interior of the cup, serves to support an adjacent cup in nested relationship and permits ready release of the lowermost cup from the next succeeding cup in the stack, particularly when the cups are stored in a vending dispenser. To form this horizontally disposed step or shelf, the container is tapered inwardly opposite to the general outward taper of the sidewall for a relatively short axial distance. Thus, in U.S. Pat. No. 3,139,213, this shelf is shown around the full periphery of the cup, and undoubtedly, such a configuration which extends sufficiently inwardly toward the cup axis as to provide maximum interference with full insertion of a second container into the first represents the ideal in preventing telescoping (supported surface of one cup proceeding beyond supporting surface of another) when a stack of nested cups is axially loaded, e.g. during handling, or when the total height of the stack becomes too great. Unfortunately, when the shelf is extended sufficiently inwardly in this manner, the reverse angle of the tapered surface is so great as to interfere with the discharge of the cup from the molding cavity, thus resulting in reduced production rates, and at times distortion of the cup. In addition, when such a continuous stacking ring having a relatively severe reverse taper is employed, there is a significant tendency for the Z-shaped area to fold on itself and collapse in accordion fashion when the stack is loaded from above, which, of course, causes undesirable frictional sticking of adjacent cups in the stack.

To alleviate these problems, it has been proposed, as disclosed in British Pat. No. 1,015,351, and Australian Pat. No. 254,306 to interrupt such a continuous support configuration, or in other words, portions intermediate supporting shelf sections would be uninterrupted parts of the cup sidewall. A somewhat different interrupted configuration is disclosed in U.S. Pat. No. 3,091,360, wherein support is obtained by the interference between a large diameter surface at the base of a support lug of an inner, supported container and a smaller diameter surface at the top of such a lug of an outer, supporting container. In addition, the spaces intermediate such lugs in the outer supporting container is open to the atmosphere with respect to the inner supported container, such openings allowing the chamber between adjacent stacked cups to be vented. Though such configurations can function admirably under certain conditions, they are not without limitations. Theoretically, with the cup configurations of the aforementioned British and Australian patents, it is possible for the non-interfering portions of the cup intermediate the support shelf portions to line up during nesting, especially if such non-interfering portions extend around a substantial portion of the cup periphery, and two such adjacent cups would accordingly jam tightly against one another. Decreasing the extent of interruption increases the susceptiblity of the cup to the collapsing and mold removal problems mentioned previously. In addition, with any of the interrupted configurations of the aforementioned patents, the load bearing supporting surface is diminished to the extent of the interruptions, and accordingly, the susceptability of cups within a stack to telescope is increased for the application of a given load.

SUMMARY OF THE INVENTION

Now, however, a new stacking ring configuration has been developed which overcomes this dilemma of difficulties occurring in the prior art.

Accordingly, it is a principal object of this invention to provide nestable containers adapted for use in automatic dispensing devices.

Another object of this invention is to provide nestable containers adapted for use in automatic dispensing devices which are provided with novel means to minimize contact between adjacent walls of containers within a stack.

A further object of this invention is to provide nestable containers adaptable for use in automatic dispensing devices which can be produced at high rates with a minimum of distortion during ejection from the forming molds.

An additional object of this invention is to provide containers of the aforementioned variety having a stacking means therein which gives good balance between ease of removal of the container from the mold and resistance to telescoping.

A specific object of this invention is to provide a stacking ring configuration in a thin walled, plastic container which provides substantial support during stacking, does not collapse when axially loaded under normal handling conditions, yet is readily released from the mold in which it is formed.

Other objects of this invention will in part be obvious and will in part appear hereinafter.

These and other objects are accomplished by providing a nestable, thin walled, cup-like plastic container comprising a circular bottom, a sidewall joined to the bottom at its peripheral margin and tapering generally upwardly and outwardly to an upper margin defining an open end and circumferential stacking means forming a part of the sidewall, said stacking means comprising a first series of circumferentially positioned, inwardly extending projections having upper surface portions for supporting contact with portions of a similarly configured container when nested therein and a second series of projections intermediate the first series extending inwardly beyond the first series having upper surface portions for supporting contact with additional portions of the similarly configured container, the length of the second series of projections measured circumfer-

entially of the container being no greater than that of the similarly measured length of the first series of projections.

BRIEF DESCRIPTION OF THE DRAWINGS

In describing the overall invention, reference will be made to the accompanying drawings wherein:

FIG. 1 is a front, elevational view of a cup embodying the present invention;

FIG. 2 is a horizontal, sectional view on an enlarged scale taken along line 2—2 of FIG. 1;

FIG. 3 is a longitudinal, sectional view illustrating the manner in which the portion of the cup seen in a sectional view taken along the line 3—3 of FIG. 1 supports the next adjacent cup in a stack; and

FIG. 4 is a view similar to FIG. 3 taken along the line 4—4 of FIG. 1.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now to the drawings, there is illustrated in FIG. 1, a nestable, thin walled, cup-like plastic container 10 comprising a circular bottom 12 which may be raised inwardly as illustrated in FIGS. 3 and 4 to provide improved resistance against outward deformation when the container is full. Cup 10 further includes sidewall 14 joined to a peripherally continuous margin 16 of bottom 12 and tapering generally upwardly and outwardly in a substantially frustro-conical configuration to an upper margin 18 defining an open end. Upper margin 18 is preferably provided with a rim 20, and is of larger diameter than lower peripheral bottom margin 16.

Peripheral stacking means 22 is formed as an integral part of sidewall 14 in the lower portion thereof. Stacking means 22 comprises a first series of reversely tapered intermediate portions 24 interconnecting peripheral margin 16 with a set of projections 26 at the upper end of each portion 24 which extend inwardly from sidewall 14 a distance on the order of 0.07 inch. In the illustrated embodiment, each portion 24 is at an angle of 6° with the vertical as defined by A in FIG. 4. To permit ease of release of container 10 from its forming mold while at the same time permitting projections 26 to provide a level of support in a manner to be more fully described hereafter, A should be kept within the range of from 2° to 6° with respect to the axis of cup 10. Also provided as an integral part of circumferential stacking means 22 is a second set of reversely tapered intermediate portions 28 each of which lies adjacent an intermediate portion 24. Portions 28 interconnect continuous peripheral margin 16 with a series of projections 30 at the upper ends thereof which extend inwardly from sidewall 14 a distance on the order of 0.103 inch. Intermediate portions 28 in the illustrated embodiment form an angle B with the vertical of 15°. Angle B is perferably maintained within the range of from 6.5° to 25° with respect to the axis of cup 10 for the same reasons given for holding angle A within the aforesaid range. Each projection 30 extends inwardly toward the axis of cup 10 beyond projections 26, as is apparent from FIG. 2, and the total circumferential length of projections 30 is less than that of the similarly measured length of projections 26. Though angles A and B are different in order to structurally strengthen stacking means 22 against an accordion type collapse, the upper surface of each projection 26 and 30 preferably lies in a substantially common horizontal plane 31 which is perpendicular to the axis of cup 10.

Referring now more particularly to FIG. 3, there is illustrated a plurality of nested thermoplastic cups 10 forming a stack, each of the cups being constructed as illustrated in FIGS. 1 and 2. Inner or upper cup (FIG. 3) receives its primary support through contact between the outer surface of its peripheral margin 16 with the upper surface of each inwardly extending projection 30 in the outer, lower cup. However, as illustrated in FIG. 4, the remaining portions of the outer surface of peripheral margin 16 of the inner or upper cup is also supported through interfering contact with the surface of each projection 26, such that inner cup 10 is supported about the full periphery of its margin 16. Thus, due to the presence of shallow projections 26, in combination with deep projections 30, it is impossible for one cup to telescope within another, or for the supporting projections to line up with one another such that an inner cup may fit completely within an outer cup in an undesirable manner.

The above description and particularly the drawings are set forth for the purpose of illustration only and is not to be taken in a limited sense.

It has been found with the novel stacking means of the present invention, that the total circumferential length of the series of deep projections 30 should always be less than that of the series of shallow projections 26 in order for the container to be readily released from its forming mold. Moreover, it is preferred that this circumferential length of projections 30 be maintained at a level of from 25 to 100 percent of that of series 26. Since projections 30 provide the primary means of support of a nested container, it is important that they provide more interference with such nested container than that of projections 26. Accordingly, each projection 30 should always extend inwardly toward the axis of container 10 an extent greater than that of a projection 26, and preferably by an amount equal from 1.5 to 13 times the inward extent of each projection 26. Furthermore, it is preferred that the number of deep projections 30 around the circumferential length of the container be from 3 to 8 and be substantially equally spaced from each other.

The cups of the present invention may be injection molded or may be formed from thermoplastic sheet material by causing a portion of the sheet to be drawn or forced into a female mold cavity and against the inner walls thereof. In this manner, upon conformation of the sheet to the inner configuration of the mold cavity, the plastic cup is cooled somewhat after which it is ejected from the mold cavity. The difficulty or ease in which the cup is ejected will depend to a large extent on the means used to eject the cup, the tendency of the plastic to stick to the inner walls of the mold cavity and the negative angles or projections within the female molding cavity. In the present invention, we are concerned with reducing the gripping action caused by the projections or annual protruberances in the mold cavity which are used to form the shoulders of the stacking ring of the cup, while at the same time maintaining the release efficiency of the cups when in nesting relationship prior to vending. It is found that the projections or protruberances required in the mold or cavity to produce the stacking means in the present cup offer a substantially reduced resistance to the withdrawal or stripping of the cup from the mold.

In general, the plastics used to form the cups of this invention are thermoplastic materials which include polymers such as those based on styrene, vinyl halide, vinylidene halide, vinyl acetate, cellulose acetate or butyrate, ethyl cellulose, acrylic acid esters, methacrylic acid esters, acrylonitrile, methacrylonitrile, ethylene, propylene and higher olefins, isobutylene, fluoro-olefines, and chlorofluoro-olefines, as well as copolymers, interpolymers, graft polymers, and chlorinated and chlorosulfonated polymers of the monomers corresponding to the above-mentioned polymeric products and mixtures of the same. A particularly useful material for forming these cups is a rubber-modified polystyrene or polystyrene which preferably has incorporated therein a rubber compound grafted or mechanically blended therein.

As previously indicated, the cups of the present invention find application in beverage vending machines, such as coffee machines and soft drink machines and wherever storage space dictates that a plurality of cups in telescoping arrangement must be stored. The cups have improved structural stability and can be easily dispensed with little or no difficulty from the bottom of a stack while at the same time presenting fewer manufacturing difficulties as regards the molding operation and particularly the withdrawal of the cup from the mold. Consequently, they may be produced at a high rate and at a very low cost.

It is obvious that many variations may be made in the products set forth herein without departing from the spirit and scope of this invention, as hereinafter claimed.

What is claimed is:

1. A nestable, thin walled, cup-like plastic container comprising a circular bottom, a sidewall joined to said bottom at its peripheral margin and tapering generally upwardly and outwardly to an upper margin defining an open end and circumferential stacking means forming a part of said sidewall, said stacking means comprising a first series of circumferentially positioned inwardly extending projections reversely tapered toward the container axis having upper surface portions for supporting contact with portions of a similarly configured container when nested therein and a second series of projections intermediate said first series extending inwardly in a reverse taper toward the container axis beyond said first series, said second series having upper surface portions for supporting contact with additional portions of said similarly configured container, the length of the second series of projections measured circumferentially of the container being no greater than that of the similarly measured length of the first series of projections.

2. The container of claim **1** wherein said second series of projections are between three to eight in number and are substantially equispaced circumferentially around the container.

3. The container of claim **1** wherein said second series of projections extend inwardly of the first series of projections by an amount equal to from 1.5 to 13 times the extent of inward projection of the first series of projections.

4. The container of claim **1** wherein said circumferential length of the second series of projections is from 25 to 100 percent of that of the first series of projections.

5. A plurality of thin walled, substantially identical, nested thermoplastic cups forming a stack, each of said cups comprising a base, an outwardly tapering sidewall extending upwardly from the peripheral margin of the base to an upper margin defining an open end and circumferential stacking means forming a part of said sidewall, said stacking means comprising a first series of circumferentially positioned inwardly extending projections reversely tapering toward the cup axis having upper surface portions in supporting contact with portions of the peripheral margin of the next uppermost container in the stack and a second series of projections intermediate said first series extending inwardly in a reverse taper toward the cup axis beyond said first series and having upper surface portions in supporting contact with other portions of the peripheral margin of said next uppermost container in the stack, the extent of circumferential contact between the upper surface portions of the second series of projections and the peripheral margin of said next uppermost container being less than the extent of circumferential contact between the upper surface portions of the first series of projections and the peripheral margin of said next uppermost container.

6. The container of claim **5** wherein the two sets of reversely tapered intermediate portions interconnect the peripheral margin of the container with the inwardly extending projections, the set of reversely tapered portions connecting the most inwardly extending projections being at an angle of from 6.5° to 25° with the vertical, the other set of reversely tapered portions being at an angle of from 2° to 6° with the vertical.

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