Nov. 14, 1950 R. J. KIECKHEFER 2,530,124

NESTED CUP

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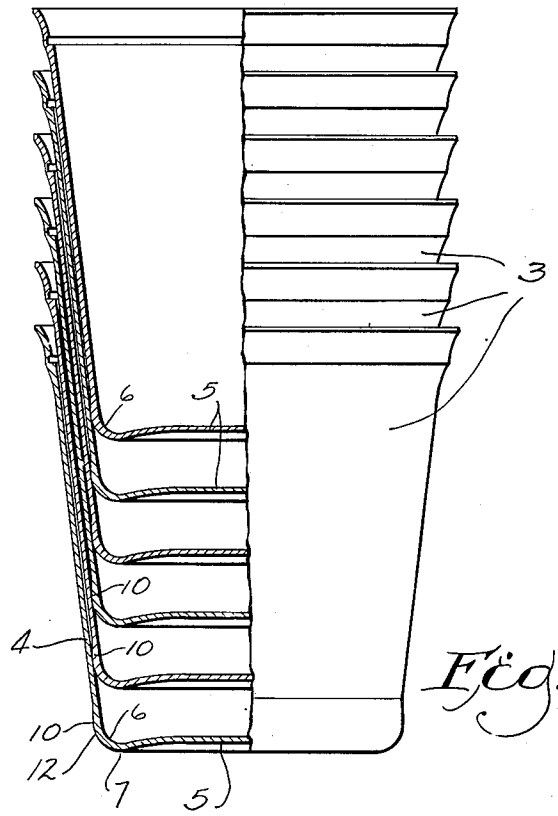


Fig. 1.

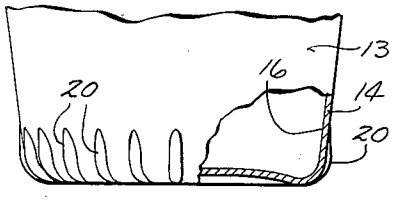


Fig. 3.

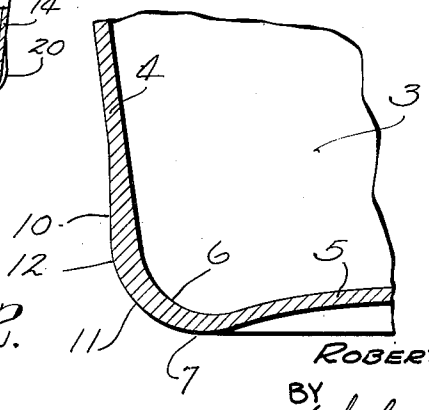


Fig. 2.

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NESTED CUP

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This invention relates to improvements in nested cups and cups adapted for nesting.

In the manufacture of cups having a bottom flush with the lower margin of the walls and merging therewith on a gradual curve, it is found that the angle of the cup wall to the vertical is only acceptable commercially if confined within an extremely narrow range of angles. Cups of the class referred to are made of pulp, paper, plastics, and other materials. In such cups, as heretofore made, there has been nothing to restrict the telescopic nesting interengagement of the cups except the contact between the walls themselves. In this respect, such cups are different from cups so made that the bottom is elevated and serves to limit the nesting engagement.

Where the nesting engagement is limited by contact between the walls, the angularity of wall usually required commercially permits the walls to wedge so tightly as to make difficult the separation of the cups in the nested stack because of the friction of the area of the wall surface in nested contact. A wall angularity of such degree as will virtually eliminate friction between such surfaces as are in nested contact so reduces the size of the bottom in relation to the size of the lip as to make the cup appear awkward, and the cup is in actual fact top-heavy and easy to upset.

It is the object of the present invention to provide means incorporated externally in the wall of the cup to prevent wedging and facilitate separation of the cups in the stack without requiring the wall angle to be increased beyond the range dictated by commercial considerations. It will be apparent that not every means of limiting the nesting movement would be suitable. Whatever limiting means is employed must be such as will not interfere with the withdrawal of the cup from any molds or forming dies used in cup manufacture, and the preferred means will not render the cup unsightly or impair its strength, or make it difficult to clean or interfere with any operations which may subsequently be performed upon it.

In the drawings:

Figure 1 is a view partially in side elevation and partially in section showing a stack of cups embodying the invention.

Figure 2 is an enlarged fragmentary detail of a lower side portion and bottom of one of the cups.

Figure 3 is a fragmentary detail view on the scale of Figure 1, showing a modified form of cup embodying my invention.

Like parts are identified by the same reference characters throughout the several views.

Each of the cups **3** is formed in such a manner that the major length of its side wall **4** comprises the frustum of a cone having approximately a seven degree angle to the axis of the cone. The

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bottom **5** is integral with the side wall, the inner surfaces merging on a broad curve as indicated at **6**. The bottom may have an upward convexity so as to ensure non-interference with the firm seat provided by the annular exterior surface at **7**.

The particular cups herein disclosed are molded of paper pulp, but, as above indicated, the invention is also applicable to cups of other materials, whether molded or fabricated. The particular advantages of the invention are realized when the relation of the bottom to the side wall is such that the cup bottom does not provide a stop limiting the wedging of one cup within another.

To overcome such wedging, the first disclosed embodiment of the present invention contemplates that each cup be provided at **10** with a cylindrical surface deviating from the general frusto-conical external surface of the wall **4**. This results in thickening the wall in the zone indicated at **10** and increasing the radius of the curve at **11** as compared with the radius of the interior curve at **6**. Although the wall surface **10** may appear, to the eye, to flare outwardly in a downwardly direction, the fact is that it is cylindrical, thus making it possible to withdraw such a cup from a forming die in the usual manner and to conduct pressure finishing operations in the usual manner.

The difference in the overall radial dimensions of the cup zone **10**, **11**, when the cup is made in accordance with this invention, as compared with the corresponding dimensions of prior art cups, omitting the cylindrical surface **10**, may be so slight as to be of the order of $\frac{1}{100}$ of an inch. Yet, as clearly shown in Figure 1, the cylindrical zone of each cup serves to space the entire remaining wall portions of each cup approximately $\frac{1}{100}$ of an inch from the wall portions of other cups with which it is nested. No matter how firmly cups embodying this invention are stacked together in the nested form illustrated in Figure 1, the slightest tilting of the cups in the stack will immediately free them, the broad external curve at **11** acting like a universal bearing and immediately releasing such frictional engagement as may exist, it being apparent that all friction is necessarily limited to the zone where the curve **11** merges with the cylindrical wall **10** at **12**.

It will be understood that the interior surface of the cup may retain its original curvature. The interior curve represented at **6** between the interior surfaces of the bottom and wall portions of the cup may, if desired, remain wholly unchanged and the thickening of the wall to the slight extent necessary to provide a cylindrical surface at **10** not only has the advantage as above described, but actually increases the stability and

meets the other objectives specified for the invention.

In the modified embodiment of Figure 3, the cup 13 has its wall 14 at the same angle of approximately seven degrees to the axis which the experience of the industry has found to be desirable. Its inner surface at 16 retains its conventional smooth and easily cleaned shape, having neither ribs nor flutes.

Its lower external surface, instead of being fully cylindrical as in the construction shown in Figure 1 and Figure 2, merely approaches a cylindrical outline to the extent that it is provided with ribs at 20, the apices of which extend to an imaginary cylinder. For such material as plastics or the like this is a very satisfactory arrangement to keep the otherwise frusto-conical wall portions of nested cups out of contact. Plastics are sufficiently firm and unyielding so that a full cylindrical contour is not necessary for the purpose. The less dense and more easily compressible the material of which the cup is made, the more important it may be to have the zone 10 approach a fully cylindrical form.

It will be understood that the ribs 20 illustrated in Figure 3 exemplify but one possibility in the way of providing projections from the external base portion of each cup to space its frusto-conical wall portions from the like wall portions of other cups. Like the full cylindrical outline shown at 10 in Figure 1, the ribs 20 of Figure 3 have the advantage of permitting easy withdrawal of such a cup from a forming die or mold.

I claim:

1. A molded container having a generally frusto-conical wall and an integral bottom with which both the interior and exterior surfaces of the wall merge curvilinearly, the said wall being provided immediately above the inner surface of said bottom with external spacing means comprising portions slightly thickened outwardly beyond a downward projection of the frusto-conical external surface of the rest of the wall but within a cylindrical outline merging therewith so that the container may be withdrawn from a mold, the overall diameter of said spacing means being smaller than the interior of all portions of the cup other than the extreme bottom portions thereof, whereby said container may be nested in a like container, the said spacing means providing only tangential contact between containers so nested.

2. The container of claim 1 in which the slightly thickened wall portions have the form of peripherally spaced projections.

3. The container of claim 1 in which the walls are of substantially uniform thickness throughout a major portion of their height, deviating from such substantial uniformity only where thickened adjacent the bottom as aforesaid.

4. A molded one-piece container adapted to nest compactly with identical containers and yet to be readily freed from any tendency toward frictional retention in nested engagement, said container comprising a generally frusto-conical wall and integral bottom, the wall being generally of uniform thickness and having inner and outer surfaces at substantially uniform spacing except in a predetermined narrow peripheral zone in a wall portion otherwise substantially fully engageable with a like nested cup, one of said surfaces having a portion deviating gradually from the other in said zone to increase the wall thickness and to vary said surface portion from frusto-conical toward a cylindrical form, whereby the said portion can be withdrawn from a mold and will nevertheless provide contact of the deviating surface substantially in a peripheral line about a like nested cup, cups so nested being elsewhere spaced by the said thickened wall and relatively pivotable upon each other at said zone for releasing any tendency toward frictional retention.

5. A one-piece container of molded pulp adapted to nest compactly with identical containers and yet to be readily freed from any tendency toward frictional retention in nested engagement, said container comprising a generally frusto-conical wall of substantially uniform thickness throughout most of its height, and a bottom integral with the wall and having inner and outer surfaces, the said wall flaring upwardly at an angle of approximately seven degrees from its axis and being of substantially uniform thickness for almost all of its height, a portion of said wall having a substantially cylindrical surface in a narrow zone above the inner surface of said bottom merging smoothly with an adjacent frusto-conical surface thereof, whereby said container may be drawn from a mold and nevertheless the said cylindrical surface will provide a substantially linear peripheral spacing contact with an identical nested container to permit relative pivotal movement of the nested containers to free them from mutual frictional retention.

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