July 24, 1962 J. R. CAINE 3,045,887

THIN WALLED PLASTIC CONTAINER

Filed Jan. 28, 1958

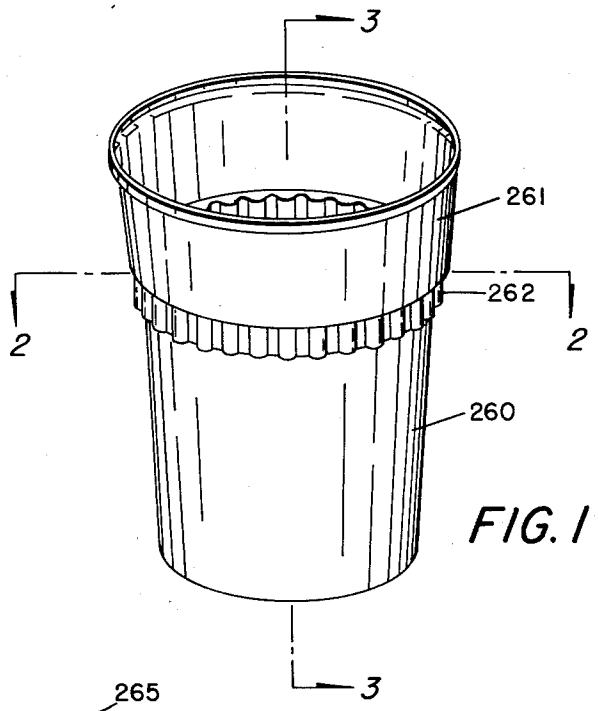

FIG. 1

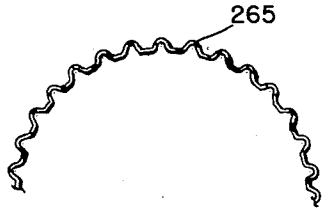

FIG. 2

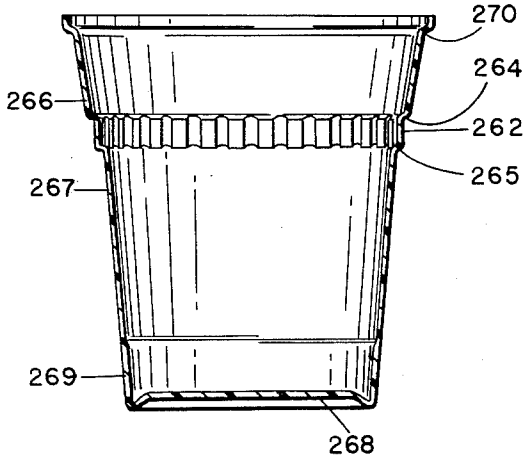

FIG. 3

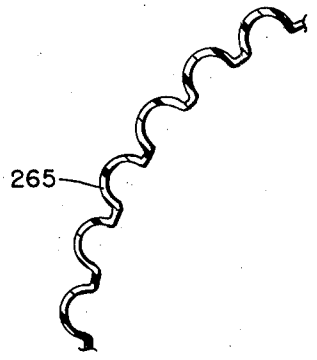

FIG. 4

INVENTOR.
JAMES R. CAINE
BY Jordan C. Clark
ATTORNEY

United States Patent Office 3,045,887 Patented July 24, 1962

3,045,887

THIN WALLED PLASTIC CONTAINER

James R. Caine, 797 Crestview Ave., Akron, Ohio

Filed Jan. 28, 1958, Ser. No. 711,739
5 Claims. (Cl. 229—1.5)

This invention relates to plastic containers and more particularly to plastic drinking cups.

Plastic cups are recognized as in many ways more desirable than paper cups, but heretofore have been very expensive. The preferred cup of this invention is made relatively inexpensive by having the middle portion of the wall of the cup—that is, the portion around the cup between the top and the bottom portions of the wall—relatively thin. The portions of the wall above and below this are made relatively thick so that the cup holds its shape not only when filled with a liquid but also, so that it does not collapse (although it gives somewhat) when pressure is applied to opposite sides of it by a person grasping it to lift it to drink from it. If the entire wall is made too thin the cup does not hold its shape. If it is made too thick it is too expensive. By making the upper portion of the wall of the cup—that is, from the rim down about one to two fifths of the way—of plastic that is thick enough to hold its shape and withstand the pressure of a person grasping the cup, the upper portion of the cup is made to retain its shape. Similarly, by making the cup from the bottom up about one to two fifths of the height of the cup of thicker plastic, the cup retains its shape not only when lifted but when filled with liquid, and resting on any flat surface. The bottom of the cup is made thick enough so that when the cup is lifted it will retain its shape without sagging too much. Thus the top portion of the wall, and the bottom of the cup are preferably made thicker than the middle portion of the wall of the cup.

The cup of this invention is advantageously drawn from a heated sheet of plastic. If a rigid polystyrene is used and the cup is to be used for hot drinks, this sheet may advantageously be about 0.035 to 0.055 inch thick; for cold drinks it may be thinner. In drawing this stock to form the cup, the top and bottom portions of the wall of the cup are made about 0.015 to 0.025 inch thick, and the central portion may be as thin as about 0.006 to 0.014 inch thick. The bottom of the cup will then be about 0.015 to 0.025 inch thick. The bottom of the cup need not be the same thickness as the thicker portions of the walls. The proportion of the wall expanse that is thickened may be varied. Ordinarily the very top of the cup will be thick so that it stands upright and does not become distorted when put to one's lips.

When the cup is drawn from plastic, the thick portions extend from the lip of the cup and from the bottom of the cup, and the bottom of the cup itself is ordinarily of approximately the same thickness as the bottom portion of the wall, although this is not necessary. It will depend on the manner of drawing the cup.

The thicker and thinner portions of the cup of this invention gradually shade into one another. There is no sharp stepping off of the wall from a thicker portion to a thinner portion.

The wall of the preferred cup of this invention tapers outwardly from the bottom up, so that the cups may be nested in one another. To facilitate nesting, and to increase the volume content of the cup, the upper portion advantageously tapers outwardly at a somewhat greater angle than the bottom portion. Thus the bottom portion of the wall may taper at an angle of about 5 degrees, and the angle of the upper portion may be about 10 degrees. In the preferred cup of this invention, the wall

is stepped outwardly from the lower tapering portion to the upper tapering portion, and the bottom of the upwardly tapering portion is preferably corrugated. The corrugations prevent one cup from fitting tightly within another. Thus, each of a nest of the cups has its bottom held above the bottom of the next lower cup by a distance equal to the height of the corrugations. As will be explained in detail in what follows, this is because the corrugations are not symmetrical around the cup.

In drinking a very hot liquid or a very cold liquid from the cup, if the cup is held at the corrugations the rate of heat transfer between the cup and the fingers holding the cup is much lower than if the cup is held at a smooth portion of the wall. This is because the corrugations reduce the area contact between the wall of the cup and the fingers. As a consequence, a cup containing a very hot or a very cold liquid can be held more comfortably at the corrugation than elsewhere.

In order to give added strength to the top of the wall and thus reduce its tendency to flatten when grasped by the fingers of a person lifting the cup, or by mechanism employed in dispensing individual cups from a nest of the cups, the cup may advantageously be stepped outwardly within a small fraction of an inch of the top of the cup. This outwardly extending portion at the top of the wall is held in the worm gears of a dispensing unit from which the cup is dispensed, and also tends to prevent collapse of the cup, as do the outwardly extending portions of the wall at the corrugations.

The invention will be further described in connection with the accompanying drawings.

FIG. 1 is a perspective view of a cup embodying the principles of the present invention.

FIG. 2 is a section through the corrugated portion of the cup on the line 2—2 of FIG. 1.

FIG. 3 is a vertical section of the cup on the line 3—3 of FIG. 1.

FIG. 4 is an enlarged section through the corrugations of the cup showing that the individual corrugations are not identical.

The drawings are illustrative and it will be understood that modifications are possible within the scope of the invention as defined in the claims.

A finished cup of the preferred design is shown in FIGS. 1–4. The walls taper upwardly and outwardly. The taper of the lower portion **260** is not as great as that of the upper portion **261**. The corrugated area **262** is immediately below the upper portion **261**. At the top and the bottom of the corrugations the cup is stepped inwardly at **264** and **265**. The individual corrugations are not uniform in cross section, as illustrated in FIG. 4, so that when one cup nests in another cup the corrugations do not mate with one another (except very rarely), but the upper cup is held out of any large surface contact with the lower cup. If the corrugations were uniform and the cups nested snugly within one another it would be difficult to separate them because a vacuum would be created between the two cups on separation. The corrugations prevent formation of a vacuum because air is easily transferred around them from the upper portion to the lower portion of the cup. The portion **266** of the wall, which is immediately above the corrugations, is stepped outwardly from the corrugations to permit the flow of air to the corrugations when the cups are nested. Substantially the only contact between the nested cups is the contacting area of the corrugated portion of an upper cup resting on the corrugated portion of a lower cup.

The portion **266** of the wall of the cup above the corrugations is somewhat thicker than the portion of the wall **267** at the middle of the cup below the corrugations. Also, the bottom **268** of the cup and the bottom of the

wall **269** are somewhat thicker than this middle portion. In a drinking cup of the proportions illustrated, made of rigid polystyrene, the bottom **268** of the cup and the two wall portions **266** and **269** are advantageously about 0.025 inch thick, and the thin portion **267** is about 0.008 inch thick. The cup is stepped outwardly at **270** near the rim to give a degree of rigidity to the cup which is not attained with a sheer wall. The cup is thus designed to be light in weight and use a minimum of plastic, while being sufficiently rigid to be readily dispensed from automatic dispensing machines and to be held by a drinker without danger of collapsing.

The corrugations permit easy separation of nested cups in a dispensing machine and give small surface contact with the fingers of a person drinking from the cup, reducing the transfer of heat either from the cup to the person, or from the person to the cup.

Modifications in the shape of the container are possible without departing from the scope of the claims which follow. A preferred method of making the present container and an apparatus capable of carrying out the method are disclosed in my copending application Serial No. 176,148 filed February 27, 1962, which constitutes a division of the present application.

This application is a continuation-in-part of my application Serial No. 612,614 filed September 28, 1956.

What I claim is:

1. A thin-walled plastic cup-like container of the type which would normally be gripped by hand comprising a bottom and annular flexible wall means extending upwardly from the periphery of said bottom and terminating in an open top, said annular wall means including a lower annular section adjacent said bottom, an upper annular section defining said open top and a central annular section between said upper and lower sections constituting a substantial part of said wall means, said upper section having a wall thickness and cross-sectional configuration producing a resistance to inward deflection not substantially greater than that sufficient to hold its shape when manually handled, said lower section and said bottom having a wall thickness and cross-sectional configuration providing a resistance to inward deflection not substantially greater than that sufficient to hold their shape when the container is filled and either resting on a flat surface or lifted therefrom, said central section adjacent said lower section gradually decreasing in wall thickness upwardly from said lower section from a thickness generally equal to the thickness of said lower section to a minimum thickness, and adjacent said upper section gradually decreasing in wall thickness downwardly from said upper section from a thickness generally equal to the thickness of said upper section to said minimum thickness, said minimum thickness being of such dimension that a planar-wall container of corresponding capacity having a uniform wall thickness of such dimension would be relatively unstable when manually handled in a liquid-filled condition, said central section including the area of said wall means which would normally be grasped when said container is manually handled and having an annular portion within such area shaped without increase of thickness so as to provide a resistance to inward deflection greater than that provided by a corresponding portion of said minimum thickness which is planar in section.

2. A container as defined in claim 1 wherein the upper extremity of said upper annular section is formed with a radially projecting annular portion and wherein said lower annular section includes an annular portion shaped without increase of thickness so as to provide a resistance to inward deflection greater than that provided by a corresponding portion of corresponding thickness which is planar in cross-sectional configuration.

3. A container as defined in claim 1 wherein said annular portion is disposed adjacent said upper section and comprises a plurality of projections extending outwardly beyond the portion of said wall means disposed therebelow, said projections presenting spaced finger-engaging surfaces having substantial downwardly facing horizontal components so that said container can be supported by finger engagement beneath said surfaces with less inward gripping pressure than that required to support a smooth-surface cylinder with its axis vertical, the contact area and distance between said finger-engaging surfaces being such that the rate of heat transfer between said annular portion and fingers of a person holding the container is much lower than if the container is held at a smooth portion of said wall means so that when it contains a very hot or a very cold liquid it can be held more comfortably at said surfaces than elsewhere.

4. A container as defined in claim 3 wherein said annular portion comprises top and bottom peripherally disposed projections superpositioned with respect to each other, the top projection being of greater diameter than the bottom projection and an intermediate band portion extending between said top and bottom projections, said intermediate band portion providing a plurality of relatively closely spaced serrations between said top and bottom projections.

5. A container as defined in claim 4 wherein said intermediate band portion extends between the outer periphery of said bottom projection and the inner periphery of the top projection, the inner periphery of the top projection being of a dimension no greater than the dimension of the outer periphery of the bottom projection, and serrations extending vertically throughout said intermediate band portion between said top and bottom projections and being spaced circumferentially within said band portion, at least some of said serrations having a size and spacing which vary from the size and spacing of other serrations.

References Cited in the file of this patent

UNITED STATES PATENTS

1,800,491	Zoia	Apr. 14, 1931
1,908,806	Allen	May 15, 1933
1,931,210	Steinacher	Oct. 17, 1933
2,345,876	Kohrtz	Apr. 4, 1944
2,367,799	Hull	Jan. 23, 1945
2,412,178	Seigh	Dec. 3, 1946
2,412,325	Devine et al.	Dec. 10, 1946
2,438,844	Dale	Mar. 30, 1948
2,530,124	Kieckhefer	Nov. 14, 1950
2,605,855	Lenz	Aug. 5, 1952
2,695,423	Pardee	Nov. 30, 1954
2,805,790	Smucker	Sept. 10, 1957
2,889,072	Lapham	June 2, 1959
2,905,350	Edwards	Sept. 22, 1959
2,942,301	Price et al.	June 28, 1960