This invention relates to paper cups of the dispensable type and to a cup of this general type of general conical form but with the bottom rounded to a substantial distance from the apex of the cone from which the cup is formed.

An object of the invention is to create a bottom to a conical cup of less than sixty degree angle whereby all substances served therein may be accessible to a conventional household spoon.

Another object of this invention is to provide an improved paper cup of less than sixty degree angle consisting of an acute angled frustro-conical side wall merging at its smaller end in a pleated bottom. The pleated bottom of the paper cup is sufficiently large to make the entire bottom accessible to a spoon and to direct the motion of fluid in the cup when agitated for suspending dissolvable fluids in the cup to aid the mixing thereof. Preferably, the bottom of the paper cup is formed by gathering into pleats the paper of an appreciable portion of the side wall of a conical paper cup at the apex thereof.

Other objects of the invention are to provide a cup of this type in which the paper is most economically used, the process of forming is reduced to its simplest steps, and the resultant cup is neat in appearance and readily telescoped within similarly formed cups for shipping.

Still another object of the invention is to provide a cup of this character in which the bottom is finished with a water resistant impregnation which gives added strength to the cup bottom.

These and other features of the invention will be seen from the following detailed specification read in connection with the accompanying drawings forming part thereof and in which—

Figure 1 shows a strip of blanks from which one type of cup is formed;
Fig. 2 shows a cup in the early stages of fabrication;
Fig. 3 shows a cup completely formed before rounding the bottom;
Fig. 4 shows a cup mounted upon a male die in position for descent of the female die;
Fig. 5 shows a cup being formed between the male and female dies;
Figs. 6–11, show a cup in successive stages of formation of the rounded bottom;
Fig. 12 shows a cup completely formed;
Fig. 13 shows a modified form of cup with rolled or beaded lip;
Fig. 14 shows a fragmentary vertical section of the rounded bottom of the cup;
Fig. 15 shows a cup pleated with a modified form of pleat in the vertical direction;
Figs. 16 and 17 show horizontal sections of vertically pleated cup bottoms;
Fig. 18 shows a vertical section of a vertically pleated cup bottom; and
Fig. 19 shows a horizontal section of a vertically pleated cup bottom taken on the line 18–18 of Fig. 18.

The rounded bottom cup

Dispensable paper cups of the conical type are widely used to provide a sanitary receptacle at soda fountains, in restaurants, in work gangs, and in the home. The side walls of cups of this type are normally formed in the shape of a cone with a very sharp apex, as the paper at the apex is usually more than one ply in thickness and brought to a firm and sharp point. This pointed cup apex not only presents a definite hazard in the handling and use of cups of this type but also forbids the use of a spoon to remove the final content of the cup as the pointed portion of the cup remains inaccessible to a spoon and also produces vortices when the contents of the cup are stirred, which prevent dissolving of much of any solid content which may be in the liquid in the cup. The pointed portion of the cup usually also serves to collect the solid portion of the content of the cup and prevents its removal either by stirring or by means of a spoon.

These difficulties, encountered in the use of the ordinary conical paper cup, are eliminated if a substantial portion of the conical side walls at the apex end of the cup can be deformed and the cup provided with a bottom which is sufficiently large to make it accessible to a spoon and so alters the characteristic motion of the fluid in the cup when stirred as to insure that the solids will be most readily dissolved and will not settle out into an inaccessible portion of the cup.

The purpose of this invention is to meet these objections to the conical paper cup by providing a frusto-conical cup preferably with a rounded bottom and a method of simply and uniformly forming such cups.

The accompanying drawings show a preferred form of the cup and method of its manufacture.

In Fig. 1 the cup blank 21 is shown as a familiar type such as is disclosed in my Patents Nos. 2,238,484 and 2,239,036. The blank may be cut from a continuous strip 20 and is formed into a conical paper cup in the manner disclosed in the aforementioned patents by rolling the blank about a conical mandrel which moves about its apex at the point 22 so that the blank edge 23 forms the lip of the cup and the concave edge
The method of forming the cup

The method of forming the rounded bottom is indicated in Figs. 4-11 inclusive of the drawings and may be generally described as the formation of a series of pleats at the apex portion of the cup and then compressing this pleated portion of the cup into the rounded form of bottom desired in the final cup.

In Fig. 4 the cup 29 is shown mounted upon a suitable conical male mandrel 30. Surrounding the cup is shown the female die member 31 with the plunger 32 about to engage the apex portion of the cup. The female and male dies are designed to form a complementary matrix for the cup and will vary in construction according to the manner to be pursued in forming the pleats.

One form of die for performing the method herein described is that shown, described and claimed in my co-pending application Serial No. 7,558, filed February 11, 1948.

The dies are preferably so arranged as to form a single pleat at one time. This pleat may be either formed by simple compression dies or may be formed by spinning the conical cup about suitable mandrels so as to form the pleats successively.

In Fig. 5 the dies shown in Fig. 4 have been brought together in the first stage of forming the method hereinafter described.

In Fig. 6 the cup 29 is shown after a single application of a die to form the pleat 33 at about the line at which the rounded bottom is to be formed upon the cup.

In Fig. 7 the cup 29 has been again treated either by compression dies or by spinning, to form the second pleat 34, while in Figs. 8, 9, 10 and 11 further stages of this work are shown resulting in the addition of successive pleats 35, 36 and 37, and as shown in Fig. 11, the final compression of the apex of the conical cup at 38.

The number of pleats is immaterial but it is important that they be small enough to bunch or pile up substantial portions of the paper cup body into small areas.

After the cup has been formed into the form shown in Fig. 11, a round die may be applied so as to compress the plurality of pleats into a continuous rounded bottom, as shown.

The manner in which the pleats are finally arranged in the formation of the cup bottom is shown in the fragmentary section of the cup bottom, Fig. 14, in which the successive pleats are shown folded over and compressed to form a fairly smooth, rounded cup bottom.

In Fig. 13 is shown a modified form of the paper cup in which the lip 43 has been rolled into a beaded cup lip. This beading is usually performed after the conical cup has been formed, and this may be done either before or after rounding of the cup bottom, as described.

While the pleating shown in Figs. 6-12 is horizontal or circumferentially disposed, the cup bottom may be rounded by a similar method in which vertical or longitudinally disposed pleats are formed. The apex of the conical cup may be formed in various ways, such as creasing the entire area of the apex portion of the cup, as shown in Fig. 16, or by equally spaced creases between substantially unaltered portions of the cup wall, as shown in Fig. 17. After formation of these creases the entire creased lower end of the cup is compressed between suitable dies to round the cup bottom and form the pleats 134, shown in Fig. 19.

The method herein disclosed distributes the paper forming the cup bottom in a uniform manner and prevents the formation of crude irregularities in the cup bottom wall and weakening of the cup bottom by crushing of the irregularly distributed paper. The pleating of the paper in the manner outlined eliminates the excess paper and also facilitates the alignment and excess paper into regular folds, causing the thickness, and avoids any undue strain on any portion during formation, and thus strengthens the rounded bottom appreciably.

While the method of forming this cup has been described as accomplished by compression dies, it is obvious that various other means may be employed to form the step of successively pleating the portions of the cup which are to be deformed and pressed into the rounded cup bottom.

Having thus shown and described several embodiments of the invention, it is to be understood that it is capable of many modifications. For example, the bottom of the truncated conical paper cup of this invention as well as being rounded may be of other desired shape such as substantially concave for producing the beneficial results of the invention. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is intended to claim all novelty inherent in the invention as broadly as permissible, in view of the prior art.

I claim as my invention:

1. A truncated conical single piece paper cup
of less than sixty degree angle comprising an acute angled substantially smooth frusto-conical side wall and a substantially inner concave spoon serviceable pleated bottom merging with the side wall, said bottom only having a plurality of circumferentially disposed apexially gathered pleats.

2. A substantially conical single piece paper cup of less than sixty degree angle comprising an acute angled substantially smooth frusto-conical side wall merging at its small end in a curved concave inner surface constituting a spoon serviceable pleated bottom, said pleated bottom having a plurality of circumferentially and apexially gathered pleats, the bottom only being pleated and the edges of at least some of the pleats being substantially concentric with the axis of the cup.

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