Jan. 5, 1965 E. A. WAYCIE 3,164,314

PAPER CUP BOTTOM STRUCTURE AND METHOD OF FORMING SAME

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FIG. 1

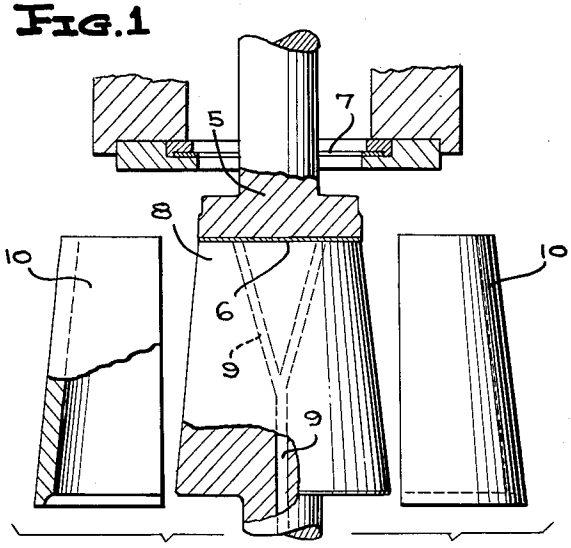


FIG. 2

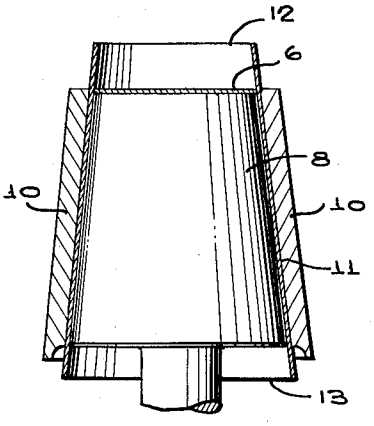


FIG. 3

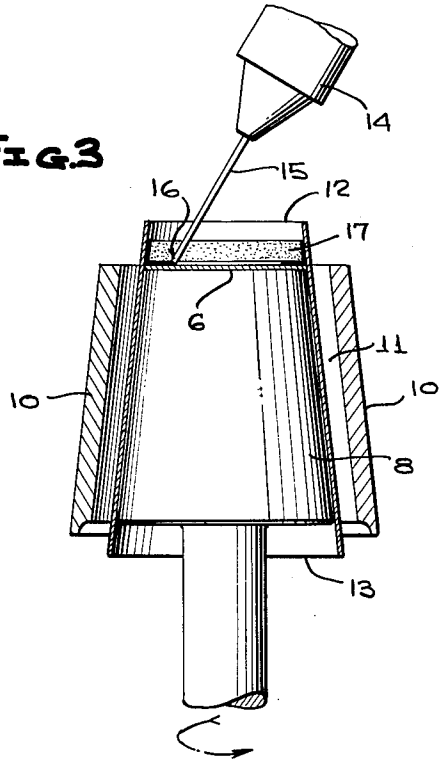
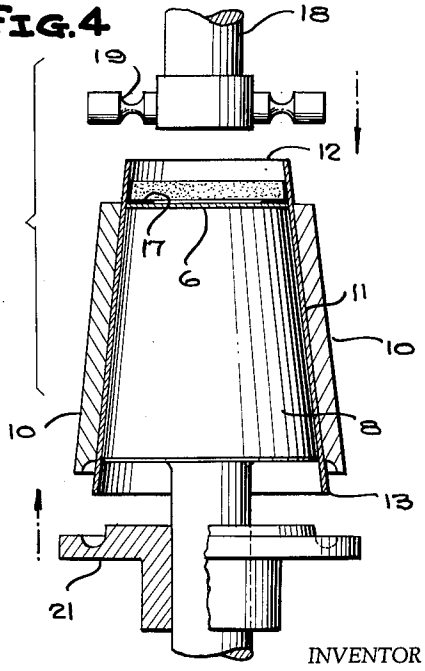


FIG. 4



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FIG. 5

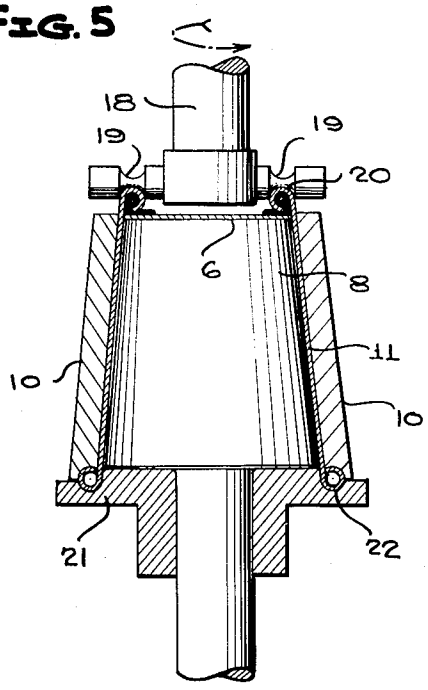


FIG. 6

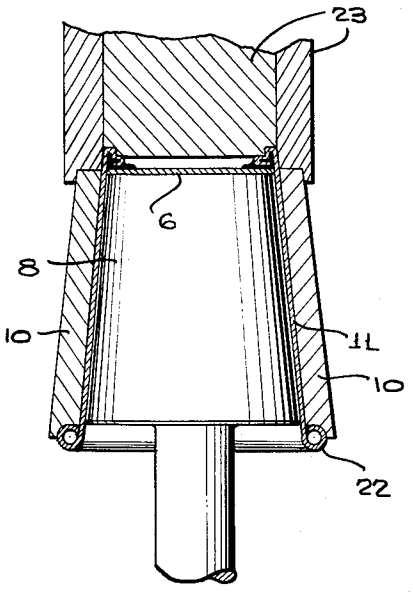


FIG. 8

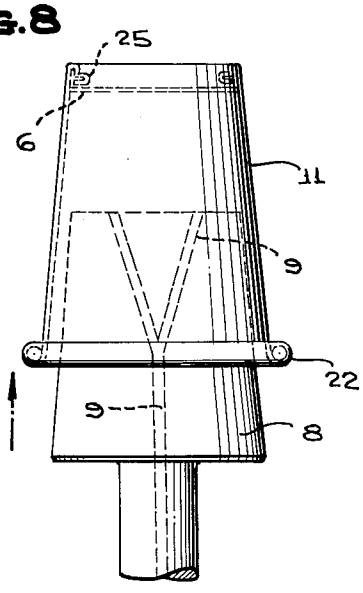
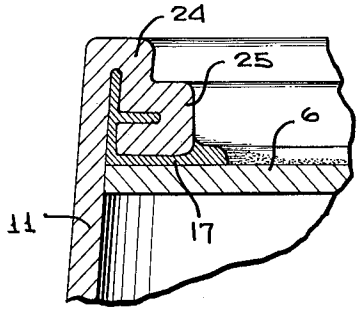


FIG. 7



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PAPER CUP BOTTOM STRUCTURE AND METHOD OF FORMING SAME

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7 Claims. (Cl. 229—1.5)

The invention relates to paper cup structures and seeks to provide an improved and novel cup bottom and a novel method of forming the same.

A primary object of the invention is to simplify the manufacture of a two-piece paper cup.

Another object of the invention is to provide a novel two-piece cup structure which is adapted for high speed commercial production.

Another object of the invention is to provide a novel two-piece cup structure in which the bottom element of the cup is in the form of a simple flat disk instead of being cup shaped and having a peripheral flange such as is employed in the conventional manufacture of two-piece cups.

Another object of the invention is to provide a novel cup structure of the character stated comprising a body wall, a bottom disk having its peripheral edge abutting the body wall, a bonding adhesive applied on the body wall endwise of the disk, and a bottom reinforcement and disk supporting seat constituting a body wall extension turned inwardly over the adhesive on the body wall and against the adhesive on the disk.

Another object of the invention is to provide a cup structure of the character stated wherein the bottom reinforcement and disk seat is in the form of a curl.

Another object of the invention is to provide a cup structure of the character stated wherein the bottom reinforcement and disk seat is shaped to provide a generally right angled bottom portion including a double walled endwise projection and a double walled inward projection paralleling and bonded to the disk.

Another object of the invention is to provide an improved method of forming a paper cup and comprising, holding a paper bottom disk on a mandrel conforming in shape at its exterior to the proposed interior of the cup, shaping a paper cup body about the mandrel with an end margin thereof projecting endwise beyond the disk, rapidly rotating the mandrel and the disk and body thereon, squirting a stream of adhesive at an outwardly directed angle against the disk at a point spaced inwardly from the peripheral edge of the rotating disk thereby by action of centrifugal force collecting on the disk and the body end margin projecting therebeyond an annular film or ring of adhesive having a generally right angular radial cross section, and reshaping said projecting body end margin inwardly against the disk and the applied ring of adhesive.

A still further object of the invention is to provide an improved method of the character stated wherein the adhesive application, in addition to a paper to paper bond formed by shaping the bottom, produces a novel leak proof seal by bridging the intersection of the disk and body wall with a fluid proof film bonded to each of said disk and body wall.

Another object of the invention is to provide an improved method of the character stated wherein the reshaping of the projecting body margin is in the form of an inwardly turned curl.

A further object of the invention is to provide an improved method of the character stated wherein an outwardly turned cup mouth defining curl is turned on the cup body simultaneously with the inward turning of the bottom reinforcing curl.

A still further object of the invention is to provide an improved method of the character stated wherein is included the step of reshaping the bottom reinforcing curl to provide a generally right angled bottom end reinforcement including a double walled endwise projecting portion and a double walled portion paralleling and bonded to the disk.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a fragmentary somewhat diagrammatic sectional view illustrating the punch forming of a disk bottom for a container, and placing and holding said disk on a mandrel about which the container is to be formed.

FIGURE 2 is a fragmentary sectional view illustrating the bottom disk in place on the mandrel with a cup body shaped thereabout and held in place by folding and holding wings.

FIGURE 3 is a view similar to FIGURE 2 showing the application of adhesive on the bottom disk and the adjacent portion of the body which has been formed and side seamed about the disk, the folding and holding wings being shown as separated and the mandrel in rotation incidental to the novel application of adhesive.

FIGURE 4 is a fragmentary sectional view showing the cup formed to the stage illustrated in FIGURE 3, the mandrel and the holding wing means being shown in the cup clamping condition with a bottom end curling means and a top end or mouth curling means in position for being moved into the bottom and mouth curling positions.

FIGURE 5 is a view similar to FIGURE 4 with the bottom curling and top or mouth curling devices moved into the active curling positions, and the curling operations being shown as completed.

FIGURE 6 is a view similar to FIGURE 5 showing the completion of a re-shaping operation in which the bottom curl shown in FIGURE 5 has been reshaped to provide a generally right angled bottom portion including a double walled endwise projection and a double walled inward projection paralleling and bonded to the bottom disk.

FIGURE 7 is an enlarged fragmentary sectional view illustrating the condition of a radial section of the cup bottom after the reshaping operation of FIGURE 6.

FIGURE 8 is a view similar to FIGURE 3 and illustrating the step of evacuating the finished cup from the mandrel by fluid pressure action against the face of the bottom disk opposed to the mandrel.

This disclosure has to do with the improved cup structure, and principally the bottom thereof, and the method of forming said cup structure. Apparatus disclosed is shown diagrammatically and does not constitute a limiting of the invention, various forms of apparatus being usable in the practicing of applicant's improved method. Preferably, the steps of the method will be carried out at a plurality of stations to which a cup body carrying mandrel is indexed, and the invention comprehends the possible use of a plurality of mandrels and possible transfer of the cup body being formed during stages in the formation. In the schematic illustration of the method herein made, punch means 5 is shown in FIGURE 1 as in the process of punching a cup bottom 6 from a paper strip 7 and placing the punched disk against the end of a mandrel 8 on which the thus placed disk is held by atmospheric pressure, a suction action being relied upon to provide the differential holding pressure through the medium of evacuation of the mandrel ducts 9. Folding and holding wings which may cooperate with the mandrel 8 in shaping a cup blank about the mandrel and holding

the same in position for completing the cup body and bonding a side seam thereon are shown schematically at **10**.

At a second work station, indicated in FIGURE 2, the mandrel **8** shown in FIGURE 2, or another mandrel to which the partially formed cup **11** and its bottom disk **6** have been transferred is shown with the wings **10** holding the cup in position with a bottom end margin **12** projecting upwardly therefrom and an upper end margin **13** projecting downwardly therefrom.

At a third working station, the holding wings **10** are shown as moved away from the cup and the mandrel **8** is shown as being rapidly rotated, by means not shown, while a nozzle **14** is squirting a stream **15** of adhesive at an outwardly directed angle against the cup bottom disk **6** at a point **16** spaced inwardly from the peripheral edge of the disk which is in abutting contact with the inner wall of the container body **11**. This manner of directing the stream of adhesive onto the rapidly rotating bottom disk results in the application of a line of adhesive **17** which is right angular in radial cross section, one portion of the right angular line lying against the disk and the other against the adjacent inner wall portion of the cup body **11** endwise of the disk as clearly illustrated in FIGURE 3.

FIGURES 4 and 5 show another or fourth working station whereat the wings **10** again are holding the cup body **11** against the mandrel **8**, the cup top end margin **13** projecting from the mandrel at the lower end, and the bottom cup margin **12** with the adhesive applied thereon and on the cup bottom disk **6** projecting from the upper end of the mandrel as shown in FIGURE 3.

A rotary curling tool **18** is shown, and the same includes a grooved curling roller **19** which when presented endwise against the bottom end of the cup body and rotated will serve to curl the bottom end margin inwardly and reshape said end margin in the form of an inwardly turned curl **20** against the disk **6** and the ring of adhesive **17** applied on said disk and the projecting body end margin, as shown in FIGURE 5. This curling of the bottom end margin of the body serves to reinforce the bottom and also provide a bottom reinforcing curl and a seat for strongly supporting the bottom disk, the disk **6** also being bonded on its seat.

It will also be apparent that endwise forcing of the curling die **21** against the cup top or mouth margin **13** will serve to outwardly curl the same as indicated at **22** in FIGURE 5. It is preferred that the formation of the mouth curl **22** be accomplished simultaneously with the formation of the bottom curl **20**. At this stage, as shown in FIGURE 5, we have what might be termed a finished cup substantially completely confined or contained.

A reshaping of the cup bottom curl may be practiced to additionally strengthen the cup and this may be accomplished at another work station as schematically illustrated in FIGURE 6. In this illustration, the cup body **11** with its mouth curl **22** and its bottom curl are held against the mandrel **8** by the wings **10** and suitable die reshaping means schematically illustrated at **23** may be presented as shown to reshape the curl **20** to provide a generally right angled bottom end reinforcement including a double walled endwise projecting portion **24** and a double walled portion **25** paralleling and bonded to the bottom disk **6** as shown in FIGURES 6 and 7. It is to be understood that any suitable form of reshaping means such as endwise movable die means, or rotating reshaping means may be employed, the particular form of apparatus forming no part of the present invention.

At a final work station, the cup finished by the reshaping operation of FIGURE 6, or, if desired, as in FIGURE 5, may be discharged from the mandrel by fluid pressure directed through the mandrel ducts **9**.

The improved cup structure provided by a practicing of the improved method disclosed herein is illustrated in detail in FIGURES 7 and 8.

The cup structure disclosed herein and formed by the novel method herein described is adapted for high speed commercial production, and the disclosed method provides a marked simplification of the manufacture of a two-piece paper cup.

While preferred cup structural details and method steps are disclosed herein, it is to be understood that variations in structure and in the method features may be provided without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A paper cup comprising a tapered tubular body having a lower portion of reduced cross section as compared to the upper portion thereof; a bottom disk recessed within the lower portion of said body and having a peripheral edge engaging the interior of said body; and a liquid proof film bridging between said body and said bottom disk and being bonded to the interior of said body below said bottom disk and to the underside of said bottom disk; said body having a lower extension including a reversely turned portion folded over the film on said body and forming a double walled lower end on said body, an inwardly turned portion connected to said reversely turned portion, and an outwardly turned portion connected to and reversely turned relative to said inwardly turned portion, said inwardly turned portion and said outwardly turned portion combining to define a double wall seat for said bottom disk, and said film having adhesive qualities and bonding said reversely turned portion to said body and said inwardly turned portion to said bottom disk and said outwardly turned portion.

2. A paper cup comprising a tubular body having a lower portion, a bottom disk recessed within the lower portion of said body and having a peripheral edge engaging the interior of said body, a liquid proof film bridging between said body and said bottom disk and being bonded to the interior of said body below said bottom disk and to the underside of said bottom disk, said body having a lower extension including a reversely turned portion folded over the film on said body and forming a double walled lower end on said body, an inwardly turned portion and an outwardly turned portion of said reversely turned portion combining to define a double wall seat for said bottom disk, and said film having adhesive qualities and bonding said reversely turned portion to said body and said inwardly turned portion to said bottom disk and said outwardly turned portion.

3. The paper cup of claim 2 wherein said film is generally L-shaped in cross section.

4. The paper cup of claim 2 wherein said inwardly turned portion terminates adjacent the interior of said body below said bottom disk.

5. A paper cup comprising a tubular body having a lower portion, a bottom disk recessed within the lower portion of said body and having a peripheral edge engaging the interior of said body, a liquid proof film bridging between said body and said bottom disk only endwise of the bottom disk and being bonded to the interior of said body below said bottom disk and to the underside of said bottom disk, said body having a lower extension including a reversely turned portion folded over the film on said body and forming a double walled lower end on said body, an inwardly turned portion and an outwardly turned portion of said reversely turned portion combining to define a double wall seat for said bottom disk, and said film having adhesive qualities and bonding said reversely turned portion to said body and said inwardly turned portion to said bottom disk and said outwardly turned portion.

6. A paper cup comprising a tubular body having a lower portion, a bottom disk recessed within the lower portion of said body and having a peripheral edge en-

gaging the interior of said body, a liquid proof film bridging between said body and said bottom disk and being bonded to the interior of said body below said bottom disk and to the underside of said bottom disk, said body having a lower extension including a reversely turned portion folded over the film on said body and forming a double walled lower end on said body, an inwardly turned portion and an outwardly turned portion of said reversely turned portion combining to define a double wall seat for said bottom disk, said double wall seat including an endmost double walled endwise projection and a double walled inward projection, said film having adhesive qualities and bonding said reversely turned portion to said body and said inwardly turned portion to said bottom disk and said outwardly turned portion.

7. The paper cup of claim 6 wherein said film is generally L-shaped in cross-section.

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