Jan. 18, 1966 E. A. WAYCIE 3,229,595

METHOD OF AND APPARATUS FOR FORMING PAPER CUP BOTTOM STRUCTURES

Original Filed April 21, 1961 2 Sheets-Sheet 1

FIG. 1

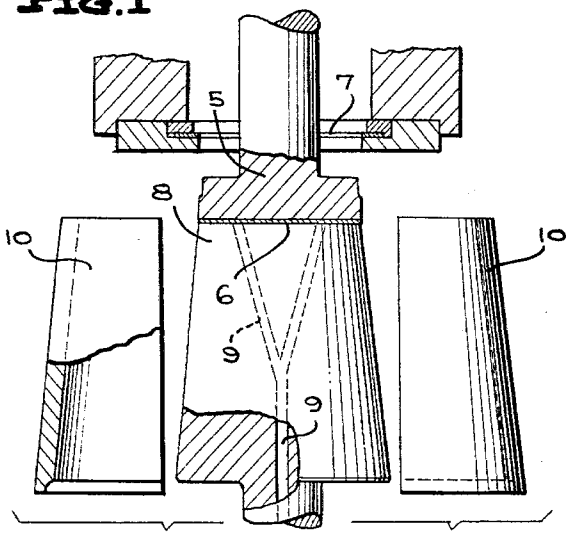


FIG. 2

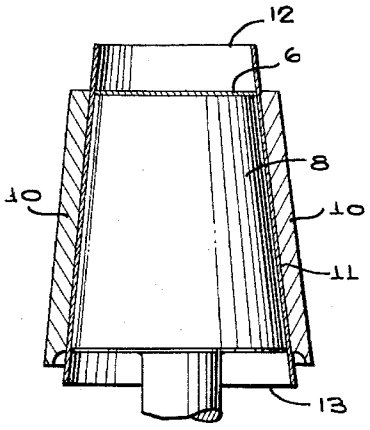


FIG. 3

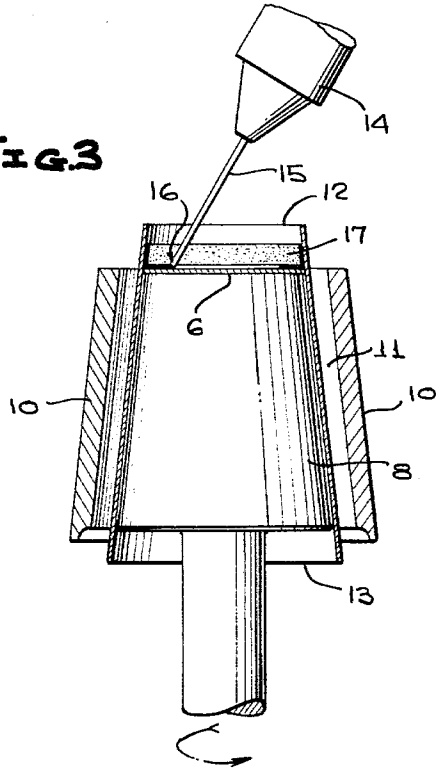
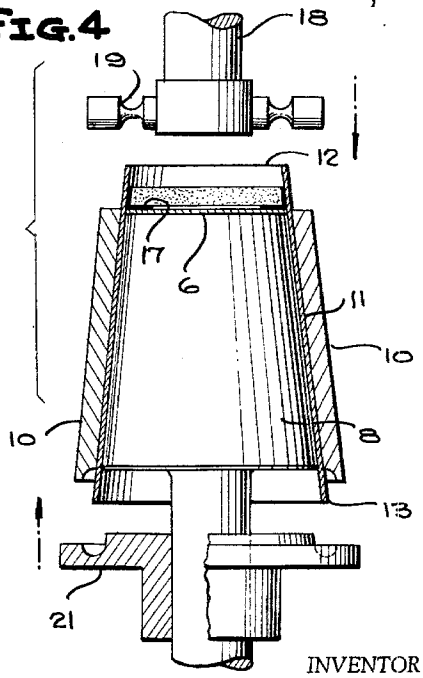


FIG. 4



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FIG. 5

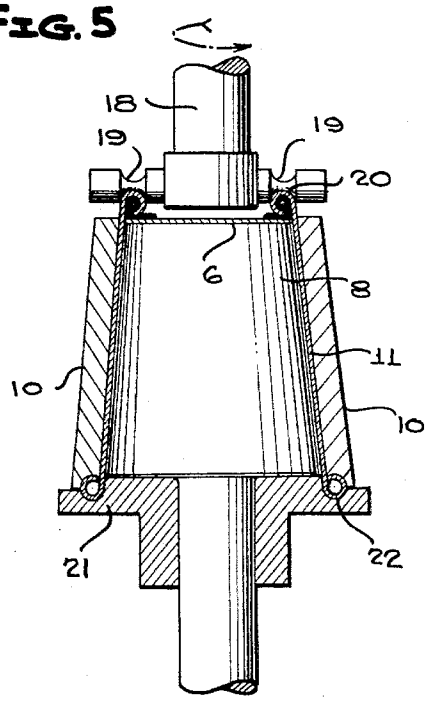


FIG. 6

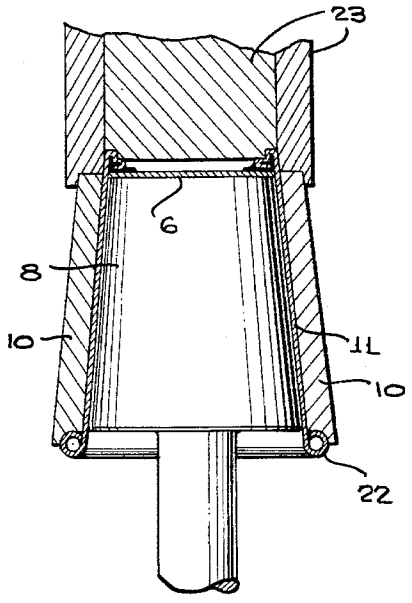


FIG. 8

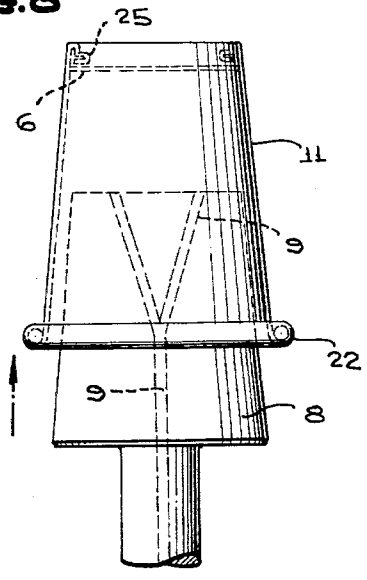
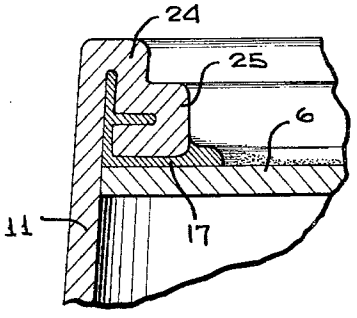


FIG. 7



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3,229,595

METHOD OF AND APPARATUS FOR FORMING PAPER CUP BOTTOM STRUCTURES

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Original application Apr. 21, 1961, Ser. No. 104,619, now Patent No. 3,164,314, dated Jan. 5, 1965. Divided and this application Apr. 27, 1964, Ser. No. 362,745

13 Claims. (Cl. 93—39.1)

This invention relates to a novel apparatus for and method of forming an improved and novel cup bottom structure.

This invention constitutes a division of my copending application for U.S. Letters Patent, Serial No. 104,619, filed April 21, 1961, and now Patent No. 3,164,314, issued on January 5, 1965.

A primary object of this invention is to provide both a novel method of and apparatus for the relatively simple, efficient and economical manufacture of a two-piece paper cup.

An object of this invention is to provide an improved method of forming a paper cup including the steps of holding a paper bottom disk on a mandrel conforming in shape at its exterior to the intended interior configuration 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 the body thereon, applying 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 whereby centrifugal force of the rotating mandrel forms an annular film or ring of the adhesive having a generally right angular radial cross sectional configuration and reshaping the projecting body end margin inwardly against the disk and the applied ring of adhesive.

A further object of this invention is to provide a novel method of the character stated wherein the adhesive application, in addition to a 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 the disk and body walls.

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

A further object of this 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.

Still another object of this 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 projected portion and a double walled portion paralleling and bonded to the disk.

A further object of this invention is to provide an improvement in apparatus of the type which includes a mandrel for supporting a cup bottom in a cup body blank, means for applying adhesive to the cup bottom, means for rotating the mandrel, and means for curling the cup bottom, the improvement including novel means for reshaping the cup bottom curl, the reshaping means including a reshaping die, and the reshaping die being provided with anular groove means for reshaping the curl to form a double walled curl portion both endwise of and parallel to the cup body blank.

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

FIGURE 1 is a fragmentary diagrammatic sectional view illustrating the punch forming of a disk bottom for a container, and the placing and holding of the 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 a 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 completed.

FIGURE 6 is a view similar to FIGURE 5 showing the completion of a reshaping 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 illustrates 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.

The novel method of this invention is preferably performed by a plurality of individual steps which are each accomplished at one of a plurality of stations to which a cup body carrying mandrel is indexed and the invention contemplates the possible and intended use of a plurality of such mandrels and the transfer of the cup body being formed during stages of the formation thereof. In the schematic illustration of the method herein disclosed, as well as particular apparatus for carrying out the method, punch means **5** is shown in FIGURE 1 of the drawings. The punch means **5** is illustrated during the process of punching a cup bottom **6** from a paperstrip **7** and placing the punched cup bottom or disk **6** against the end of a mandrel **8** on which the disk is held by atmospheric pressure due to a suction action evacuating air from beneath the disk through mandrel ducts **9**. Folding and holding wings which may cooperate with the mandrel 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 as shown schematically at **10**.

At a second working station (FIGURE 2), which can be for example, a second station of an indexing turret or similar advancing mechanism, the mandrel **8** of FIGURE 2 or another such 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 or portion **12** projecting upwardly therefrom and an upper end margin **13** projecting downwardly therefrom.

At a third working station, the holding wings **10** are shown moved away from the cup and the mandrel **8** is shown as being rapidly rotated, by conventional rotating

means not shown, while a nozzle **14** is applying or 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 (unnumbered) 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 **6** results in the application of a line of adhesive **17** which is right angular in radial cross-section i.e., substantially L-shaped, with one portion of the right angular line lying against the disk **6** and the other against the adjacent inner wall portion **12** of the cup body **11** endwise of the disk as is clearly illustrated in FIGURE 3.

FIGURES 4 and 5 of the drawings 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 margin **12** of the cup body and rotated relative thereto will curl the bottom end margin inwardly and reshape the same to the configuration of a curl **20** seated against the disk **6** and the ring of adhesive **17** on the disk and the projecting body end margin, as is clearly illustrated in FIGURE 5. This curling of the bottom end margin of the body serves to reinforce the bottom and also provides a bottom reinforcing curl and a seat for strongly supporting the bottom disk **6** which is also 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, is what might be termed a finished cup substantially completely confined or contained.

In accordance with this invention, a further reshaping of the cup bottom curl **20** is accomplished at another work station, as is schematically illustrated in FIGURE 6 of the drawings. 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**, are 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 while the reshaping means **23** is preferred, other suitable forms of reshaping means such as endwise movable die means or rotating reshaping means may be employed.

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 and apparatus disclosed herein is illustrated in detail in FIGURES 7 and 8.

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

I claim:

1. The herein described method of forming a paper cup, said method 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 whereby by action of centrifugal force collecting on the disk and the body end margin projecting endwise therebeyond a 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.

2. The herein described method of forming a paper cup, said method 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 whereby by action of centrifugal force collecting on the disk and the body end margin projecting endwise therebeyond a ring of adhesive having a generally right angular radial cross section, and reshaping said projecting body end margin in the form of an inwardly turned curl against the disk and the ring of adhesive applied on said disk and said projecting body end margin.

3. The herein described method of forming a paper cup, said method 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 whereby by action of centrifugal force collecting on the disk and the body end margin projecting endwise therebeyond a ring of adhesive having a generally right angular radial cross section, first reshaping said projecting body end margin inwardly against the disk and the applied ring of adhesive, and then reshaping the 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.

4. The herein described method of forming a paper cup, said method 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 a bottom end margin thereof projecting endwise beyond the disk and a top end margin thereof projecting beyond an end of the mandrel remote from 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 whereby by action of centrifugal force collecting on the disk and the body bottom end margin projecting endwise therebeyond a ring of adhesive having a generally right angular radial cross section, and reshaping said projecting bottom body end margin, and simultaneously turning said top end body margin into an outwardly directed curl to define the cup mouth.

5. The method defined in claim **1** wherein the disk is punch formed and presented to the mandrel by the punch immedately after the forming thereof, and wherein the holding of the disk on the mandrel is by atmospheric pressure at the punch side of the disk and negative pressure suction action at the mandrel side of the disk.

6. The method defined in claim **3** wherein the disk is punch formed and presented to the mandrel by the punch immediately after the forming thereof, and wherein the

holding of the disk on the mandrel is by atmospheric pressure at the punch side of the disk and negative pressure suction action at the mandrel side of the disk, and including the step of discharging the cup from the mandrel by fluid pressure action against the face of the disk opposed to the mandrel.

7. Apparatus for forming a paper cup comprising a mandrel conforming in shape at its exterior to the proposed interior of the cup, means for holding a cup blank against the exterior of the mandrel, means for positioning a cup bottom in said cup blank and upon the mandrel, internally of an end portion of the cup blank, means for rotating the mandrel, means for applying adhesive to the cup bottom whereby centrifugal force urges the adhesive to a generally L-shaped cross sectional configuration bridging the cup bottom and body, means for curling the end portion and means for reforming the curled end portion to form a double walled endwise projecting portion and a double walled portion paralleling and bonded to the bottom.

8. In an apparatus of the type including a mandrel for supporting a cup bottom in a cup body blank, means for applying adhesive to the cup bottom, means for rotating the mandrel, and means for curling the cup bottom, the improvement comprising means for reshaping the curl, said reshaping means including a reshaping die having an annular groove for reshaping the curl to form a double walled curl portion both endwise of and parallel to the cup bottom.

9. A method of forming a generally tubular body closed at least at one end thereof comprising the steps of assembling a tubular body with a disk such that the disk is internally of the body with an end margin of the body projecting endwise beyond the disk, rapidly rotating the assembled body and disk, applying an adhesive against the disk at least at a point spaced inwardly from the peripheral edge of the rotating disk whereby the action of centrifugal force causes the collection of a ring of adhesive bridging a peripheral juncture between the peripheral edge of the disk and the body, and shaping said projecting end margin inwardly against the disk and the applied ring of adhesive.

10. Apparatus for forming a paper cup comprising means for supporting an assembled cup body and bottom disk in an inverted position with a marginal edge portion of the body projecting axially upwardly beyond the disk, said supporting means having an end face upon which said disk rests, means for rapidly rotating the assembled body and disk, a nozzle, said nozzle being in fluid communication with a source of adhesive material, said nozzle being supported above said supporting means at a downwardly and radially outwardly directed angle, and said nozzle terminating at an orifice disposed radially inwardly of the periphery of said end face whereby adhesive deposited upon said disk by the nozzle is directed radially outwardly by centrifugal force to form a ring of adhesive bridging the disk and body end margin.

11. The method as defined in claim 9 including the additional step of reshaping the once shaped projecting end margin to form a bottom reinforcement defined by a radial wall adhesively bonded to the disk and a double walled axially projecting circumferential wall portion.

12. The apparatus as defined in claim 10 including means for forming said end margin into an inwardly turned curl, and means for reshaping said curl to form a bottom end reinforcement including a double walled axially projecting portion and a double walled radial portion.

13. In an apparatus of the type including a mandrel for supporting a cup bottom in a cup body blank, means for applying adhesive to the cup bottom, means for rotating the mandrel, and means for curling the cup bottom, the improvement comprising means for reshaping the curl, said reshaping means including a reshaping die, said reshaping die including a generally annular groove opening axially toward said mandrel, said groove being partially defined by opposed inner and outer opposing circumferential surfaces, and said outer circumferential surface being axially longer than said inner circumferential surface whereby a curl first formed by said curling means is reshaped by said groove into a double walled curl having double wall portions both endwise of and parallel to the cup bottom.

References Cited by the Examiner

UNITED STATES PATENTS

1,766,420	6/1930	Wessman et al.	93—39.3
2,120,901	6/1938	Moore	93—36.5 X
2,216,331	10/1940	Swallow et al.	93—39.3
2,313,750	3/1943	Hothersall.	
2,553,590	5/1951	Joswig.	
2,725,001	11/1955	O'Neil	93—55.1 X
3,028,798	4/1962	Allen	93—55.1

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