June 16, 1942. F. C. SMITH 2,286,692

METHOD OF AND APPARATUS FOR PRODUCING ROLLED RIMS ON PAPER CUPS

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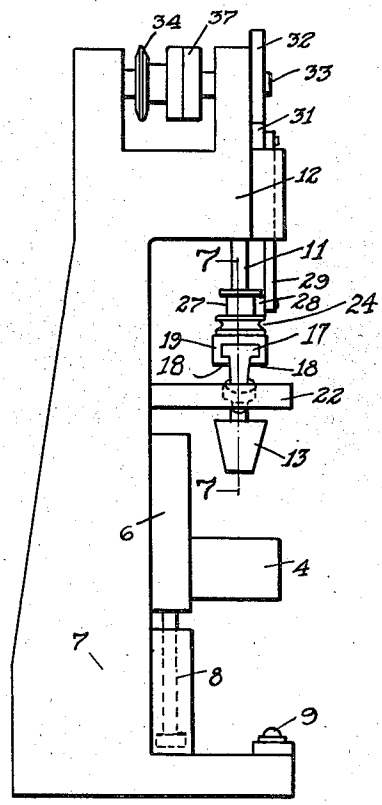


Fig. 1.

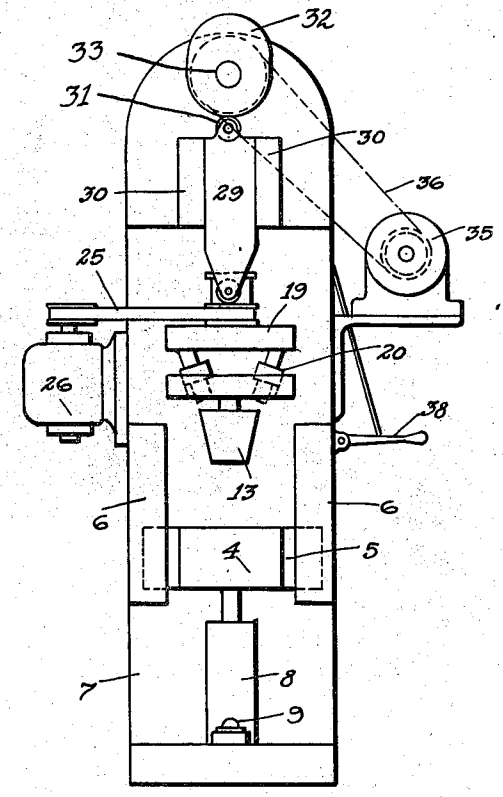


Fig. 2.

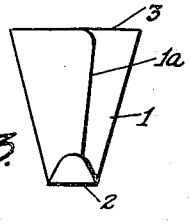


Fig. 3.



Fig. 5.



Fig. 5a.

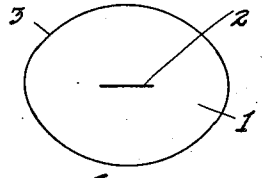


Fig. 4.

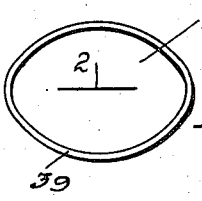


Fig. 6.

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METHOD OF AND APPARATUS FOR PRODUCING ROLLED RIMS ON PAPER CUPS

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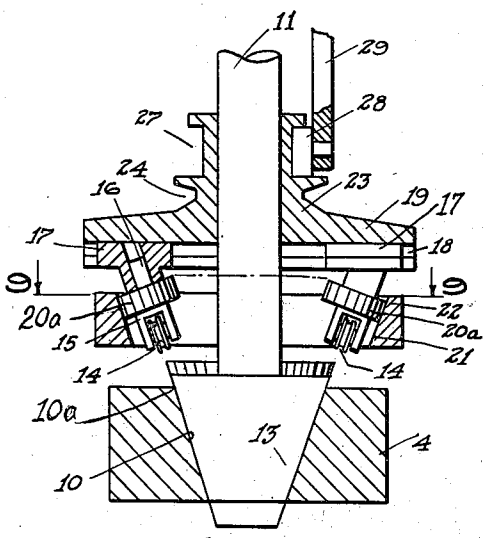


Fig. 7.

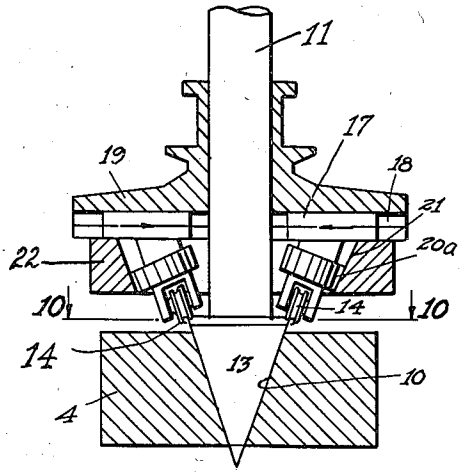


Fig. 8.

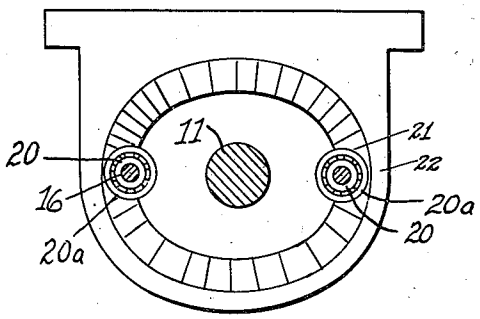


Fig. 9.

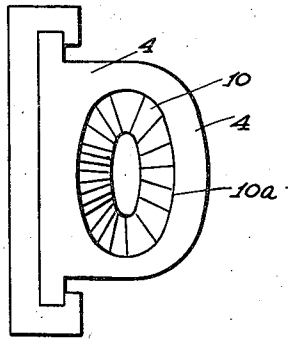


Fig. 10.

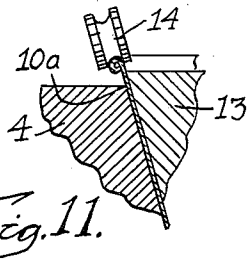


Fig. 11.

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UNITED STATES PATENT OFFICE

2,286,692

METHOD OF AND APPARATUS FOR PRODUCING ROLLED RIMS ON PAPER CUPS

Frederick C. Smith, Worcester, Mass., assignor to United States Envelope Company, Springfield, Mass., a corporation of Maine

Application January 10, 1941, Serial No. 373,890

4 Claims. (Cl. 93—36.5)

The present invention relates to the manufacture of paper drinking cups or containers of the type having a wedge-shaped or conical body and open mouth of elliptical form when supported for use, such, for example, as cups constructed in accordance with Dickerson Reissue Patent No. 17,553, dated January 7, 1930.

The object of the invention is to provide an improved method of and apparatus for forming rolled rims or beads on paper containers of the above indicated character, by the performance of a spinning operation around the edge of a container mouth in a truly elliptical path. Furthermore, the spinning is carried on within a changing zone corresponding to the diminishing elliptical perimeter of the container body, as the spinning progresses.

The above and other advantageous features of the invention will hereinafter more fully appear from the following description considered in connection with the accompanying drawings, in which:

Fig. 1 is a view in side elevation of apparatus for forming rolled rims on cups.

Fig. 2 is a view in front elevation of the apparatus shown in Fig. 1.

Figs. 3 and 4 are views in side elevation and in plan, illustrating the appearance of a cup before the formation of a rolled rim thereon.

Figs. 5, 5*a* and 6 are views in side elevation and in plan, showing a completed cup with a rolled rim or bead.

Fig. 7 is a vertical sectional view along the line 7—7 of Fig. 1, on an enlarged scale.

Fig. 8 is a sectional view at right angles to Fig. 7 and showing the parts in rim-rolling position.

Fig. 9 is a horizontal sectional view along the line 9—9 of Fig. 7, looking in the direction of the arrows.

Fig. 10 is a horizontal sectional view along the line 10—10 of Fig. 8, looking in the direction of the arrows, and with the cup form removed.

Fig. 11 is a fragmentary sectional view on an enlarged scale, showing the formation of a bead.

Like reference characters refer to like parts in the different figures.

Referring first to Figs. 3 and 4, a cup of the type with which the present invention is concerned is shown as comprising a generally wedge-shaped body 1, terminating in a straight edge bottom 2 and flaring outwardly to an open mouth, the edge 3 of which is of elliptical form. It is to be noted that the edge 3 lies in a single plane substantially parallel to the bottom 2, and in making the cup, the blank from which the cup is formed is so cut as to give an elliptical form to the edge 3, when the blank is curled about a suitable form and its edges secured together along the body seam 1*a*.

Referring now to Figs. 1 and 2, there is shown an illustrative embodiment of apparatus for forming rolled rims on cups of the type shown in Fig. 3, without alteration of the form of the open elliptical mouth that such cup presents. As shown, the apparatus consists of a holder 4 mounted on a slide 5 movable between vertical ways 6 provided by a frame 7. The slide 5 is operable up and down between the ways 6 by means of a piston within a fluid pressure cylinder 8 under the control of a button 9, with the holder normally occupying the position of Fig. 2, in readiness to receive a cup.

As best shown in Figs. 7 and 10, the holder 4 provides an opening 10, the upper periphery of which is elliptical in form, as indicated at 10*a*, with the wall of the opening tapering downwardly so that when a cup having the form of Fig. 3 is placed in the opening 10, its body 1 will fit snugly in the holder 4. The holder 4 is so mounted on its slide 5 as to dispose the central axis of the opening 10 in exact alinement with the axis of a vertical mandrel 11 mounted in an overhanging portion 12 of the frame 7 above the holder. The lower end of the mandrel 11 carries a cup form 13, so shaped as to fit within the holder opening 10 when the holder is raised into the position of Fig. 7 by operation of the button 9.

When a cup has been placed in the holder opening 10 and the holder raised so as to cause the cup form 13 to enter the opening 10, the body of the cup will be firmly clamped between the holder and the form, with its elliptical edge 3 lying entirely in a horizontal plane disposed above the upper end of the form 13. The clamped cup is then in readiness for operation upon by the rim-rolling device of the present invention which, as previously pointed out, is adapted to convert the elliptical edge of the cup into a rounded rim or bead, without in any way altering the form of the cup mouth.

As best shown in Fig. 7, the rim-rolling device consists of a pair of grooved rolls 14, each rotatably mounted between the arms of a yoke 15 provided at the end of a stud 16 mounted on a slide 17. Each slide 17 is movable between parallel ways 18 provided on a cross head 19 that is rotatably and slidably mounted on the mandrel 11. Therefore, the slide 17 carrying each roll 14 is

capable of both rotative movement with the cross head 19 as well as transverse movement on the cross head with respect to the axis of the mandrel 11.

The stud 16 which carries each roll yoke also carries a ball bearing 20, the outer race 20a of which is adapted to bear on a track 21 formed on a stationary cam 22 surrounding the spindle 11. As best shown in Fig. 9, the cam track is elliptical in form, with its surface tapering inwardly at an angle substantially corresponding to the angle which the sides of the cup form make with the vertical. Consequently, rotation of the cross head 19 with respect to the stationary cam 22 will cause the rolls 14 to travel in a truly elliptical path as the bearings 20 move around the track 21, said bearings being maintained in contact with the cam track 21 by centrifugal force.

The cross head 19 provides a hub 23 capable of both rotative and axial movement with respect to the mandrel, and a groove 24 formed on the hub 23 receives a belt 25, for rotatably driving the entire rim-rolling device mounted on the cross head from any suitable source of power, such as a motor 26. The hub 23 also provides a groove 27 for receiving a roll 28 at the lower end of an operating slide 29 movable between ways 30 provided by the frame portion 12. The upper end of the slide carries a roll 31 bearing on a cam 32 mounted on the end of a shaft 33, so that the slide 29 is adapted to impart up and down movement to the cross head 19 simultaneously with rotation thereof.

The shaft 33 carrying the cam 32 is rotatably driven, by means of a sprocket 34 connected to a motor 35 by a belt 36, and the cam 32 is so formed that the slide 29 is moved from the position of Fig. 7 to the position of Fig. 8 and back again, for each complete revolution of the shaft 33, to perform the rim-rolling operation. In order to insure that each cup will be acted upon uniformly, a suitable one-revolution clutch is interposed between the driving sprocket 34 and the shaft 33, as indicated at 37. This clutch 37 is adapted to be actuated each time the holder 4 is raised, as by means of a suitable handle 38, so that the cross head 19 will be returned to the position of Fig. 2, and remain there after each rim-rolling operation, until the cup just operated upon has been removed from the holder, and the holder again raised with a fresh cup therein.

When the holder 4 with a cup therein has been raised to the position of Fig. 7, the cup will be firmly clamped between the holder and the form 13, with the edge 3 of its open elliptical mouth extending above the upper end of the form. Operation of the clutch 37 by the handle 38 will then cause the slide 29 to move the cross head 19 downwardly, and as the cross head rotates, the ball bearings 20 will move the slides 17 with respect to the mandrel axis as the bearings roll around the elliptical track 21 on the stationary cam 22. Therefore, as the grooved rolls 14 engage the edge 3 of the cup, the rolls 14 are moving in a truly elliptical path, substantially corresponding to the form of the cup mouth. The perimeter of this elliptical path progressively diminishes as the cross head 19 moves to the position of Fig. 8, with the result that a rounded bead 39 is spun on the cup by the rolls 14 operating within a changing zone corresponding to the perimeter of the cup body at any stage of the spinning, see Fig. 11.

The holder is then lowered into the position of Fig. 2 to permit removal of a finished cup, which has the appearance shown in Figs. 5 and 6. It is evident from a comparison of Figs. 4 and 6, that the rolled rim of the finished cup has substantially the same elliptical form as the edge 3, with the ellipse of the bead on a slightly smaller scale. This finished cup will be easy to drink from, owing to the reinforcing effect of the bead, and obviously, the beaded cups will nest readily in a stack, and can be handled in the same dispensers that have heretofore been employed in connection with unbeaded cups, such as are shown in Figs. 3 and 4.

From the foregoing, it is apparent that by the present invention there is provided an improved method of and apparatus for forming rolled rims or beads on paper cups or containers of the type shown, with the beads being formed by a spinning action, which takes place in a truly elliptical path, always corresponding to the perimeter of the cup body, as the spinning progresses. In this respect, the method and apparatus of the present application differs from the disclosure of my copending application, Serial No. 373,648, filed January 8, 1941, wherein the bead forming operation takes place in a circular path.

I claim:

1. Apparatus of the class described, comprising a holder for receiving a paper cup having a conoidal or wedge-shaped body and an open elliptical mouth, a rigid form relatively movable with respect to said holder for clamping the cup body therein, with the edge portion of the cup mouth extending beyond said form, a tool slidably mounted on a carrier rotatable about the axis of said cup form, and means cooperating with said tool simultaneously with its rotation by said carrier for causing said tool to travel in an elliptical path of diminishing perimeter as it engages the edge of said cup to roll a bead thereon.

2. In the art of spinning beads on the elliptical rims of conoidal or wedge-shaped paper cups, the improvement which consists in supporting each cup stationarily in a rigid form, with its rim protruding therefrom, applying to said rim a spinning element which travels in an elliptical path, and causing relative transverse movement between rim and element in a direction corresponding substantially to the taper of the cup body.

3. In apparatus of the class described, means for stationarily supporting a conoidal or wedge-shaped paper cup, with its elliptical rim in protruding relation to said supporting means, a spinning member having an elliptical path of travel for engagement with said rim, and means for procuring relative transverse movement between member and rim in the direction of taper of the cup's wall.

4. In apparatus of the class described, means for stationarily supporting a conoidal or wedge-shaped paper cup, with its elliptical rim in protruding relation to said suporting means, a spinning member revolving about the axis of said supporting means and adapted to be engaged with said rim, and a stationary cam cooperating with said member to confine its travel to an elliptical path, said cam having its surface on substantially the same taper as the cup body, whereby the feed of said member against said rim causes said member to travel in an elliptical path of gradually diminishing perimeter.

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