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J. B. BOLCATO
METHOD AND APPARATUS FOR OUTSIDE CAULKING
OF BOTTOM OF PAPER CUP

3,202,065

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3 Sheets-Sheet 1

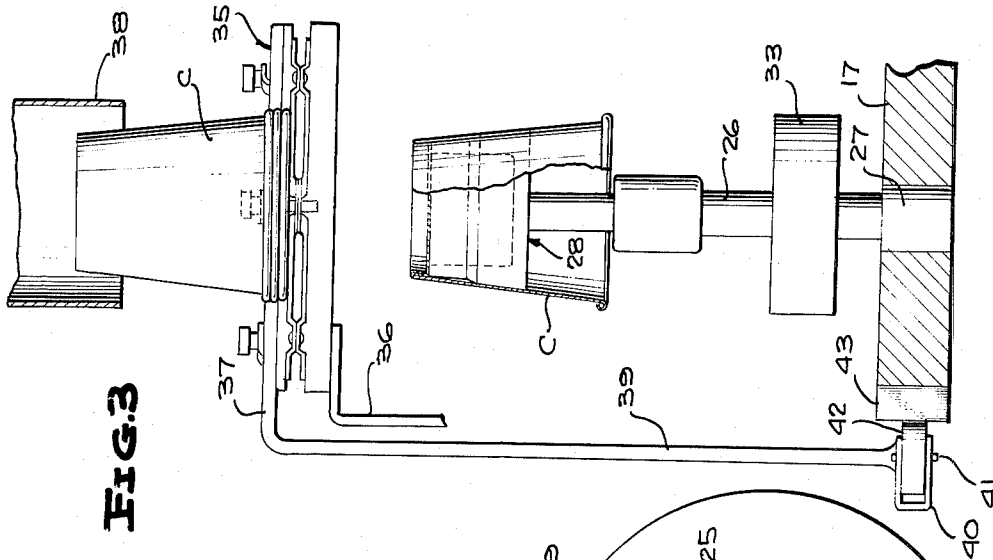


Fig. 3

Fig. 2

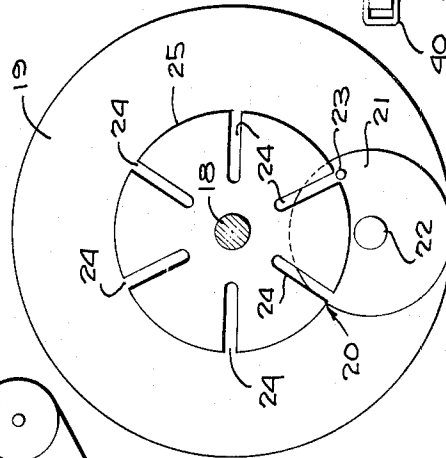
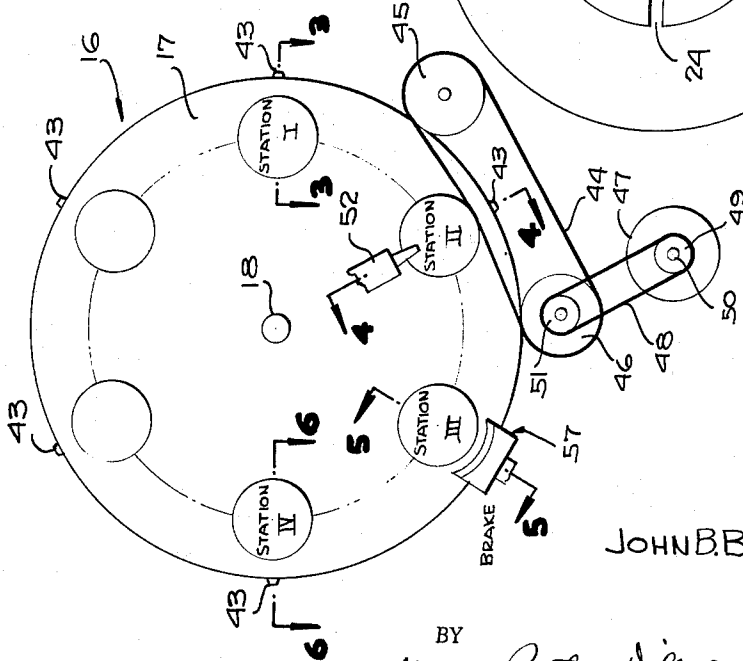


Fig. 1



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3 Sheets-Sheet 2

FIG. 5

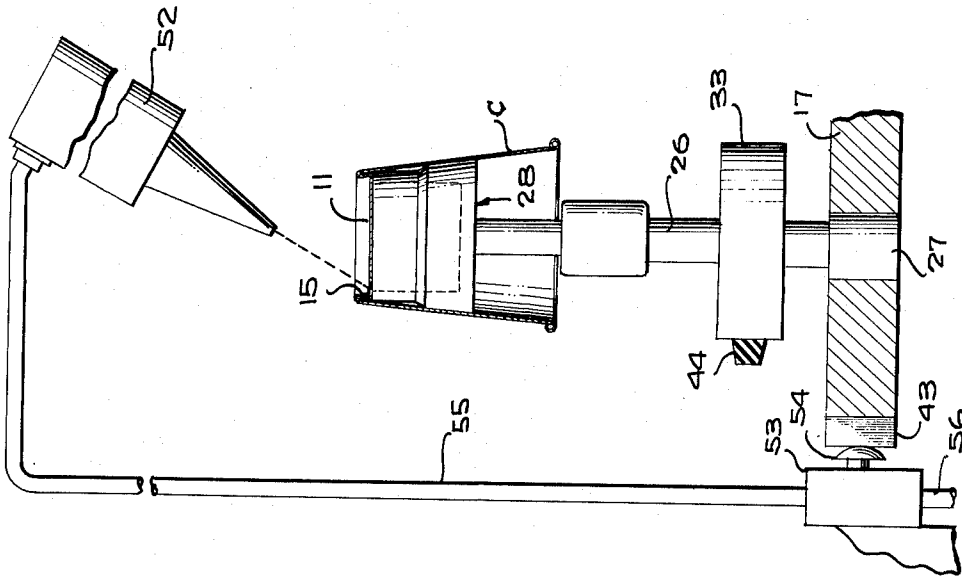
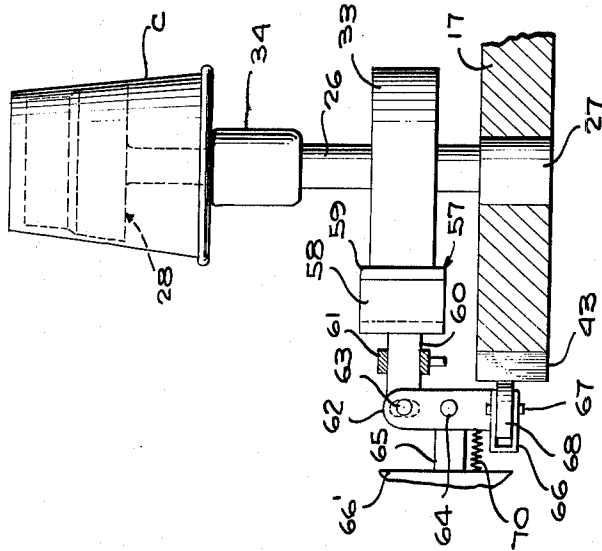


FIG. 4

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3 Sheets-Sheet 3

Fig. 7

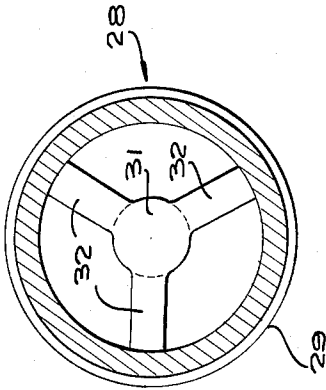


Fig. 8

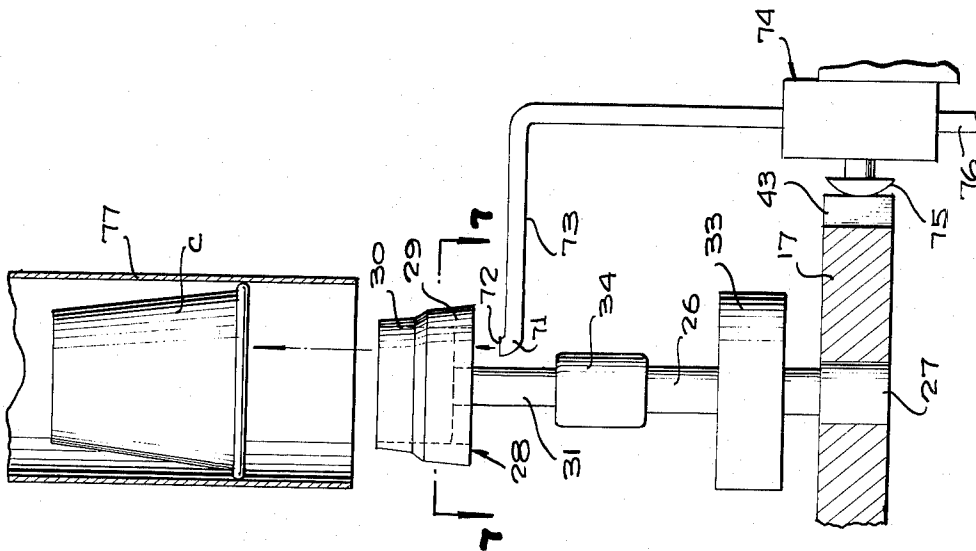
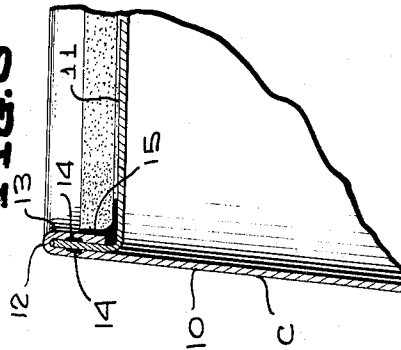


Fig. 6

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1

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METHOD AND APPARATUS FOR OUTSIDE CAULKING OF BOTTOM OF PAPER CUP

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13 Claims. (Cl. 93—36)

This invention relates in general to new and useful improvements in paper cups and the manufacture of paper cups, and more particularly relates to the outside caulking of a paper cup to prevent leakage in the bottom seam thereof.

In the manufacture of paper cups, cups that leak through the bottom seams are unacceptable to the trade. Consequently, many cups must be scrapped even though they appear satisfactory. It is difficult to provide cups that definitely will not leak at the bottom seam because of the character of the adhesive employed in the formation of the seam. In the conventional manufacture of paper cups, the adhesive is relied up to leak-proof the seams, as well as bond them, but frequently, the adhesive shrinks during the setting or curing stage, causing the adhesive to break away from the surfaces of the paper bottom and cup body and thereby permit liquid contained in the cup to leak through the bottom seam.

Accordingly, it is one of the primary objects of the invention to devise a practical procedure for sealing the bottom seams of paper cups after the cups have been made so that a liquid contained in the cups cannot leak through the bottom seams thereof.

Another object of the invention is to provide a novel and simple procedure for leak-proofing the bottom seams of paper cups after their fabrication has been completed irrespective of whether liquid would leak through the seams as manufactured.

Another object of this invention is to apply a caulking compound to the bottom exterior of a paper cup in order to leak-proof the bottom seam of the cup, and at the same time, to apply the caulking compound in a position where it will not be readily discernible.

The dual reliance on the seam adhesive or bonding agent for providing the necessary mechanical interlock between the cup bottom and the cup body and the sealing of the seam between the cup bottom and the cup body against leakage has been a source of manufacturing difficulties. This is particularly true with the advent of harder surfaces which has hindered the ability of bonding agents to satisfy the requirement for a sealed seam and still permit satisfactory rates of manufacture.

Accordingly, a further object of this invention is to provide a subsequent caulking treatment on the bottom of a paper cup for caulking and sealing the seam between the bottom and cup body whereby it is no longer necessary for the bonding agent between the cup body and the bottom to function as a sealer and thereby permits a wider range of bonding agents to provide for the necessary structural interlock.

Another object of this invention is to provide a novel method of applying a sealer to a container in a manner which in no way interferes with, or slows down, production of, packing of, or storing of the cup being manufactured.

Still another object of this invention is to provide a novel method of providing for the sealing of the bottom seam of a cup which is readily flexible and may be accomplished at any time after the manufacture of the cup.

Still another object of this invention is to provide a sealer for the bottom seam of a cup which is not acted upon by the direct head pressure within the cup, but is required only to resist a seepage pressure.

2

A still further object of this invention is to provide a novel apparatus for automatically receiving, applying caulking compound to bottoms of cups, and releasing the cups, the apparatus being of a nature wherein it may be placed in a manufacturing line for cups intermediate the cup making machine and the packing station.

Yet another object of this invention is to provide a novel apparatus for applying caulking compound to bottoms of cups, the caulking compound being directed against the bottom of a cup by means of a nozzle and there being provided means for rotating the cup during the application of the caulking compound whereby centrifugal force due to the rotation of the cup will result in the flowing of the caulking compound into the corner of the bottom of the cup and into the areas where a seal is required.

Yet another object of this invention is to provide a novel cup holder for mounting on a spindle which may be utilized in conjunction with an air blast for removing a cup therefrom, the cup holder being in the form of an open ended sleeve having an exterior surface for engaging the interior of a cup, the sleeve being secured to a spindle by means of spokes whereby air may be directed through the cup holder and against the bottom of a cup to remove a cup from the cup holder.

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 schematic plan view showing an apparatus in accordance with the invention.

FIGURE 2 is a horizontal sectional view taken under the indexing table of FIGURE 1, and shows the specific details of a Geneva drive for the shaft of the indexing table.

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along the line 3—3 of FIGURE 1, and shows the specific details of the mechanism at the cup dispensing station of the apparatus.

FIGURE 4 is an enlarged fragmentary vertical sectional view taken along the line 4—4 of FIGURE 1, and shows the general details of the apparatus at the station where the caulking compound is applied to the bottom of a cup.

FIGURE 5 is an enlarged fragmentary vertical sectional view taken along the line 5—5 of FIGURE 1, and shows the details of the brake for stopping the rotation of the spindle after the caulking of the cup bottom.

FIGURE 6 is an enlarged fragmentary vertical sectional view taken along the line 6—6 of FIGURE 1, and shows the specific details of the mechanism at the discharge station of the apparatus.

FIGURE 7 is an enlarged fragmentary sectional view taken through the cup holder only along the line 7—7 of FIGURE 6 and shows the specific details of the cup holder.

FIGURE 8 is an enlarged fragmentary vertical sectional view taken through the bottom of the inverted paper cup and shows the application of caulking compound thereto.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURE 8 a portion of a conventional type of paper cup, the cup being generally referred to by the numeral C. The cup C includes the usual cup body 10 and cup bottom 11, the cup bottom 11 being provided with a depending peripheral flange 12. The cup bottom 11 is telescoped within the lower end of the cup body 10 with the peripheral flange 12 in abutting engagement with the inner surface of the cup body 10. The lower edge 13 of the cup body 10 is reversely turned and is disposed rearwardly of the periph-

eral flange of the cup bottom 11. The flange 12 is secured to both the inturned edge 13 and to the inner surface of the cup body 10 by means of a suitable adhesive 14 in the customary manner.

The construction of the cup C illustrated in FIGURE 8 is accomplished in the conventional manner with one slight difference. The adhesive 14 may be varied, as is deemed advisable, to provide for a more secure mechanical joint between the cup bottom 11 and the cup body 10 without emphasis upon the forming of a complete seal in the seam between the cup bottom and the cup body. However, after the cup C has been formed in the customary manner and normally, but not necessarily, before it is initially packed, caulking compound 15 is applied to the bottom 11 to assure the sealing of the seam between the cup bottom 11 and the cup body 10. The caulking compound 15, as is clearly shown in FIGURE 8, is deposited in the corner of the bottom at the intersection of the inturned free edge 13 and the cup bottom 11 to assure against any leakage at this point. Thus, any liquid disposed within the cup C that should seep past the seam between the cup bottom 11 and the cup body 10, will be stopped and effectively sealed by means of the caulking compound 15. Also, the caulking compound 15 will seal the extreme end of the lapped seam of the cup body 10.

It is to be understood that it is not necessary for the caulking compound 15 to dry or set rapidly because its primary purpose is not adhesion. Consequently, the caulking compound may be formulated to remain pliable or plastic for a long period so that there will be little or no tendency for the caulking compound to contract to permit the passage of liquid. Therefore, while the adhesive 14 used in forming the bottom seam of the paper cup C may shrink upon setting or drying and thus tend to produce leaks, the caulking compound 15 will remain pliable and seal the paper cup where it would otherwise leak due to the shrinking of the adhesive. It is preferred that the caulking compound 15 consist of a suitable binder filled with an inert material. Examples of such caulking compound are water based emulsions such as those used in the formation of adhesives presently used in the bottom seams and may include water based emulsions of modified polymers, which may be acrylics, acetates, vinyls, etc. These water based emulsions are filled with inert materials, such as clays, chalks, silicates, rubber, etc.

Referring now to FIGURE 1 in particular, it will be seen that there is schematically illustrated the apparatus for applying the caulking compound 15 to bottoms of paper cups C. The apparatus is generally referred to by the numeral 16 and includes an indexing table 17 which is carried by a shaft 18. The shaft 18 is rotatably supported by a base 19, as is shown in FIGURE 2, and is driven by a conventional Geneva drive, generally referred to by the numeral 20, for rotation and indexing. The Geneva drive 20 includes the usual rotating plate 21 carried by a drive shaft 22 and supporting a drive pin 23. The drive pin 23, during each revolution of the drive shaft 22, engages in a slot 24 in a driven plate 25 which is secured to the shaft 18. The plate 25 is arranged so that each time the drive shaft 22 rotates, the indexing table is advanced through an angle of 60 degrees, one station, and is permitted to remain in a fixed position until the drive pin 23 passes through its cycle of rotation and engages in the next slot 24.

Although the indexing table 17 is of a six-station type, only four of the stations are used. These four stations are referred to as stations I, II, III and IV.

The indexing table 17 carries six spindles 26 which project upwardly from the indexing table 17 and which have their lower ends rotatably supported in bearings 27 carried by the indexing table 17. Each spindle 26 has secured to the upper end thereof a cup holder, generally referred to by the numeral 28. Each cup holder 28, as is best shown in FIGURES 6 and 7, includes a

sleeve-like member 29 which has an exterior surface 30 which is tapered and is adapted to be received snugly within a lower portion of an inverted cup C. The sleeve 29 is secured to a spindle extension 31 by means of a plurality of spokes 32 to permit the upward flow of air through the open ended sleeve 29 for reasons to be described hereinafter. The spindle extension 31 is secured to the upper end of its respective spindle 26 by means of a coupling 34. In order to rotate each spindle 26 and the cup holder 28 carried thereby, each spindle 26 is provided with a pulley 33 which is driven in a manner to be described hereinafter.

Station I

Referring now to FIGURE 3 in particular, it will be seen that a cup dispenser, generally referred to by the numeral 35, is suitably mounted on a bracket 36, for example, above the path of the cup holders 28 at station I. The cup dispenser 35 is of a conventional type and is operated by a trip arm 37 to release a cup C and permit the cup C to drop by gravity down over the cup holder 28 of the spindle 26 which is positioned immediately below the cup dispenser 35 in the indexed position of the indexing table 17. If desired, the cups C may be delivered to the cup dispenser 35 by means of a cup delivery tube 38 which leads from a cup maker or any other element in the line of cup making. Of course, it is even possible to place the inverted nested cups C in the position illustrated in FIGURE 3 manually.

The trip arm 37 is provided with a downwardly projecting extension 39 which is provided at the lower end thereof with a bifurcated fitting 40. The fitting 40 has a vertically disposed axle 41 on which a cam follower 42 is disposed. The outer surface of the indexing table is in the form of a cam and in radial alignment with each of the spindles 26, a small cam lobe 43 projects outwardly from the circumferential surface of the indexing table 17. The small cam lobes 43 are best shown in FIGURE 1.

Section II

Referring first to FIGURE 1, it will be seen that disposed adjacent station II is an endless drive belt 44 carried by a drive pulley 46 and an idler pulley 45. The pulleys 45 and 46 have shafts which are suitably supported from the base 19 in a manner not shown. The drive pulley 46 is driven by an electric motor 47 which is coupled to the drive pulley 46 by means of a drive belt 48 entrained over a pulley 49 mounted on the armature shaft 50 of the motor, and a pulley 51 secured to the pulley 46 for rotation therewith.

It is to be noted that as a specific one of the spindles 26 approaches station II, the pulley 33 thereof engages the drive belt 44 so that at the time the indexing table 17 is indexed at station II, the spindle 26 disposed at that station and the cup holder 28, as well as the cup C carried thereby, will be rotated at a desired speed.

Referring now to FIGURE 4 in particular, it will be seen that at station II, there is disposed a discharge nozzle 52 for directing caulking compound onto the bottom 11 of a cup C carried by the associated cup holder 28. The caulking compound is directed generally towards the intersection of the cup bottom 11 with the inturned lower edge 13 of the cup body 10. The flow of caulking compound from the nozzle 52 is controlled by means of a push button controlled valve 53 having a push button type actuator 54. A caulking compound supply line 56 leads to the valve 53 and another caulking compound line 55 runs from the valve 53 to the nozzle 52. Normally, the valve 53 is closed. However, as the indexing table 17 approaches an indexed position, the cam lobe 43 for the particular spindle which is being positioned at station II, engages the push button 54 of the valve 53 for moving the same to an open position.

When the caulking compound 15 is directed onto the cup bottom 11, as is shown in FIGURE 4, the cup C is

rapidly rotating. As a result, the caulking compound 15 is directed by means of centrifugal force into the interstices of the seam between the bottom wall and the cup body in the manner generally shown in the drawings to assure a satisfactory sealing of the bottom seam.

When the indexing table 17 is again driven, the cup C is still rotating; even after the pulley 33 of the respective spindle 26 moves out of engagement with the drive belt 44, idle rotation of the cup holder 28 continues.

Station III

At station III, there is provided a brake, generally referred to by the numeral 57, for stopping the rotation of the spindle carrying the newly caulked paper cup. The brake assembly 57 includes a brake member 58 having a facing or brake shoe 59 secured thereto, the brake shoe 59 being directly engageable with the pulley 33 for stopping the rotation of the respective spindle 26. The backing member 58 is carried by a suitable arm 60 which is mounted in a guide 61. A lever 62 has a pin and slot connection 63 with the arm 60. The lever 62, which is of a parallel link type, is carried by a pivot pin 64 carried by an arm 65 supported in any desired manner from the base 19 or some suitable support by means of a bracket 66.

A bifurcated fitting or fork member 66 is mounted at the lower end of the lever 62. The fitting 66 carries a vertical axle 67 on which a rotatable cam follower 68 is mounted, the cam follower 68 being engageable with the peripheral surface of the indexing table 17 and is engageable with a cam lobe 43 projecting therefrom in an indexed position of the indexing table 17. The follower 68 is held against the indexing table 17 by means of a spring 70 which extends between the bracket 66' and the lever 62.

It will be readily apparent that when the indexing table 17 is indexed, and the spindle 26 arriving at station III from station II is positioned at station III, the engagement of the cam follower 68 by the cam lobe 43 will result in the movement of the brake assembly 57 so that the brake shoe 59 will engage the pulley 33 and thus stop the rotation of the associated spindle 26.

Station IV

Referring now to FIGURE 6 in particular, it will be seen that at station IV, there is disposed a compressed air nozzle 71 having a discharge orifice 72 positioned for directing a blast of compressed air up through the sleeve 29 of the cup holder 28 when the associated cup holder 28 is indexed at station IV. The compressed air nozzle 71 is connected to a valve 74 by means of an air line 73. The valve 74 is of the push button type and includes a push button actuator 75. The actuator 75 is normally in the valve closing position, and must be pressed inwardly to effect the opening of the valve 74. The push button 75 is aligned with the peripheral surface of the indexing table 17 and is engaged by one of the cam lobes 43 for movement to a valve opening position. Compressed air passes into the valve 74 through the compressed air line 76 and compressed air passing through the valve 74 passes to the nozzle 71 through the compressed air line 73.

The compressed air from the nozzle 71 is directed upwardly through the open ended cup holder 28 for impingement against the bottom of a cup C carried by the particular cup holder 28. If desired, a suction discharge tube 77 may be aligned with the spindle 26 at the discharge station, station IV, to facilitate the removal and handling of a caulked cup.

The advantages of caulking a cup from the bottom thereof should be obvious from the foregoing. It will also be readily apparent that there has been devised a novel apparatus for caulking cups, as well as a novel method of accomplishing the caulking.

From the foregoing, it will be seen that novel and advantageous provision has been made for carrying out the desired end. However, attention is again directed to the

fact that variations may be made in the example cut, apparatus and method disclosed herein without departing from the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. A method of forming a paper cup having a completely sealed bottom seam comprising the steps of forming a paper cup having a bottom telescoped within the lower part of the cup body and wherein the bottom has a depending flange disposed between and bonded to a lower portion of the cup body and an inwardly disposed reversely turned lower edge of the cup body, rotating the paper cup about its axis, and depositing caulking compound on the cup bottom at the intersection of the bottom flange and the reversely bent cup body lower edge with the centrifugal force of the rotating cup evenly distributing the compound.

2. The method of claim 1 wherein the axis of the paper cup is vertically disposed with the bottom facing upwardly when the compound is being applied.

3. An apparatus for placing caulking compound on the exterior of a cup bottom for sealing the cup bottom relative to the body of the cup, said apparatus comprising a plurality of rotatable spindles each having a cup holder thereon for holding a paper cup in an inverted position, means for moving said spindles along a predetermined path and periodically stopping said spindles at predetermined points, said points having located thereat in sequence a cup dispenser for delivering a cup to each of said spindles passing said cup dispenser, a caulking compound dispenser generally overlying the path of said spindles for applying caulking compound to cup bottoms passing therebeneath and means adjacent said caulking compound dispenser for rotating said spindles as said spindles pass said caulking compound dispenser whereby caulking compound deposited on cup bottoms will be urged into place by centrifugal force, and means for removing cups from said spindles.

4. The apparatus of claim 3 wherein brake means are disposed intermediate said caulking compound dispenser and said cup removing means for reaction on said spindles to stop the rotation thereof.

5. The apparatus of claim 3 wherein each of said spindles carries a pulley, and said spindle rotating means includes a drive belt engaged by said spindle pulleys when said spindles are disposed adjacent said caulking compound dispenser.

6. The apparatus of claim 3 wherein each of said cup holders is in the form of a sleeve telescoped within an inverted cup, each of said cup holders also including spokes securing said sleeve to a respective one of said spindles, and said cup removing means includes an air blast nozzle for directing a blast of air upwardly through each cup holder in sequence to remove an associated cup therefrom.

7. The apparatus of claim 3 wherein brake means are disposed intermediate said caulking compound dispenser and said cup removing means for reaction on said spindles to stop the rotation thereof, each of said spindles carries a pulley, said spindle rotating means includes a drive belt engaged by said spindle pulleys when said spindles are disposed adjacent said caulking compound dispenser, and said brake means includes a brake shoe for engagement with said spindle pulleys.

8. An apparatus for placing caulking compound on the exterior of a cup bottom for sealing the cup bottom relative to the body of the cup, said apparatus comprising an indexing table, a plurality of spindles rotatably mounted on said indexing table for movement therewith, each of said spindles having a cup holder at the upper end thereof, means for step by step rotating and indexing said indexing table at predetermined circumferentially spaced points, said points having located thereat in sequence a cup dispenser for delivering a cup to each of said spindles passing said cup dispenser, a caulking compound dis-

penser generally overlying the path of said spindles for applying caulking compound to cup bottoms passing therebeneath and means adjacent said caulking compound dispenser for rotating said spindles as said spindles pass said caulking compound dispenser whereby caulking compound deposited on cup bottoms will be urged into place by centrifugal force, and means for removing cups from said spindles.

9. An apparatus for placing caulking compound on the exterior of a cup bottom for sealing the cup bottom relative to the body of the cup, said apparatus comprising an indexing table, a plurality of spindles rotatably mounted on said indexing table for movement therewith, each of said spindles having a cup holder at the upper end thereof, a drive pulley on each spindle, means for step by step rotating and indexing said indexing table at predetermined circumferentially spaced points, said points having located thereat in sequence a cup dispenser overlying said indexing table for delivering a cup to each of said spindles passing beneath said cup dispenser; a caulking compound dispenser overlying said indexing table for applying caulking compound to cup bottoms passing therebeneath and a drive belt disposed adjacent said caulking compound dispenser and engageable with said spindle pulleys to rotate said spindles during the application of caulking compound, a brake shoe engageable with said spindle pulleys for stopping the rotation thereof and means for removing caulked cups from said cup holders including an air blast nozzle for delivering compressed air into said cup holders from beneath, each of said cup holders including a sleeve having spokes securing the same to a respective spindle whereby compressed air may pass upwardly therethrough and react on a cup bottom.

10. In a paper cup making machine, a spindle mounted cup holder for holding a cup in an inverted position and for removal by an upwardly directed blast of air, said cup holder being in the form of an open ended sleeve having a cup body engageable outer surface, and radiating spokes mounting said sleeve on said spindle for flow of air through said sleeve.

11. A method of sealing the exterior seam at the closed end of a paper cup having a bottom end affixed within a tubular body comprising the steps of placing the cup in inverted position on a holder, rotating the holder, and directing a stream of fluid caulking compound into the exterior corner formed by the body and the bottom while the cup is being rotated.

12. A method of forming a paper cup having a completed sealed bottom seam comprising the steps of forming a paper cup having a bottom telescoped within the lower part of the cup body and wherein the bottom has a depending flange disposed between a lower portion of the cup body and an inwardly disposed reversely turned lower edge of the cup body, supporting the paper cup

with the bottom facing upwardly, advancing the supported cup to a point at which the paper cup is rotated about its axis, depositing caulking compound on the cup bottom at the intersection of the bottom flange and the reversely bent cup body lower edge during the rotation of the paper cup with the centrifugal force of the rotating cup evenly distributing the compound, terminating the rotation of the paper cup, and terminating the support of the paper cup.

13. An apparatus for placing caulking compound on the exterior of a cup bottom for sealing the cup bottom relative to the body of the cup, said apparatus comprising a plurality of rotatable spindles each having a cup holder thereon for holding a paper cup in an inverted position, each of said spindles carrying a pulley, means for moving said spindles along a predetermined path and periodically stopping said spindles at predetermined points, said points having located thereat in sequence a cup dispenser for delivering a cup to each of said spindles passing said cup dispenser, a caulking compound dispenser generally overlying the path of said spindles for applying caulking compound to cup bottoms passing therebeneath, means adjacent said caulking compound dispenser for rotating said spindles as said spindles pass said caulking compound dispenser whereby caulking compound deposited on cup bottoms will be urged into place by centrifugal force, said spindle rotating means including a drive belt entrained about at least a pair of pulleys, said drive belt including a belt run whose exterior surface is in driving contact with said spindle pulleys when said spindles are disposed adjacent a caulking compound dispenser, means for removing cups from said spindles, and brake means disposed intermediate said caulking compound dispenser and said cup removing means for reaction on said spindles to stop the rotation thereof.

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