

Nov. 17, 1964

K. NEGORO

3,157,339

PAPER CUP WITH CAULKED BOTTOM AND METHOD OF MAKING

Filed July 18, 1961

3 Sheets-Sheet 1

Fig. 2

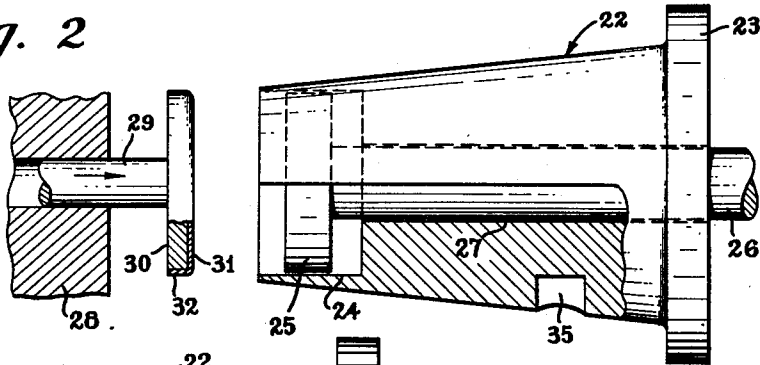


Fig. 3

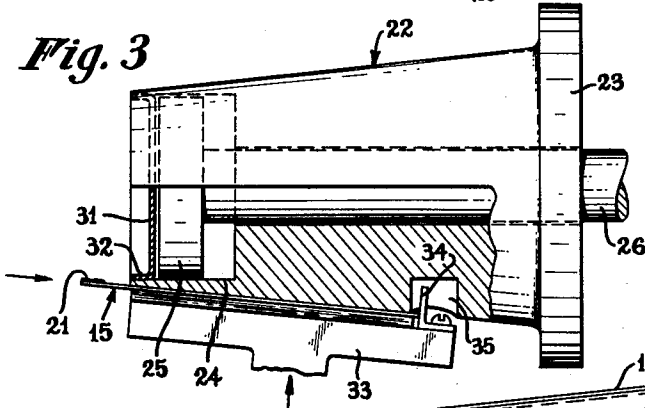


Fig. 4

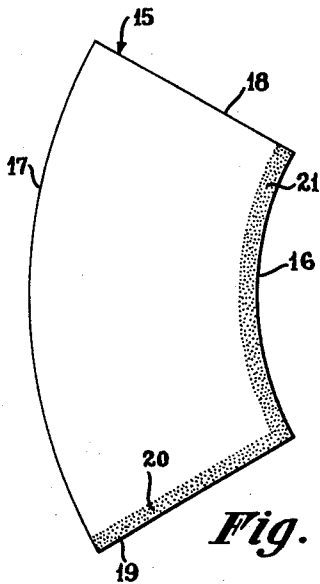
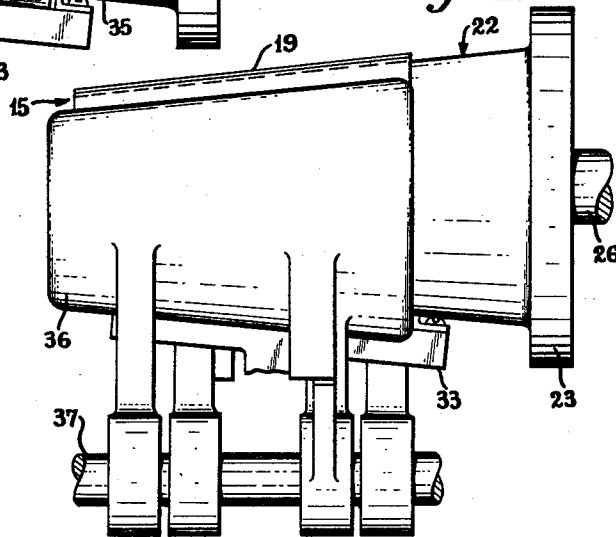


Fig. 1

INVENTOR
KAIJI NEGORO

BY
Main, Porter, Miller & Stewart
ATTORNEYS

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K. NEGORO

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3 Sheets-Sheet 2

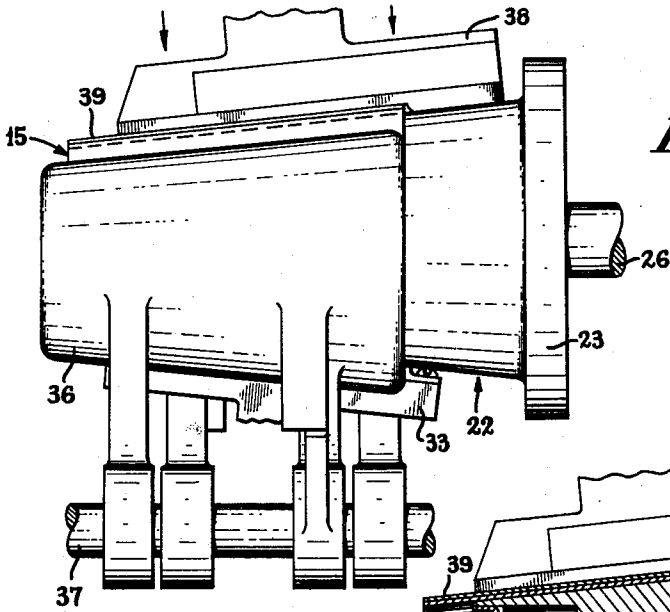


Fig. 5

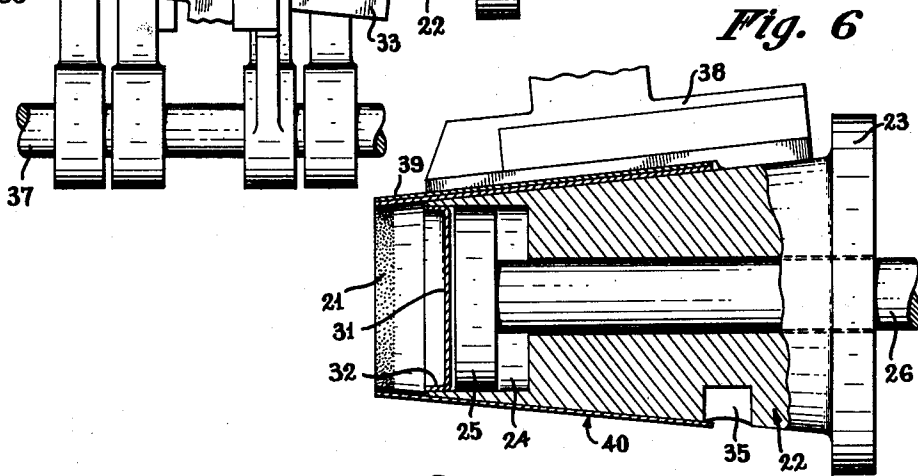


Fig. 6

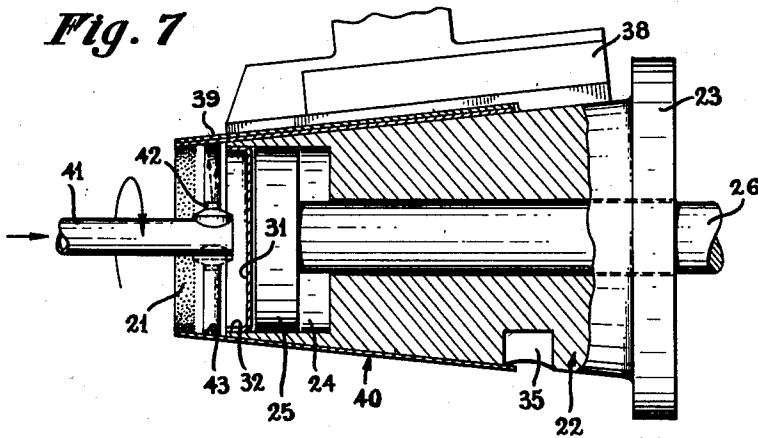


Fig. 7

INVENTOR
KAIJI NEGORO

BY
Mason, Porter, Miller & Stewart
ATTORNEYS

Nov. 17, 1964

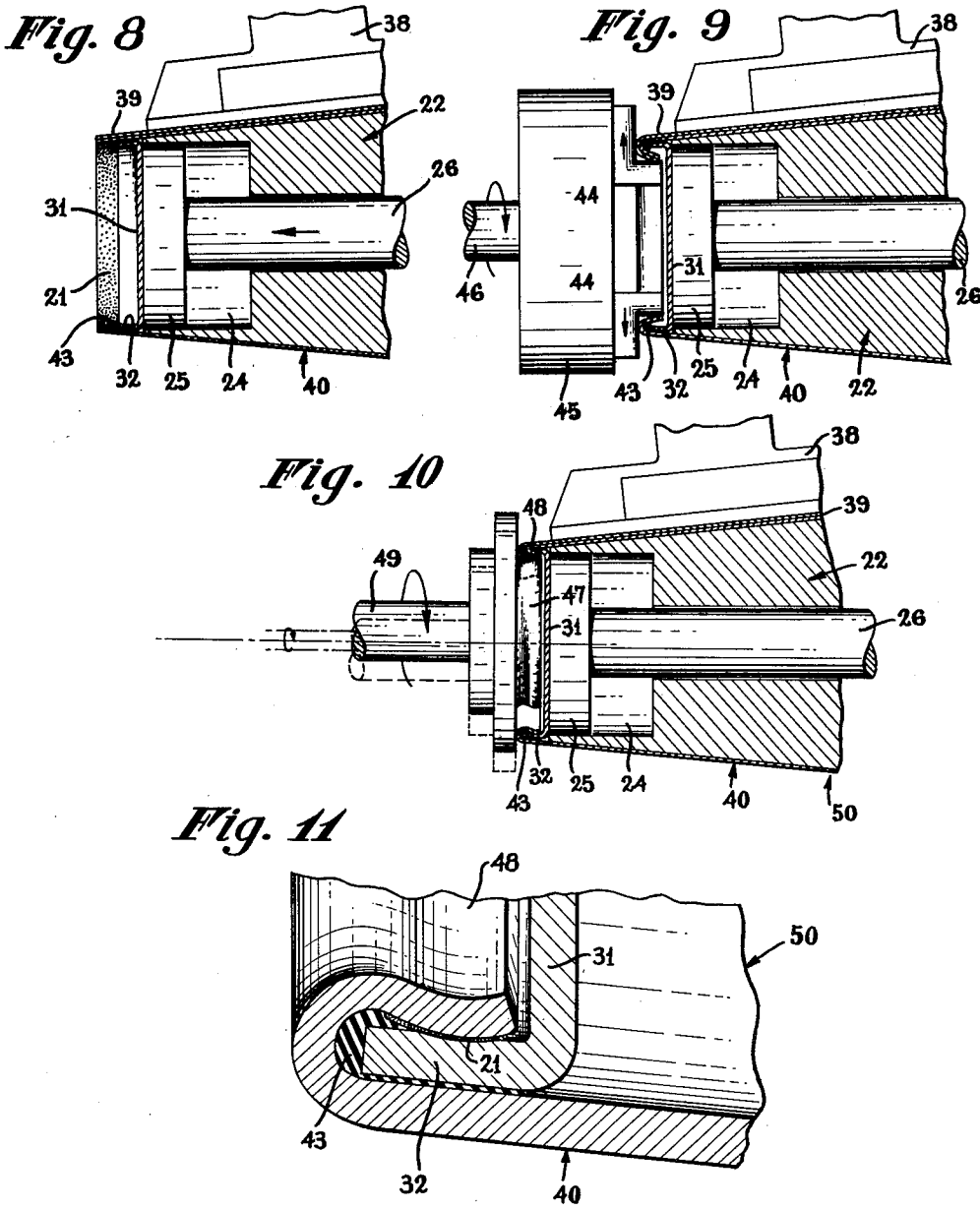
K. NEGORO

3,157,339

PAPER CUP WITH CAULKED BOTTOM AND METHOD OF MAKING

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3 Sheets-Sheet 3



INVENTOR

KANJI NEGORO

BY

Mason, Porter, Diller & Stewart
ATTORNEYS

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3,157,339
**PAPER CUP WITH CAULKED BOTTOM AND
 METHOD OF MAKING**

Kaiji Negoro, Clarendon Hills, Ill., assignor to Continental
 Can Company, Inc., New York, N.Y., a corporation of
 New York

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 14 Claims. (Cl. 229-5.5)

This invention relates in general to new and useful
 improvements in the manufacture of paper cups, and
 more particularly relates to the manufacture of a leak-
 proof paper cup.

In the manufacture of paper cups in the conventional
 manner, the cup bottom is secured to the cup body by
 means of an adhesive. Although the cup bottom may be
 properly bonded to the cup body when the cup is initially
 formed, the adhesives tend to contract upon setting or
 drying and in certain instances, this causes the adhesives
 to pull away from the surfaces being bonded or create
 cracks therein, either of which may cause the cup bottom
 seams to leak. There are many types of conventional
 adhesives used in the manufacture of paper cups, such as
 water based emulsions of modified polymers, which may
 be acrylics, acetates, vinyls, etc. A common disadvan-
 tage of all of these adhesives is, however, that they tend
 to shrink upon setting or drying and thereby tend to pro-
 duce cups that may leak.

It is therefore the primary object of this invention to
 provide a leak-proof paper cup.

Another object of this invention is to provide a novel
 paper cup utilizing conventional adhesives but with the
 further treatment of the paper cups so as to assure against
 leaking of the cups.

Still another object of this invention is to provide a
 novel leak-proof paper cup wherein an adhesive is util-
 ized for securing the cup bottom to the cup body and
 caulking material is utilized in the bottom seam to as-
 sure against leakage.

Another object of this invention is to provide a novel
 paper cup of the type including a cup body and a cup
 bottom with the cup bottom having a depending periph-
 eral flange and the cup body having a reversely turned
 flange, the two flanges being adhesively connected to-
 gether and there being disposed within the reversely
 turned portion of the cup body suitable caulking com-
 pound which engages at least a free end of the peripheral
 flange of the cup bottom to form a seal therealong with
 the cup body.

A further object of this invention is to provide a novel
 paper cup which is leak-proof, the paper cup being formed
 in the conventional manner and having the bottom there-
 of secured to the cup body by means of an adhesive, and
 the cup bottom being sealed relative to the cup body by
 means of caulking compound which supplements the ad-
 hesive as a sealing material, the caulking compound be-
 ing relatively pliable and having little or no tendency to
 contract so as to assure a permanent seal.

Another object of this invention is to provide a novel
 method of forming a leak-proof paper cup wherein a
 cup bottom is telescoped within the lower portion of a
 cup body inwardly of the final position of the cup bot-
 tom, after which caulking compound is applied to the
 inner surface of the cup body below the cup bottom, and
 then the cup bottom is moved to its final position within
 the cup body and into engagement with the caulking
 compound, after which the lower end of the cup body is
 reversely turned inwardly to form the necessary connec-
 tion with the cup bottom.

Still another object of this invention is to provide a
 novel method of forming a leak-proof paper cup wherein

a cup body has telescoped therein a cup bottom of the
 type with a depending peripheral flange, the cup bottom
 being telescoped inwardly of its final position within the
 cup body, after which caulking compound is applied to
 the inner surface of the cup body below the flange of the
 cup bottom, and then the cup bottom is moved outwardly
 to its final position with respect to the cup body with the
 flange of the cup bottom engaging and flowing the caulking
 compound to form a seal between the cup bottom
 and the cup body, after which the lower end of the cup
 body is reversely turned inwardly and adhesively secured
 to the inner surface of the flange of the cup bottom.

A further object of this invention is to provide a novel
 method of forming a paper cup which is of a leak-proof
 construction, the method including the steps of providing
 a body blank having a line of adhesive along the lower
 edge of the blank and along one side edge of the blank,
 forming the blank around a mandrel and adhesively con-
 necting together the side edges thereof to define a cup
 body, inserting into the cup body a cup bottom of the
 type having a depending peripheral flange with the cup
 bottom being positioned inwardly of its final position rela-
 tive to the cup body, applying a ring of caulking com-
 pound to the inner surface of the lower portion of the
 cup body inwardly of the band of adhesive and outwardly
 of the peripheral flange of the cup bottom, moving the
 cup bottom outwardly to its final position during which
 movement the cup bottom flange engages and causes flow-
 ing of the caulking compound, after which the lower end
 of the cup body is reversely inwardly turned to define a
 flange having the ring of adhesive thereon, and securing
 the flange of the cup body to the inner surface of the
 flange of the cup bottom.

With the above and other objects in view that will here-
 inafter 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 drawing:

In the drawing:

FIGURE 1 is a plan view on a reduced scale of a blank
 for forming a cup body in accordance with the invention.

FIGURE 2 is a schematic elevational view with parts
 broken away and shown in section of a mandrel on
 which is formed a cup body from the blank of FIGURE
 1, there being associated with the mandrel a device for
 inserting a cup bottom in the mandrel.

FIGURE 3 is an elevational view of the mandrel of
 FIGURE 2 with the cup bottom inserted therein and the
 cup body blank initially positioned with respect to the
 underside of the mandrel and clamped thereagainst.

FIGURE 4 is an elevational view of the mandrel with
 cup body shaping wings in position forming the cup body
 blank around the mandrel.

FIGURE 5 is an elevational view of the mandrel with
 an upper seam clamping member in position clamping
 the overlapping edges of the cup body blank and pres-
 sure setting the adhesive in the seam of the cup body.

FIGURE 6 is a vertical sectional view taken through
 the mandrel as it appears in FIGURE 5, but with the
 cup body body forming wings and the lower clamp mem-
 ber being omitted.

FIGURE 7 is a sectional view similar to FIGURE 6,
 and shows the step of spraying a ring of caulking com-
 pound on the inner surface of the cup body below the cup
 bottom.

FIGURE 8 is a fragmentary vertical sectional view
 similar to FIGURES 6 and 7, and shows the cup bottom
 after it has been moved outwardly of its previous posi-
 tion to its final position during which it has engaged and
 caused flowing of the caulking compound.

FIGURE 9 is a vertical sectional view through the

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mandrel and shows the lower end of the cup body in the process of being inwardly reversely folded by means of a rotary folding head.

FIGURE 10 is a fragmentary vertical sectional view through the mandrel showing the reversely turned portion of the cup body being engaged by a roller to complete the formation of the seam between the cup bottom and the cup body and the setting of the band of adhesive on the lower end of the cup body.

FIGURE 11 is an enlarged fragmentary vertical sectional view taken through the lower portion of the completed paper cup after the final seaming of the cup body to the cup bottom.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURE 1 a blank 15 from which a cup body is formed. The blank 15 is of an arcuate configuration, as is conventional in cup body blanks, and has a short curved side 16 and a longer curved side 17. The cup body blank 15 also includes a pair of straight sides 18 and 19 which are disposed in converging relation. A band of adhesive 20 is disposed along the side 19 on the inner surface of the blank 15. A similar band of adhesive 21 is disposed on the inner surface of the blank 15 along the side 16. The adhesive of the bands of adhesive 20 and 21 may be of a conventional type used in the manufacture of paper cups, and may be a water based emulsion of modified polymers, which polymers may be acrylics, acetates, vinyls, etc.

Reference is now made to FIGURE 2 in particular, wherein there is illustrated a mandrel, generally referred to by the numeral 22. The mandrel 22 is of a frusto-conical outline and has a mounting flange 23. At this time, it is pointed out that although only one mandrel 22 is illustrated, in a cup making machine, there are a plurality of such mandrels mounted on a turret for intermittent rotation from station to station so that several operations may be successively performed on the cup bodies being carried by the mandrels. The mandrel 22 being of a conventional type, further details of the turret will not be disclosed, and only those portions of the cup making machine particularly pertaining to the disclosed invention will be illustrated and described.

The smaller end of the mandrel 22 is provided with a large diameter bore 24, the bore 24 opening out through the smaller end of the mandrel 22 and being of a diameter almost equal to the external diameter of the mandrel 22 at the smaller end thereof. A pusher head 25 is mounted within the bore 24 to facilitate the removal of a completed cup from the mandrel 22. The pusher head 25 is carried by a push-pull rod 26 which extends through the mandrel 22 through a bore 27 therethrough. The manner in which the rod 26 is reciprocated is not a part of this invention and will not be described hereinafter.

The mandrel 22 may be considered at a first station in the illustration of FIGURE 2. At this station, there is provided a suitable support 28 carrying a push-pull rod 29 which is reciprocated in timed relation to the positioning of the mandrel 22 at the station. The push-pull rod 29 has a head 30 which carries a cup bottom 31. The cup bottom 31 is provided with a depending peripheral flange 32.

At the first station, the cup bottom 31 is pushed into the large bore 24 in the end of the mandrel 22 and is removed from the head 30 with the cup bottom 31 being completely recessed within the bore 24, as is illustrated in FIGURE 3.

The mandrel 22, carrying the cup bottom 31, is then moved to a second station where the cup body blank 15 is delivered to the mandrel 22. A lower clamping bar 33 moves upwardly into cooperation with the underside of the mandrel 22 to clamp the cup body blank 15 thereagainst. The lower clamping bar has a stop member 34 thereon to engage the side 17 of the cup body blank 15 and thus properly position the same with respect to the

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mandrel 22. The mandrel 22 is provided with a suitable recess 35 in the underside thereof to clear the stop member 34.

After the cup body blank 15 has been clamped to the mandrel 22 at station 2, the mandrel 22 is moved to station number 3 where a pair of wings 36 suitably pivotally mounted on a shaft 37 swing upwardly and around the mandrel 22 forming the cup body blank 15 around the mandrel with the side edge 19 overlapping the side edge 18.

After the body blank 15 has been folded around the mandrel 22, a seam clamping bar 38 is moved downwardly into engagement with that portion of the seam being formed between the overlapped edges of the cup body blank 15 being clamped between the seam clamping bar 38 and the mandrel 22 to set the adhesive 21. Thus, a bonded, leak-proof seam 39 is formed and the cup body blank 15 now becomes a completed cup body 40, as is best shown in FIGURE 6. It is to be noted that the cup body 40 has the lower small end thereof extending beyond the smaller end of the mandrel 22. It is also to be noted that the cup bottom 31 is retracted a considerable distance within the cup body 40, the cup bottom 31 being disposed inwardly of its final position relative to the cup body 40.

The mandrel 22, while the seam 39 is still being clamped by the seam clamping bar 38, is moved to a fourth station, as is shown in FIGURE 7. At this station, the lower clamping bar 33 and the wings 36 have been retracted. At the fourth station, a tube 41 is mounted for longitudinal reciprocatory movement. The tube 41 is connected to a suitable source of caulking compound which is supplied under pressure. The right hand end of the tube 41, as shown in FIGURE 7, is closed and is provided with one or more nozzles 42 from which caulking compound is sprayed onto the inner surface of the cup body 40 adjacent the lower end thereof. The caulking compound, which is referred to by the numeral 43, is sprayed onto the cup body 40 in the form of a ring with the caulking compound 43 being disposed inwardly of the adhesive band 21 and outwardly of the peripheral flange 32 of the cup bottom 31.

After the caulking compound 43 has been applied at station number 4, the mandrel 22 is advanced to station number 5. In the movement of the mandrel 22 from station number 4 to station number 5, the rod 26 is moved to the left, moving the head 25 to the left, as is illustrated in FIGURE 8. Movement of the head 25 to the left forces the cup bottom 31 out of the recess 24 and to its proper position with respect to the cup body 40. In the movement of the cup bottom 31 to its proper position within the cup body 40, the peripheral flange 32 of the cup bottom 31 engages the ring of caulking compound 43 and effects of flowing of the caulking compound with some of the caulking compound being disposed between the outer surface of the cup bottom flange 32 and an opposed portion of the cup body 40.

In FIGURE 9, the mandrel 22 is illustrated as being at the fifth station. At the fifth station, the lower end of the cup body 40 engages outwardly moving formers 44 of a cup body folding member 45 which is carried by a shaft 46 mounted for rotation during the cup body folding operation and being reciprocable to retract the forming member 45. It is to be noted from FIGURE 9 that the lower end of the cup body 40 is folded inwardly in a manner to enclose the caulking compound 43 at the edge of the peripheral flange 32 of the cup bottom 31.

The mandrel 22 next moves to station number 6, where the inwardly folded portion of the cup body 40 is engaged by an eccentrically mounted roller 47 which engages the inwardly turned portion of the cup body, the inwardly turned portion being in the form of a peripheral flange of the cup body and being referred to by the numeral 48. The roller 47 is carried by an eccentrically mounted shaft 49 which is mounted for reciprocatory

movement as well as eccentric rotary movement. At station number 6, the seam between the peripheral flange 43 of the cup body and the peripheral flange 32 of the cup bottom 31 is formed with a setting of the adhesive of the adhesive band 21 to adhesively secure the inner surface of the cup bottom peripheral flange 32 to the opposed surface of the peripheral flange 43 of the cup body 40.

As the mandrel 22 is continued to be indexed by the turret of which it is a part, the rod 26 may be further moved to the left to push on the cup bottom 31 and initiate the removal of the paper cup, generally referred to by the numeral 50, from the mandrel 22.

Reference is now made to FIGURE 11 wherein there is shown on a very large scale the specific details of the seam between the cup body 40 and the cup bottom 31. It will be seen that the peripheral flange 43 of the cup body 40 is secured to the inner surface of the peripheral flange 32 of the cup bottom 31 in the customary manner by the adhesive 21. In addition, it will be seen that the space at the free edge of the peripheral flange 32 and defined by the reversely turned portion of the lower end of the cup body 40, including the peripheral flange 43, is substantially filled by the caulking compound 43. When the cup bottom 31 was moved outwardly from the position illustrated in FIGURE 7 to the position illustrated in FIGURE 8, there was a flowing of the caulking compound 43 with the result that at least certain of the caulking compound 43 is between the outer surface of the peripheral flange 32 and the opposed portion of the inner surface of the cup body 40. Further, at the time the lower end of the cup body 40 is reversely turned inwardly, there is a slight squeezing out of the caulking compound 43 with the result that additional of the caulking compound 43 enters between the peripheral flange 32 and the cup body 40. As a result, the caulking compound 43 not only seals the cup body 40 to the free edge of the peripheral flange 32 of the cup bottom 31, but also the caulking compound 43 is disposed between the outer surface of the peripheral flange 32 and the opposed surface of the cup body 40 to provide for an additional area of sealing.

The caulking compound 43 consists of a suitable binder filled with an inert material. Examples of such caulking compounds are water based emulsions such as those used in the formation of the adhesives 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.

It is to be understood that it is not necessary for the caulking compound, which is enclosed within the folded seam, 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 and permit the passage of liquid when the caulking compound has been embodied in the bottom seam of a paper cup. Therefore, while the adhesive used in forming the bottom seam of the paper cup may shrink upon setting or drying and thus tend to produce leaks, the caulking compound will remain pliable and seal the paper cup where it would otherwise leak due to the shrinking of the adhesive. It will be readily apparent that in accordance with the invention, a leak-proof paper cup may be formed by the addition of the caulking compound. It will also be apparent that the paper cup may be formed on existing cup making machinery with the addition of the caulking compound applying station and the specific shifting of the cup bottom in relation to the cup body subsequent to the application of the caulking compound.

From the foregoing, it will be seen that novel and advantageous provision has been made for carrying out the desired end. However, attention is directed to the fact that variations may be made in the example method

and apparatus disclosed herein without departing from the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. A paper cup comprising a cup body and a cup bottom telescoped within said cup body, said cup bottom having a depending peripheral flange opposing the inner surface of said cup body, said cup body having a reversely turned lower portion terminating in a peripheral flange telescoped within said cup bottom peripheral flange and opposing the inner surface thereof, said reversely turned lower portion being spaced axially of said cup bottom peripheral flange and defining a pocket, and caulking compound disposed in said pocket and sealing said cup bottom relative to said cup body against leakage.
2. The paper cup of claim 1 wherein said cup body peripheral flange is adhesively secured to said cup bottom peripheral flange.
3. The paper cup of claim 1 wherein said caulking compound is formed of a binder filled with an inert material.
4. The paper cup of claim 1 wherein said caulking compound is formed of a water based emulsion binder filled with an inert material.
5. The paper cup of claim 1 wherein a thin layer of said caulking compound is disposed between at least part of the opposed surface portions of said cup bottom peripheral flange and said cup body.
6. The paper cup of claim 1 wherein a thin layer of said caulking compound is disposed between at least part of the opposed surface portions of said cup bottom peripheral flange and said cup body, and said cup body peripheral flange is adhesively secured to said cup bottom peripheral flange.
7. A method of forming a leak-free paper cup of the type including a cup body and a cup bottom telescoped within the cup body, the steps of telescoping the cup bottom within the lower end of the cup body, applying a continuous ring of caulking compound to the inner surface of the cup body below the cup bottom, and then reversely turning the extreme lower portion of the cup body inwardly to complete the forming of the bottom of the cup.
8. the method of claim 7 wherein the cup bottom has a depending peripheral flange and including the further step of adhesively securing the reversely turned portion of the cup body to the cup bottom flange.
9. A method of forming a leak-free paper cup of the type including a cup body and a cup bottom telescoped within the cup body, the steps of telescoping the cup bottom within the lower end of the cup body inwardly of the final position of the cup bottom, applying a continuous ring of caulking compound to the inner surface of the cup body below the cup bottom, moving the cup bottom downwardly into engagement with the caulking compound, and then reversely turning the extreme lower portion of the cup body inwardly to complete the forming of the bottom of the cup.
10. A method of forming a leak-free paper cup of the type having a cup body and a cup bottom with the cup bottom being telescoped within the cup body and having a depending peripheral sealing flange, the steps of telescoping the cup bottom within the lower end of the cup body inwardly of the final position of the cup bottom, applying a continuous ring of caulking compound to the inner surface of the cup body below the cup bottom flange, moving the cup bottom downwardly to the final position thereof with the cup bottom flange engaging the caulking compound, and then reversely turning the extreme lower portion of the cup body inwardly to enclose the caulking compound and to form a peripheral flange telescoped within the cup bottom peripheral flange.
11. The method of claim 10 together with the additional step of adhesively securing the cup body flange to the cup bottom flange.
12. A method of forming a leak-free paper cup of

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the type having a cup body and a cup bottom with the cup bottom being telescoped within the cup body and having a depending peripheral sealing flange, the steps of telescoping the cup bottom within the lower end of the cup body inwardly of the final position of the cup bottom, applying a continuous ring of caulking compound to the inner surface of the cup body below the cup bottom flange, moving the cup bottom downwardly to the final position thereof with the cup bottom flange engaging the caulking compound and flowing the caulking compound with a portion of the caulking compound flowing between the cup bottom flange and the opposed portion of the cup body, and then reversely turning the extreme lower portion of the cup body inwardly to enclose the caulking compound and to form a peripheral flange telescoped within the cup bottom peripheral flange.

13. A method of forming a leak-free paper cup of the type having a cup body and a cup bottom with the cup bottom being telescoped within the cup body and having a depending peripheral sealing flange, the steps of providing the inner surface of the cup body at the lower end thereof with a band of adhesive, telescoping the cup bottom within the lower end of the cup body inwardly of the final position of the cup bottom, applying a continuous ring of caulking compound to the inner surface of the cup body inwardly of the band of adhesive and below the cup bottom flange, moving the cup bottom downwardly to the final position thereof with the cup bottom flange engaging the caulking compound, and then reversely turning the extreme lower portion of the cup body inwardly to enclose the caulking compound and to form a peripheral flange carrying the adhesive with the cup body flange being telescoped within the cup bottom peripheral flange and adhesively secured thereto.

14. A method of forming a leak-free paper cup of the type having a cup body and a cup bottom with the cup bottom being telescoped within the cup body and having

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a depending peripheral sealing flange, the steps of providing the inner surface of the cup body at the lower end thereof with a band of adhesive, telescoping the cup bottom within the lower end of the cup body inwardly of the final position of the cup bottom, applying a continuous ring of caulking compound to the inner surface of the cup body inwardly of the band of adhesive and below the cup bottom flange, moving the cup bottom downwardly to the final position thereof with the cup bottom flange engaging the caulking compound and flowing the caulking compound with a portion of the caulking compound flowing between the cup bottom flange and the opposed portion of the cup body, and then reversely turning the extreme lower portion of the cup body inwardly to enclose the caulking compound and to form a peripheral flange carrying the adhesive with the cup body flange being telescoped within the cup bottom peripheral flange and adhesively secured thereto.

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