Aug. 18, 1942. W. E. AMBERG 2,293,036

PAPER CUP

Filed Oct. 5, 1938

Fig. 1.

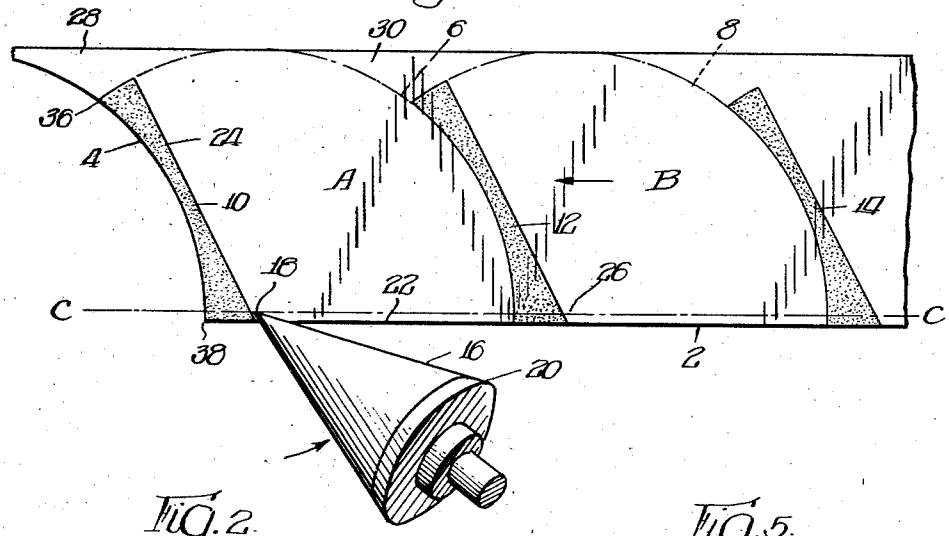


Fig. 2.

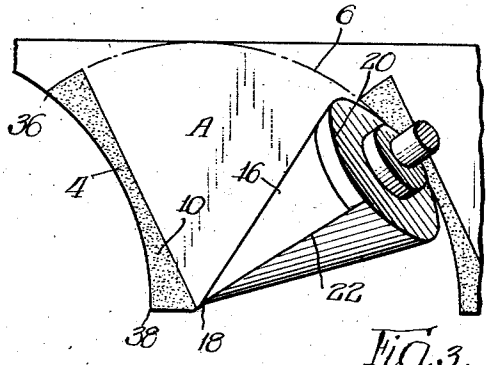


Fig. 3.

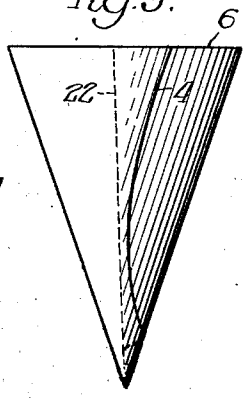


Fig. 4.

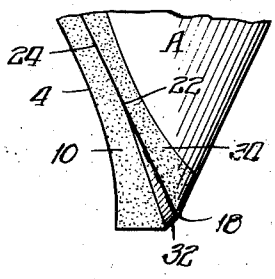
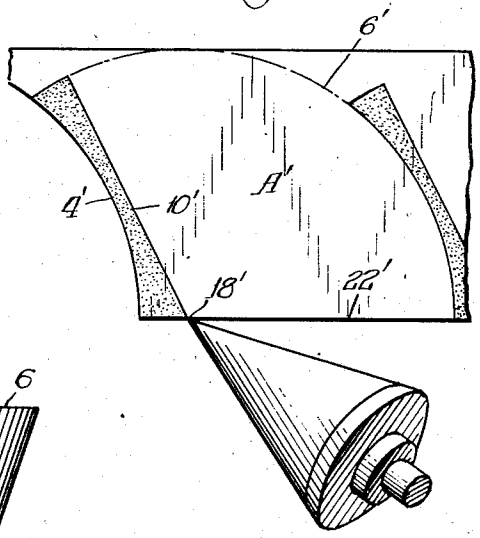


Fig. 5.



INVENTOR.
Walter E. Amberg,
BY
ATTORNEY.

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2,293,036

PAPER CUP

Walter E. Amberg, Chicago, Ill., assignor to Universal Paper Products Company, Chicago, Ill., a corporation of Illinois

Application October 5, 1938, Serial No. 233,345

4 Claims. (Cl. 229—1.5)

This invention relates to a new and improved type of paper cup and more particularly a cone-shaped paper cup suitable for use in dispensing water, soda and other liquids.

One of the objects of the invention is to provide a paper cup which can be made from a strip of paper with a minimum amount of material and very little waste.

Another object is to provide a new and improved type of paper cup which can be formed rapidly and continuously on a cup machine from a continuous roll of paper. Other objects will appear hereinafter.

These objects are accomplished in accordance with this invention by the provision of a cone-shaped cup formed from a blank comprising a convex side, a concave side and a straight side arranged to intersect each other. The convex side and the concave side have the same radii of curvature and are spaced apart on a line joining the centers of curvature a distance substantially greater than the radius of curvature. The straight side of the blank is substantially parallel to or coincides with the line joining the centers of the radii of curvature of the convex and concave sides.

This blank is formed into a cup by rolling it or winding it around the center of curvature of the convex side as the apex of the cone so that the convex side forms the periphery of the cup and portions of the blank adjacent the concave side together with portions of the blank adjacent the straight side are overlapped and form a part of the side wall of the cup. In forming such a cup the center of the radius of curvature of the convex side may be on the straight side, but it is preferable in accordance with this invention that said center be within the blank and that the blank be wound or rolled in such a manner as to form an underlying pocket of material at the apex, thereby rendering the cup leak-proof. The position of the center of curvature of the convex side is preferably such that the edges of any underlying pocket of material do not project beyond the confines of the overlapping portion when the cup is formed around said center as the apex of the cone.

Other features and advantages of the invention will become apparent from a reading of the following specification in the light of the accompanying drawing in which:

Figure 1 shows a strip of paper having dotted lines to indicate the manner in which the blank is cut;

Figure 2 is a view of a portion of the strip shown in Figure 1 illustrating a preferred manner of winding the blank into a cone-shaped cup;

Figure 3 is a side elevational view of the completed cup;

Figure 4 is a view of the apex portion of the cup showing a preferred form of construction;

Figure 5 illustrates a modified method of forming cups and blanks as herein described.

As illustrated in Figure 1, the blanks are severed successively from a strip of paper 2 along lines 4, 6 and 8. Prior to severing the blanks adhesive is applied to portions of the paper strip as indicated at numerals 10, 12 and 14.

Paper strip 2 is advanced beneath a conical former 16 which is rotating against a flat surface in an orbit having its center of curvature at point 18.

As illustrated in Figure 1, the center point 18 is also the center of the arc 6 which defines the convex side of the blank. Conical former 16 is provided with a cutting edge 20 and also with any suitable means for gripping the side of paper strip 2. Hence, as said former rotates in its orbit it grips the side of paper strip 2 and immediately thereafter, or simultaneously therewith, the cutting edge of said former begins to cut the paper strip along line 6 and roll it into a cone-shaped receptacle. The straight edge 22 of blank A is carried by the former, as illustrated in Figure 2, and is rolled or wound on the former until it substantially corresponds with line 24 at which point it is overlapped by the glued portion 10 and the resultant cone-shaped cup is discharged from the conical former in any suitable manner, for example, by means of air or a mechanical ejector. During the formation of the cup the blank A may be held on the former in any suitable manner, as, for instance, by vacuum or by mechanical grippers. Shortly after the cup is formed it is discharged while the conical former continues in its orbit. In the meantime the strip of paper 2 is fed forward into the orbit of conical former 16 so that the center 26 of the radius of curvature of convex side 8 is substantially at the apex of former 16, or in other words, occupies the position of point 18 previously occupied by blank A.

As conical former 16 continues in its orbit it then forms a cup from blank B in the same manner as just described for blank A. Thus, a series of cups is successively formed from a continuous strip of paper with only a small amount of waste as represented by the areas 28 and 30.

In Figure 1, line C—C connects the centers of

lines 4, 6 and 8 and said lines are spaced apart on center line C—C a distance which is greater than their radii of curvature. Thus, referring to blank A, it will be seen that as the cup is formed line 6, when appropriately cut by conical former 16, becomes the convex side of the blank and forms the periphery of the cup, line 4 becomes the concave side and line 22 becomes the straight side. These sides are also arranged as to intersect each other and to form a three-sided blank. Actually of course, according to the method described, no blank is formed prior to the formation of the cup. This method of making cups differs radically from methods heretofore in use which involve cutting the blank before the formation of the cup. One of the features of the present invention resides in the fact that the cup is formed from a strip of paper without changing the direction of the material from which the cup is formed. In some methods heretofore in use, where the cup has been formed from a continuous strip of paper, it is absolutely essential to sever the paper before beginning the formation of the cup because when the former grips the material to be formed into a cup, it changes the direction of said material. According to the present invention no such change of direction is necessary. The former, as previously explained, rolls in an orbit against a flat surface which may be provided with a cutting knife conforming to the curvature of the orbit and adapted to cooperate with cutting knife 20 on conical former 16.

The construction of the apex of the cup is illustrated in more detail in Figure 4. As shown in Figure 4, when the paper is wound onto the conical mandrel a pocket of material 32 is formed just beyond the apex 18. This pocket of material contains no adhesive but is overlapped and held in place by adhesive coating 10. The position shown in Figure 4 corresponds to that which obtains when the material A has been wound on conical former 16 to the point where straight edge 22 coincides with line 24 and is just about to be overlapped by curved edge 4 containing adhesive coating 10. As material A continues to be wound upon conical mandrel 16, adhesive coating 10 will overlap and coincide with area 34.

According to one of the preferred embodiments of the invention it has been found that unusually good results may be obtained by coating area 34 with a dried coating of adhesive, usually referred to as a remoistening adhesive. Area 10 is coated with a wet adhesive which is applied to the top side of paper strip 2 at some point prior to the point where said strip passes beneath mandrel 16 but sufficiently close that the adhesive does not become dry before the cup is formed. The dried coating 34 on the other hand is applied to the under side of the paper along straight edge 22 at such a point that it is substantially dry before the cup is formed. When the wet coating of adhesive is brought into contact with the dried coating of adhesive, an unusually strong bond is obtained.

It will be understood that small portions of the paper ordinarily forming the cup may be removed by clipper knives or in any other suitable manner while the cup is being formed. For example, if desired, corner portions 36 and 38 may be cut off along straight or curved lines without departing from the invention.

While, according to the preferred construction, the centers of curvature of lines 6 and 8 are substantially within the strip of material, as illustrated in Figures 1 and 2, it is also possible to provide a cup in which the centers of radii of curvature of said lines are on the edge of strip 2. This is illustrated in Figure 5 in which the center of curvature 18' of line 6' adapted to form the convex side or periphery of the cup is on the straight edge 22', thus providing a cup in which the blank A' has a concave side 4', a convex side 6', a straight side 22' and a point 18' adapted to form the apex of the cup and which is also the center of curvature of the side 6'. In this type of cup the adhesively coated area 10' overlaps the straight edge 22' but there is no pocket of material at the apex, as illustrated by portion 32 of Figure 4. In the modification described in Figure 5 the line joining the centers of curvature of the concave and convex sides substantially coincides with the edge of the strip.

It is preferable, in accordance with the present invention, that the conical mandrel 16 pick up the paper strip 2 along straight edge 22. This permits the mandrel 16 to grab or hold a maximum area of the paper strip and furthermore, brings the mandrel in contact with the edge of the paper strip along substantially the entire length of the mandrel at approximately the same time, thus making it possible for the mandrel to grab and hold the strip more tightly. It will be understood, however, that instead of moving the mandrel in a counterclockwise direction, as shown in Figure 1, it may be moved in its orbit in the opposite direction, in which event, however, mandrel 16 would pick up curved edge 4 and the glue areas 10, 12 and 14 of Figure 1 would be applied along straight edge 22 on the top side of the advancing strip, thus placing curved edge 4 within the blank rather than outside, as previously described.

While the glue areas are shown in the drawing as being applied along the edge of the paper, it will be understood that it is customary in practice to leave a margin free from glue in order to keep the glue from extending beyond the edges when they are overlapped.

The expression "center of curvature of the convex side within the confines of the blank" is employed herein generically to include and cover a blank in which said center is on the edge of the blank as well as one in which the center is substantially inside of the blank. The expression "substantially parallel" is used generically herein to cover coinciding lines as well as lines which are side by side. The expression "sides arranged to intersect each other" is intended to cover an arrangement of sides which actually intersect or which would normally intersect except for the removal of portions of the blank in the immediate proximity of the points of intersection.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A three sided blank for forming a cone-shaped paper cup having a substantially true conical form, said blank being unsymmetrical in shape of a generally tapering configuration and comprising a convex side formed from a single arc adapted to form the mouth of the cup and having its center of curvature at a point within the confines of the blank, a straight side, a concave side joining said straight and convex sides and formed from a single arc having the same radius as the convex side with its center of curvature outside of the blank, the straight line joining the centers of curvature of the convex and concave sides being parallel to and adjacent

the said straight side, said center of curvature of the convex side being nearer the concave side than the convex side as measured along said straight line joining the centers of curvature of said sides adapted to lie substantially at the apex when the blank is wound into a cup, said center of curvature being so positioned with relation to the concave side and the straight side that an under-lying pocket of material is formed when said sides are overlapped without projecting beyond the confines of the overlapping portion.

2. A cone-shaped cup having a substantially true conical shape formed from a blank of flexible sheet material of an unsymmetrical generally tapering configuration comprising three sides arranged to intersect each other, one of said sides being a convex side with its center of curvature within the confines of the blank, another of said sides being a concave side with the same radius of curvature as the convex side and with its center of curvature outside of the blank, said convex and concave sides extending a short distance beyond a straight line joining the centers of curvature and intersecting the third side which is substantially parallel to said line joining the centers of the radii of curvature, said blank being wound into a cone-shaped cup with the apex substantially at the center of curvature of the convex side and the other two sides overlapping to form a seam in the side walls of the cup with a pocket of material in said seam adjacent the apex.

3. A three sided blank for forming a vessel having substantially a true conical shape, said blank being unsymmetrical in shape of a generally tapering solid configuration and comprising a body portion and an overlap portion and comprising a lower edge consisting of a single concave arc, an upper edge consisting of a single convex arc to define the mouth of the vessel having the same radius of curvature as the lower edge and a side edge which is substantially straight, said side edge and said lower edge being adapted to overlap each other to form a seam in the side wall of the vessel, and the center of curvature of said upper edge being within the blank at a point nearer the lower edge than the upper edge as measured along a straight line through the centers of curvature of said convex and concave arcs.

4. A cone-shaped paper cup of a substantially true conical shape formed from a blank of unsymmetrical tapering configuration comprising a lower edge having a concave arc, an upper edge having a convex arc of the same radius of curvature as said lower edge and a substantially straight side edge, said convex arc forming the mouth of the cup with its center of curvature in said blank substantially at the apex of the cup, and said concave arc and said straight side being overlapped to form a seam in a minor portion of the side wall of the cup extending from the apex to the mouth of the cup, the width of said seam being greater adjacent the apex and adjacent the mouth of the cup than in the central portion of the side wall.

WALTER E. AMBERG.