June 23, 1942. W. E. AMBERG ET AL 2,287,015

PROCESS AND APPARATUS FOR MANUFACTURING PAPER CUPS

Filed Aug. 3, 1940 3 Sheets-Sheet 1

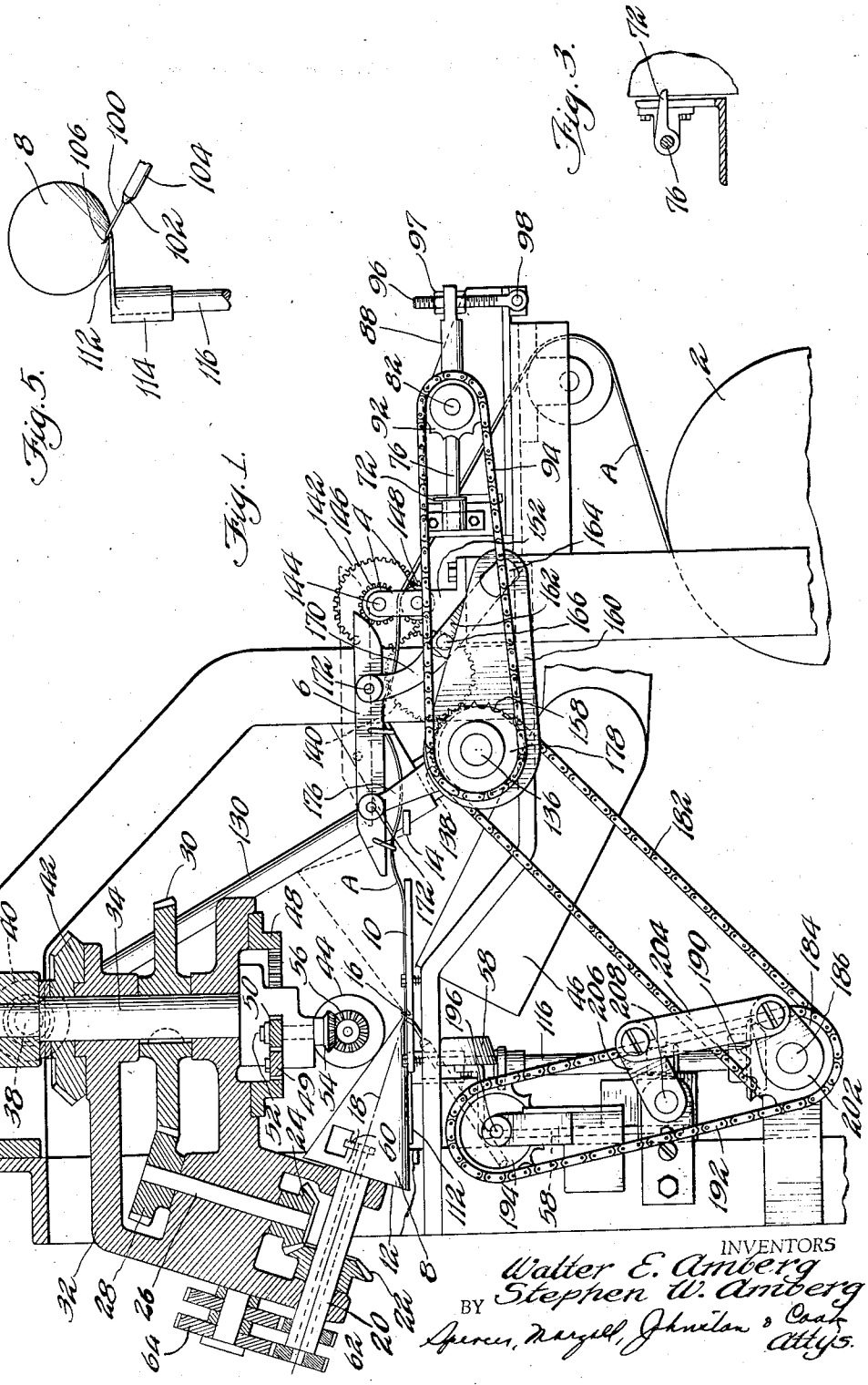


Fig. 1.

Fig. 5.

Fig. 3.

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Filed Aug. 3, 1940 3 Sheets-Sheet 2

Fig. 2.

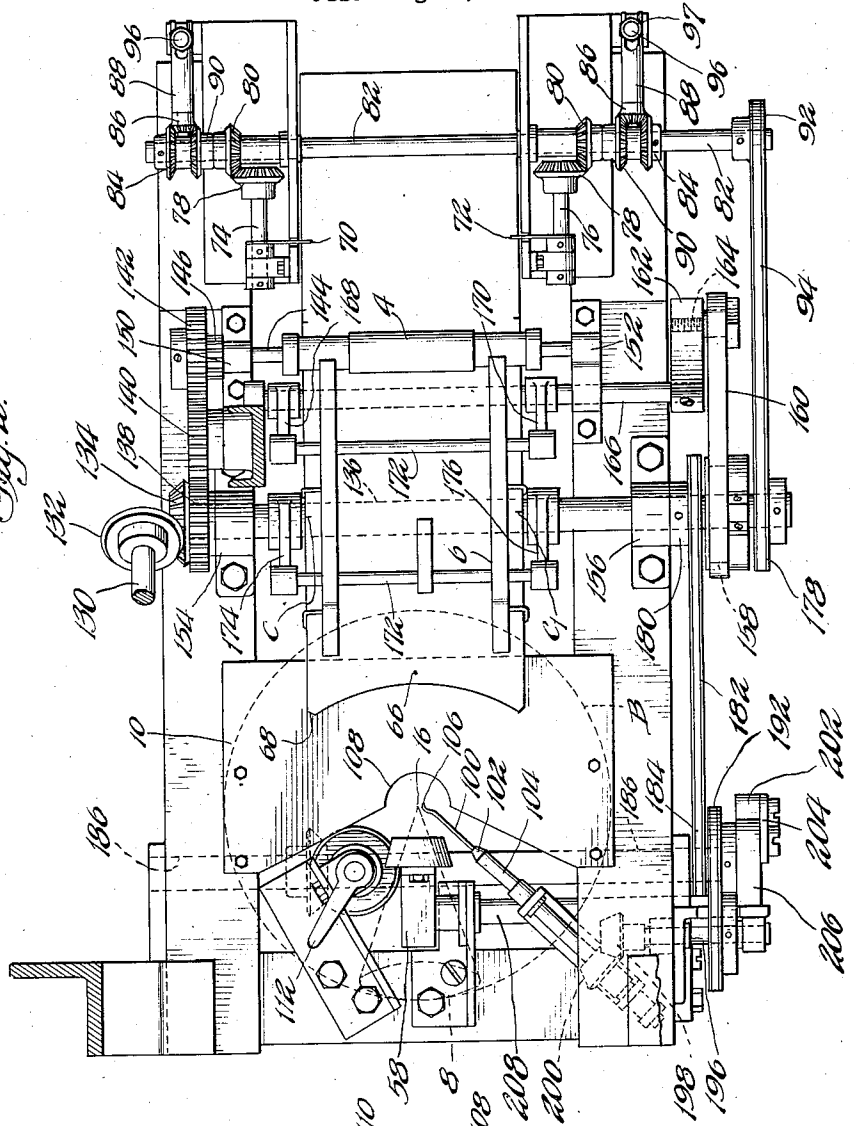
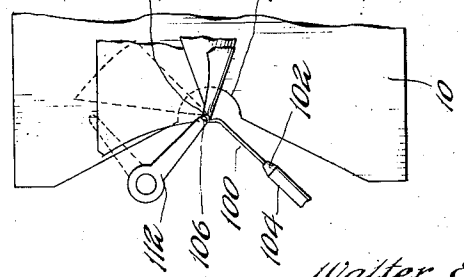


Fig. 6.



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Fig. 4.

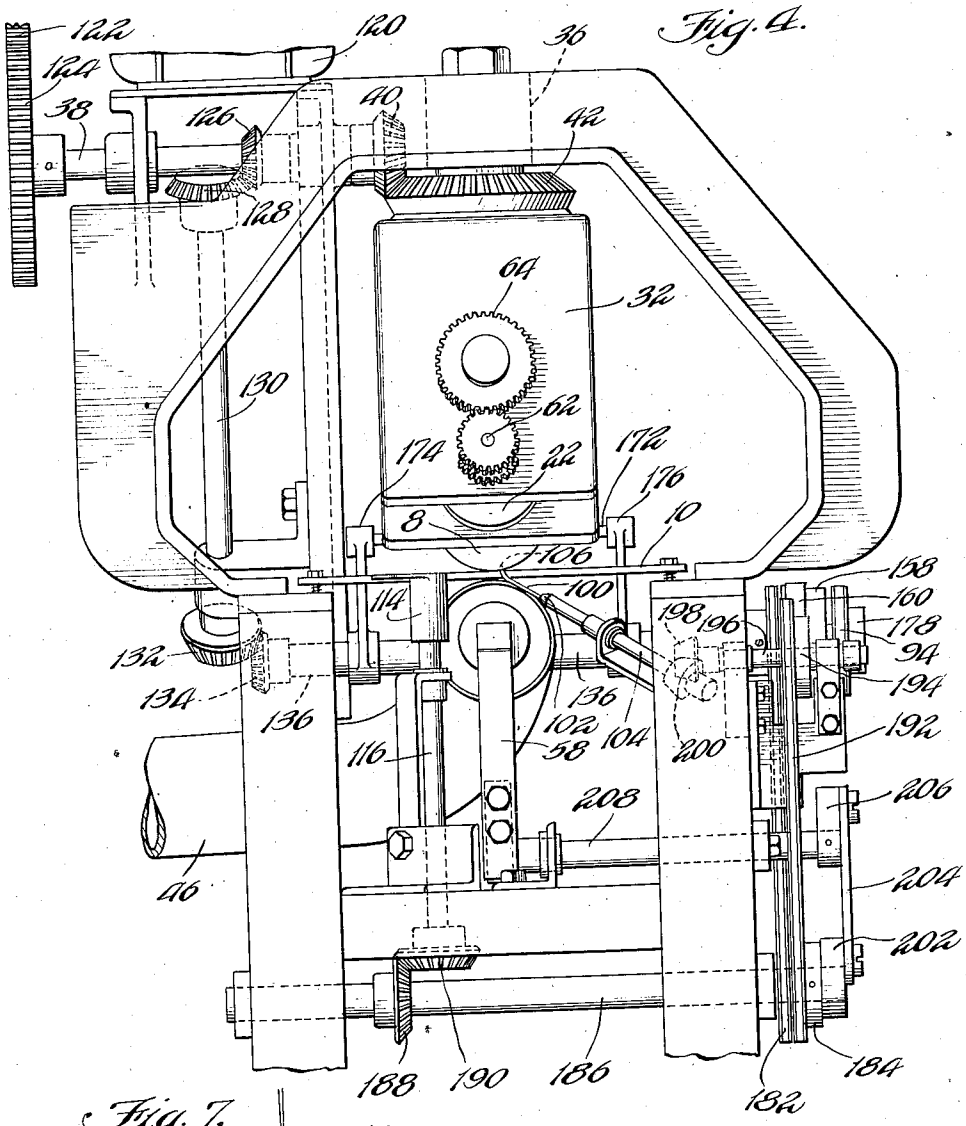
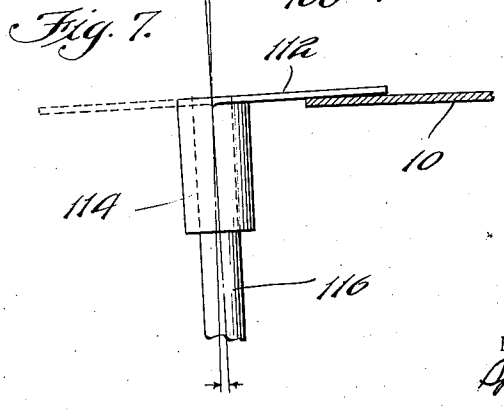


Fig. 7.



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PROCESS AND APPARATUS FOR MANUFACTURING PAPER CUPS

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Application August 3, 1940, Serial No. 350,878

9 Claims. (Cl. 93—36.2)

This invention relates to a process and apparatus for the manufacture of paper cups, and more particularly to a new and improved process and apparatus for the manufacture of cone shaped paper cups.

One of the objects of the invention is to provide a method of manufacturing paper cups at greatly increased speeds of production.

Another object of the invention is to provide an improved method and apparatus for making cone shaped paper cups substantially without waste.

Still another object of the invention is to provide a method of making cone shaped paper cups from strip stock such as a continuous strip of paper taken from a roll wherein certain operations are carried out on the paper far in advance of the actual formation of the cup.

Still another object of the invention is to provide a method and apparatus for feeding a continuous strip of paper by means of feed rolls and a take-up mechanism to a conical cup forming mandrel in a continuous operation, wherein the cup forming operation is assisted by partially severing, cutting or slitting opposite edges of the strip of paper in advance of the feed rolls, this severing operation being effected by rotating knives capable of rotating at varying speeds and adjustable as to timing of rotation without stopping the cup forming operation.

Still another object of the invention is to provide a new and improved method and new and improved devices for removing the finished cup from the forming mandrel.

Another object of the invention is to provide a new and improved method and new and improved devices for gripping, holding and releasing the edge of the paper strip prior to, during and after the cup forming operation.

Another object of the invention is to provide a new and improved method and new and improved devices for forming the apex of the cone shaped cup.

Other objects and advantages of the invention will appear by reference to the following description in view of the acompanying drawings, in which:

Figure 1 represents partly in section an elevational view of a cup forming method and cup forming device employed to accomplish the objects of this invention;

Figure 2 is a plan view with parts broken away and with some parts removed of the cup forming devices shown in Figure 1;

Figure 3 is a detailed view taken along the line 3—3 of Figure 1;

Figure 4 is an end view of the apparatus shown in Figures 1 and 2;

Figure 5 is an end view similar to Figure 4 showing only the tucking mechanism, the creasing mechanism and the forming cone to illustrate how said mechanisms operate without interfering with one another.

Figure 6 is a partial plan view similar to Figure 2 showing a changed position of certain parts of the apparatus with other parts being omitted for clearness;

Figure 7 is a diagrammatic view showing how the creaser operates above and below the top surface of the bottom plate.

Referring to Figure 1, it will be seen that a strip of paper A is fed from a roll 2 through a pair of feed rolls 4 and a take-up mechanism 6 to a forming mandrel 8. The paper is supported on a bottom plate 10. A knife edge 12 is provided on mandrel 8 which cooperates with a knife blade 14 beneath the paper strip A.

The apex of the conical forming mandrel is at point 16. In the full line position shown in Figure 1 the mandrel is in discharge position, that is to say, a cup has been formed and has just been discharged or is about to be discharged. In the dotted line position shown in Figure 1 the mandrel is in the process of forming the cup by rolling over the unsevered end of the strip and simultaneously severing the strip as the cup is formed in a single severing operation.

The mandrel 8 is rotated about its own axis 18 by means of a shaft 20 driven from any suitable source of power. At the same time, the mandrel 8 rotates in an orbit generally shown at B in Figure 2 around the apex point 16 which is also the center of the orbit. This rotation may be effected in any suitable manner, for example, by means of a gear 22 on shaft 20 engaging a gear 24 on shaft 26, which in turn is fixed to a gear 28 engaging a larger gear 30. The latter gear 30 is stationary and is affixed to vertical spindle 34 so that in effect the gear 28 runs around it or uses it as a track. The entire mandrel assembly is supported by a casting 32 which revolves around the stationary spindle 34. The vertical spindle 34 is held in a stationary bolt head 36.

The entire mandrel assembly, including casting 32, is rotated in an orbital path from the main drive shaft 38 connected to a suitable source of power, not shown, and supported by means of the stationary bolt head 36. The drive shaft 38

is connected through a gear 40 to gear 42, which is fixed to the casting 32 so that as gear 40 rotates it causes gear 42 and at the same time casting 32 to rotate in an orbital path. The gear 30 being fixed to vertical spindle 34 is stationary so that the oribital rotation of casting 32 causes the rotation of gear 28. This latter rotation is transmitted through shaft 26 to gear 24 and thence to gear 22, which in turn rotates shaft 20 and causes the mandrel 8 to rotate about its own axis while it is moving in its orbital path.

To the lower part of the vertical spindle 34 is affixed a housing upon which is mounted a rotatable wheel 44. It will be observed that the wheel 44, hereinafter referred to as the discharge wheel or kick-off roll, occupies a position off-center with respect to a line drawn through the center of the mandrel orbit and that its position is relatively fixed. When the mandrel is in discharge position, as shown in full lines in Figure 1, the completed cup thereon is brought against the rapidly rotating wheel 44 and is thereby discharged into a chute 46 mounted in the general position shown in Figure 1 below the plane of advance of the paper strip and off-center with respect to the apex of the conical cup.

The rotation of the casting 32 also causes the rotation of discharge wheel 44. This is accomplished by means of an internal gear 48 which is affixed to the casting 32 and engages an idler gear 49 engaging with a gear 50, which in turn drives shaft 52 fixed to a miter gear 54, the latter engaging with another miter gear 56 affixed to the kick-off roll 44.

It is an important feature of the present invention that the discharge wheel or kick-off roll 44 occupies a relatively fixed position, which is off-center with respect to a line drawn vertically through the center point 16 of the mandrel orbit and on the discharge side of the orbital path B. Thus, when the conical mandrel 8 is actually forming the cup, for instance, when it is in the dotted position, shown in Figure 1, the discharge wheel or kick-off roll 44 is out of the way. As soon as the cup is formed and when the conical mandrel moves into the discharge position, as shown in full lines in Figure 1, it moves against the kick-off roll and since the kick-off roll is rotating at a relatively high rate of speed, it instantly causes the completed cup to be discharged from the conical mandrel and to fly into the chute 46 positioned below the forming position. In order to keep the discharge cups from piling up at the mouth of the chute a conventional type of stacker mechanism may be used, as shown, for instance, by the stacker mechanism 58 which is adapted to move back and forth into and out of the mouth of the chute.

In order to form the cup, the edge of the paper strip is gripped by means of a dog 60 on mandrel 8 which is operated from an internal shaft 62 driven by means of a mutilated gear assembly 64. The mutilations in gears 64 are so arranged that the dog 60 grips the paper as soon as the point 66 corresponding to the apex point of the cup (Figure 2) coincides with the point 16, which is the center of the mandrel orbit. It will be observed from Figure 2 that while the forming mandrel 8 is in the discharge position the leading edge of the paper at point 66 has not quite reached the center of the mandrel orbit 16. However, as the mandrel 8 continues to rotate in an orbit in a counter-clockwise direction, the paper continues to advance.

With the point 66 coincides with the point 16 the paper is in cup forming position. At the same time, the transverse cuts C and C_1 intersect the mandrel orbit B. At this point the dog 60 on mandrel 8 is open but as soon as it arrives opposite the edge 68 of the paper, the arrangement of the mutilated gear assembly 64 causes the dog 60 to close on edge 68. The gripping means or dog 60 continues to remain closed until such time as the paper is wound tightly enough on the mandrel to permit the dog to be released. The winding of the cup begins before the strip is severed. As the mandrel continues to roll in its orbit, the strip is severed causing a small triangularly shaped piece of paper to be cut out along the line of cut C. A similar piece of paper is cut out at the end of the severing operation along the line of cut C_1. These cut out pieces are defined in part by the cuts C and C_1, in part by the sides of the strip, and in part by the mandrel orbit or the orbit of the cutting knife on the mandrel.

The purpose of the small triangularly shaped cut out portions is to facilitate the advance of the edge of the strip into the opening permitted by the dog 60 in mandrel 8, and also to prevent the presence of sharp edges within the interior of the cup or on the outside thereof. It will be appreciated that these cuts C and C_1 might be made in the strip by clipper knives actuated by the rotation of the mandrel or by some other means. An important feature of the present invention, however, resides in the discovery that it is much more advantageous to place these knives behind the feed rolls, that is to say, between the paper roll and the feed rolls, and to employ continuously rotating clipper knives.

As shown in Figure 2, the knives 70 and 72 are rotated on shafts 74 and 76, respectively. Both mechanisms are driven synchronously by a chain and sprocket drive from a power shaft. As illustrated in Figure 2, the shaft 76 has affixed thereto a miter gear 78, which in turn engages with a miter gear 80 affixed to shaft 82. At the far end of shaft 82 is affixed another miter gear 84, which engages with a miter gear 86 freely rotatable on a fixed shaft 88. Loosely mounted on shaft 82 is a gear and sprocket assembly D comprising a miter gear 90 and a sprocket 92. This assembly is rotated from a source of power, not shown, through a chain 94 passing over sprocket 92. The rotation from miter gear 90 is transmitted to the shaft 82 through miter gear 86 and miter gear 84. It will be observed, however, that the shaft 88 on which miter gear 86 is rotatably mounted may be moved in an arcuate path around shaft 82 by means of adjusting lock nuts and a screw 96. The screw 96 passes through a slot in shaft 88 and is pivoted at point 98. The loose fit of the shaft 88 plus the pivoting of screw 96 permits the arcuate movement of shaft 88 and the adjustment of the shaft 88 to any desired position within certain limits merely by changing the lock nuts 97. A change in position of shaft 88 with respect to shaft 82 changes the timing at which the knife 76 rotates. The amount of adjustment of shaft 88 is normally relatively small, say about one-fourth to one-half inch. By adjusting this lock nut and screw assembly it is therefore possible to increase or decrease the speed of rotation of shaft 82 and thereby also increase or decrease the speed of rotation of clipper knives 70 and 72. In this way, it is possible to control the operation of the clipper knives in accordance with the speed of the cup forming operation and to make any neces-

sary adjustments without stopping the machine.

The feed rolls 4 are operated continuously from any suitable source of power, as, for example, a shaft connected to the main shaft through a series of gears, not shown. It will be appreciated that as soon as the mandrel 8 begins to roll over and sever the paper from the strip, the forward movement of the strip must cease, thereby causing some of the paper to pile up back of the edge which is being severed. The actual feeding of the paper is continued again after the severing operation by means of a take-up mechanism 6, as generally shown in Figures 1 and 2. This mechanism moves upwardly, as shown by the dotted line position in Figure 1, to take up the slack in the paper, and when it is time for the paper to be fed forward again, the mechanism falls downwardly thereby causing the paper to feed to the forming mandrel. The upward and downward movement of the mechanism may be accomplished in any suitable manner, for example, by means of cams, or the upward movement may be accomplished by means of cams or other suitable means, while the downward movement takes place by means of gravity. This is made possible by the fact that the take-up mechanism is positioned directly above the plane in which the strip of paper is fed to the forming mandrel.

A further important feature of this invention is illustrated in Figures 1, 2, 4, 5 and 6. This feature consists in the use of a tucking mechanism in combination with a creasing mechanism. The tucking mechanism comprises a continuously rotating finger 100 mounted by means of a collar 102 on a rotating shaft 104, which may be driven in any suitable manner. The rotation of the shaft 104 is so coordinated with the movement of the paper strip A and the movement of the conical mandrel 8 that the flat bladed portion 106 of the tucking finger 100 moves between the top of the paper strip and the exterior surface of the conical mandrel A just prior to the time that the conical mandrel passes over the edge of the strip. The rotation of this tucking mechanism therefore insures that the leading edge of the paper will be properly tucked under the apex of the forming mandrel. The paper is actually bent downwardly slightly, as shown in Figure 1, this being possible due to the fact that there is a cut out recess 108 in the bottom plate 10, as shown in Figure 2. Hence, the paper is actually unsupported at its central point. However, the paper cannot move sideways because it has already been gripped by the mandrel.

As the mandrel continues to roll it occupies the position shown in Figure 6. In this position there is a slight overlapping of material projecting beyond the apex of the cup due to the fact that the apex 66 of the cup is slightly within the leading edge of the paper. This overlapping portion of material is generally indicated by numeral 110 in Figure 6. In order to assure that a pocket of material is properly formed at the apex a creasing mechanism 112 is provided which rotates continuously in a plane oblique to the plane of movement of the advancing paper strip, as shown in Figure 7. It will be observed that the tucking mechanism 100 also rotates continuously in an oblique plane so that only at one point or in one portion of their rotations do the tucking mechanisms and the creasing mechanisms move into the path or plane of the paper. The creasing mechanism 112 advances over the overlapped portion 110 and presses it against the top side of the paper sheet. Then as the rotation of the forming mandrel continues, a pocket of material is formed at the apex of the cup. The creasing blade 112 is fixed by means of a collar 114 to a rotating shaft 116 which may be rotated in any suitable manner. The rotation is carried out in synchronism with the formation of the cup so that the overlap portion 110 arrives opposite the rotating blade 112 at the time when it is to be creased.

The method of forming paper cups in accordance with the present invention may be summarized briefly as follows. Paper of the desired width and of a suitable type for forming paper cups is fed from a roll 2 by means of feed rolls 4 through take-up mechanism 6 to forming mandrel 8. As it approaches the forming mandrel it is supported by a bottom plate 10 and as it passes into the mandrel orbit B it passes over a knife edge 12 which coincides with a portion of the mandrel orbit. Mandrel 8 rotates about its own axis and also moves in an orbital path B. When the point 66, which is to form the apex of the cup, is directly above the point 16, which forms the center of the mandrel orbit, one edge of the paper is in a position to be gripped by the moving mandrel 8. This edge is shown in Figure 1 as edge 68. Gripping of the edge is accomplished by means of a dog 60 which opens and closes periodically in response to any suitable actuating means such as the mutilated gear assembly 64. As the mandrel 8 approaches the edge 68 of the paper strip A the dog 60 is open, causing the edge 68 to pass within the opening between the dog and an associated part of the mandrel, whereupon the dog 60 closes and grips the edge 68 of the paper and as the mandrel 8 continues to roll in its orbital path the paper is held tightly against it. When the cutting edge 14 of the mandrel 8 arrives at the edge of the paper strip A it immediately begins to sever the paper in cooperation with the cutting edge 12 lying beneath the paper strip. The line of severance coincides with the mouth of the cup which is being formed. As each edge of the strip is severed, small pieces are preferably cut out along the cuts C and C_1.

As previously stated, cuts C and C_1 are preferably placed in the paper by adjustable rotating knives 70 and 72 at a point in advance of the feed rolls 4. These cuts intersect the line of severance of the mandrel orbit.

As soon as the conical mandrel grips the paper and begins to wind it into a cup, the forward movement of the paper strip A necessarily ceases due to the fact that the paper is held between the mandrel and the bottom plate 10. At the same time the take-up mechanism 6 lifts up in order to take up the excess paper which is continuously being fed forward. As soon as the mandrel 8 has completed the severing operation, take-up mechanism 6 falls and moves the paper strip A forward toward the cup forming position.

After the cup is severed from the end of the paper strip, the winding operation is continued until the cup is completely formed. As the mandrel continues to move and rotate in its orbital path, the paper cup thereon is brought into contact with the rapidly rotating discharge wheel 44. This wheel is preferably provided with a rubber tire or other suitable type of friction surface so that its rapid rotation causes the immediate and instantaneous discharge of the cup into the chute

46 at the position of the mandrel 8, shown in full line in Figures 1 and 2.

To assist in the cup forming operation and to assure that the cups are formed accurately and rapidly, the tucking finger or blade 100 is provided. This blade rotates in a path or plane oblique to the plane of the paper strip A just prior to the cup forming operation. As the blade 100 rotates it moves over and against the top of the paper strip at one point in its rotation. The rest of the time it is out of the path of the paper strip. The movement into contact with the top of the paper strip is effected just prior to the time that the conical mandrel passes over the leading edge of the strip. The movement of the blade 100, therefore, insures that the paper will be properly tucked under the apex of the forming mandrel. Actually in the modification shown in the drawings, the paper is not supported at the apex point, because there is a cut out recess 108 in the bottom plate 10 at this point. After the paper has been tucked beneath the end of the mandrel and has been wound on the mandrel, an overlapping portion of material is formed adjacent the apex point of the cup. In order to assure that this overlapping portion is properly enclosed within the side walls of the cup, a creasing mechanism 112 is provided which also rotates continuously in a plane oblique to the plane of movement of the advancing paper strip. The creasing mechanism 112 advances over the overlap portion 110 and presses it against the top side of the paper sheet. In this way a pocket of material is formed accurately and rapidly at the apex of the cup.

It will be understood that many variations may be made in the method and apparatus described without departing from the invention. The instrumentalities for driving the various parts of the apparatus have not been shown because many different types of driving mechanisms may be employed, and anyone skilled in the art could construct the apparatus from the embodiments thereof shown herein.

The drive mechanisms for the various parts of the apparatus may be described as follows. The source of driving power is a motor 120 connected through a driving shaft, not shown, to a gear 122, the latter in turn being connected to a gear 124 fixed to shaft 38. The manner in which shaft 38 drives the cup forming assembly through gears 40 and 42 has already been described.

Affixed to shaft 36 is a bevel gear 126 which drives a bevel gear 128 affixed to shaft 130, as shown in Figure 4. Affixed to the other end of shaft 130 is a bevel gear 132 which drives a bevel gear 134 fixed to shaft 136.

A gear 138 affixed to shaft 136 drives an idler gear 140 which in turn drives a gear 142 affixed to shaft 144. Shaft 144 drives the upper feed roll 4. Also fixed on shaft 144 is a gear 146 which drives a gear 148, which in turn drives the lower feed roll 4, as shown in Figure 1. It will be observed from Figure 2 that the shaft 144 is conventionally mounted in a pair of bearings 150 and 152 and that the shaft 136 is mounted in a pair of bearings 154 and 156.

The take-up mechanism 6 is operated in the following manner. The drive shaft 136 drives an eccentric cam 158 as shown in Figures 1 and 2. Mounted on the eccentric cam 158 is an arm 160, which is caused to reciprocate by the action of the cam 158. A link 162 is attached to one end of the arm 160 by means of a shoulder screw 164. The link 162 is affixed to a shaft 166, which in turn is affixed to a pair of arms 168 and 170. The arms 168 and 170 are affixed to a shaft 172, as shown in Figure 2 and the latter in turn is freely connected to the take-up mechanism 6 in the manner shown in Figures 1 and 2. The front end of the take-up mechanism 6 is freely supported by means of a shaft 172 which in turn is supported by a pair of arms 174 and 176, freely mounted on the main shaft 136. The arm 160 reciprocates causing the link 162 to reciprocate and thereby causing the shaft 166 to oscillate. As a result the take-up mechanism 6 is oscillated. In this way the paper is fed continuously through the feed rolls and the excess is taken up intermittently by the take-up mechanism 6.

The timing mechanism, which has previously been described, is operated from the shaft 136 by means of a sprocket 178 connected to chain 94.

The creasing mechanism is driven in the following manner. A sprocket 180 affixed to shaft 136 drives a chain 182, which in turn drives a double sprocket assembly 184 fixed on a shaft 186. The shaft 186 is also affixed to a bevel gear 188, which drives another bevel gear 190 affixed to a shaft 116. The shaft 116 drives the creasing mechanism 114 in the manner previously described. One part of the double sprocket 184 is connected to a chain 192, which in turn is associated with a sprocket 194 affixed to a shaft 196. The shaft 196 drives a bevel gear 198, which in turn drives a bevel gear 200 fixed on shaft 104. The tucking mechanism is driven from the shaft 104 in the manner previously described.

The stacking mechanism is operated in the following manner. An arm 202 is affixed to shaft 186 and is rotated thereby causing the reciprocation of a connecting link 204 which is freely connected to a second arm 206, as shown in Figure 4. The arm 206 is fixed to a shaft 208 and the shaft 208 in turn is fixed to the stacker mechanism 58. When the arm 206 is reciprocated the shaft 208 is oscillated causing the stacker 58 to reciprocate, thereby in turn causing the finished cups to be discharged into the chute 46 as they come off of the forming mandrel.

It will be understood that any suitable type of gluing mechanism may be employed in forming cups in accordance with this invention. Ordinarily it is preferable to apply the glue between the roll of paper 2 and the feed rolls 4, but the glue may, if desired, be applied at some other point without departing from the invention. In general, any of those methods applicable to the gluing of strip stock may be used in the present invention. It will be understood, of course, that if the glue is applied between the paper roll 2 and the feeding rolls 4, it must be applied in such a way, or the feed rolls 4 must be arranged in such a way, that the glue does not come into contact with the feed rolls.

The invention is not limited to the formation of the particular type of cup illustrated herein. It may be employed in other cup making methods and in other cup making devices, particularly in those methods and devices in which the cup is formed from a continuous strip of paper. For some purposes it may be desirable to omit certain parts of the apparatus, as, for instance, the rotating knives 70 and 72. The tucking and creasing mechanisms may be employed in making any type of paper cup in which there is a pocket of material at the apex, regardless of the manner in which the paper strip is fed to the forming mandrel. These mechanisms are par-

ticularly advantageous in making paper cups from a continuous strip of paper.

The cup forming method and devices herein described have made it possible to produce cone shaped paper cups at extremely high speeds, as, for example, in excess of five cups per second per single mandrel or forming head.

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

1. A method of forming cone shaped paper cups which comprises continuously unwinding a strip of paper from a roll, continuously feeding said strip of paper with the aid of a feeding means to a forming mandrel and partially severing a marginal area of said paper strip substantially transversely by applying thereto a continuously rotating cutting force rotating about an axis running generally lengthwise with respect to the path of movement of the strip.

2. A method of forming cone shaped paper cups which comprises supplying a strip of paper to a forming mandrel, winding said strip on said mandrel and tucking the apex point of the cup under the apex point of the mandrel during the winding operation by a rotating force rotating in a plane oblique to the path of movement of said strip.

3. A method of forming cone shaped paper cups which comprises forming a paper cup by winding a strip of paper on a mandrel, tucking the apex point of the cup under the apex point of the mandrel during the initial steps of the winding operation by applying a rotating force in a plane oblique to the paper strip and thereafter creasing a portion of the paper adjacent the apex point of the cup by applying another rotating force rotating in a plane oblique to the paper strip.

4. A method of forming cone shaped paper cups which comprises advancing a strip of paper from a roll to a forming mandrel in such a manner that the point which is to form the apex of the cup is substantially unsupported, winding said strip on said mandrel and tucking the unsupported portion beneath the apex point of the mandrel when the cup is partially wound by applying thereto a rotating force rotating in a plane oblique to the path of the advancing strip of paper.

5. In an apparatus for making conical paper cups, feeding means arranged to feed a strip of paper stock from a roll of paper, forming means to form said strip of paper stock into a cone shaped paper cup, and a rotating knife positioned to one side of said strip and adapted to partially sever said strip transversely at a point between said paper roll and said feeding means.

6. In an apparatus for making paper cups, means for feeding a strip of paper stock to a cup forming position, means for partially severing said paper stock before it reaches said cup forming position, said means comprising a rotating knife, and means for adjusting the timing of said knife rotation while said knife is rotating.

7. In an apparatus for making conical paper cups, a forming mandrel for winding a strip of paper into a cup, a tucking mechanism for tucking the apex point of the strip under the apex point of the forming mandrel, and a creasing mechanism for thereafter creasing a portion of the paper adjacent the apex point.

8. In an apparatus for making conical paper cups, a forming mandrel for winding a strip of paper into a cup, and a tucking mechanism for tucking the apex point of the paper under the apex point of the mandrel during an intermediate stage of the winding operation.

9. In an apparatus for making conical paper cups, means for feeding a strip of paper stock from a roll of paper to a conical forming mandrel including feed rolls and a take-up mechanism, a rotating knife on each side of said strip of paper between said roll of paper and said feed rolls to partially sever the edges of said strip, a supporting plate beneath said strip of paper adjacent the paper cup forming position, means for moving said forming mandrel about its own axis while simultaneously rotating it in an orbital path, a portion of said orbital path being above said supporting plate, a non-supporting area in said supporting plate adjacent the center of said orbital path, means to cause said forming mandrel to grip an edge of said paper strip when the point which is to form the apex of the cup substantially coincides with the center point of said orbital path, a tucking mechanism to tuck a forward edge of said strip adjacent the apex point of the cup beneath the apex point of said mandrel, said tucking mechanism comprising a rotating member rotating in a plane oblique to the plane in which the paper strip stock is being advanced, a discharge roll occupying a substantially fixed position off-center with respect to the center of the orbital path of the forming cone, means for rotating said roll, the position of said roll being such that at a predetermined point in its orbital path after the paper has been wound into a completed cup the forming mandrel bearing the completed cup will bring the exterior surface of the cup into contact with said rotating roll thereby causing said paper cup to be discharged to a position below the plane of the advancing strip of paper, and a chute off-center with respect to the apex of the cup while it is on the forming mandrel to catch the completed cup when it is discharged.

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