May 22, 1956 E. VANTLANDER ET AL 2,746,626

CUP-MAKING MACHINE

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Fig. 1.

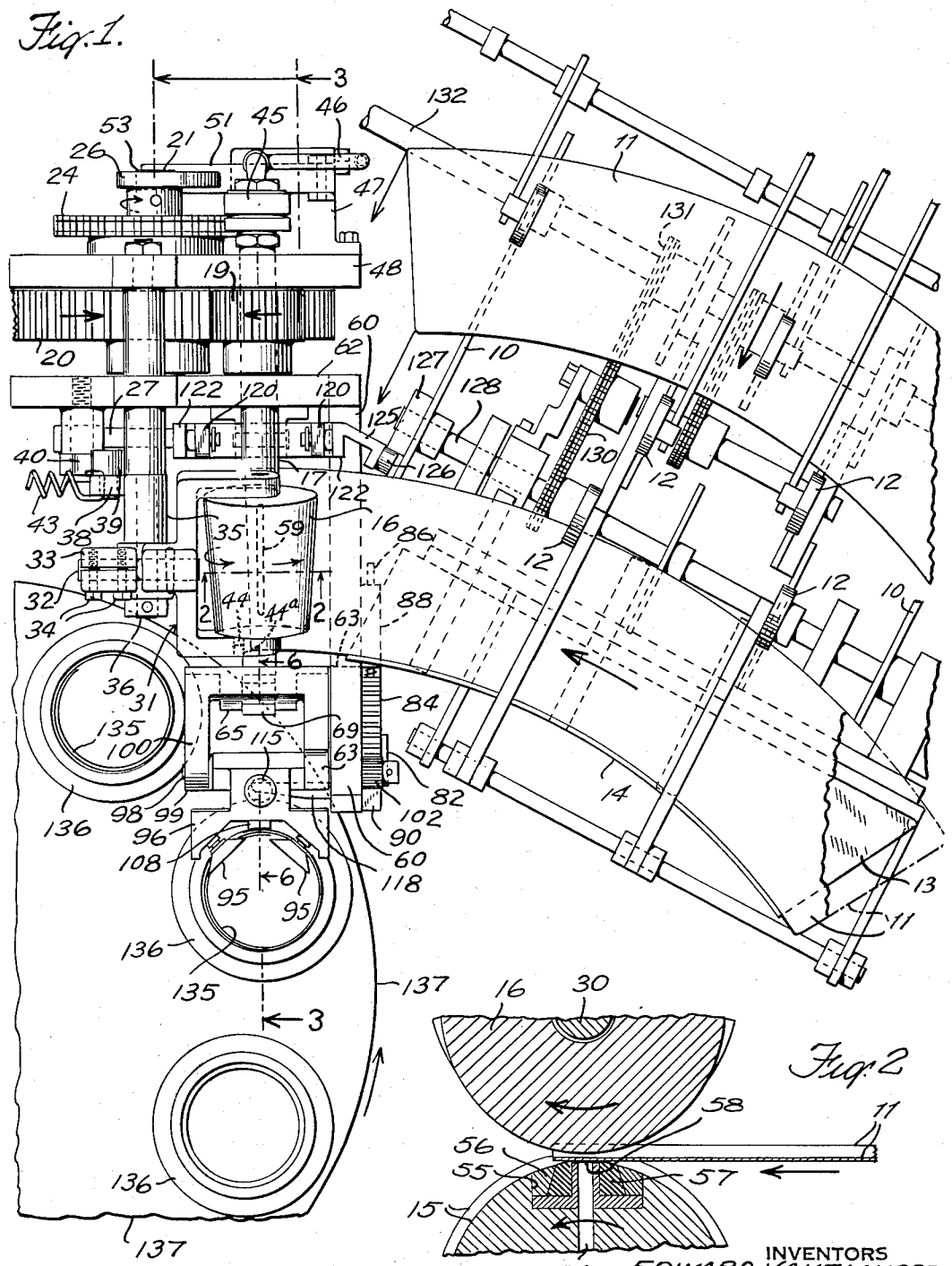



Fig. 2




INVENTORS
EDWARD VANTLANDER
FOSTER JACOBS
BY
ATTORNEY

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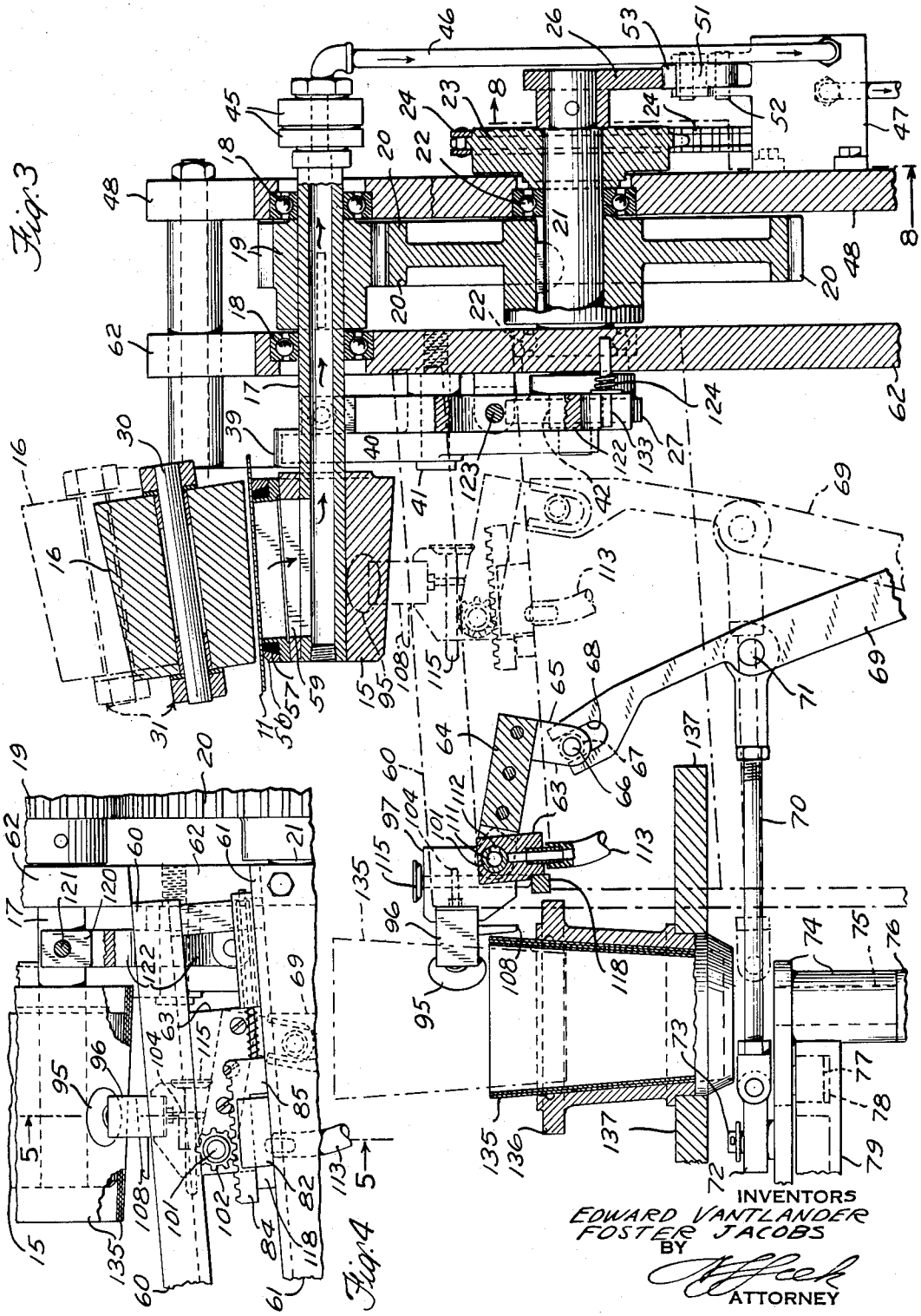


Fig. 3

Fig. 4

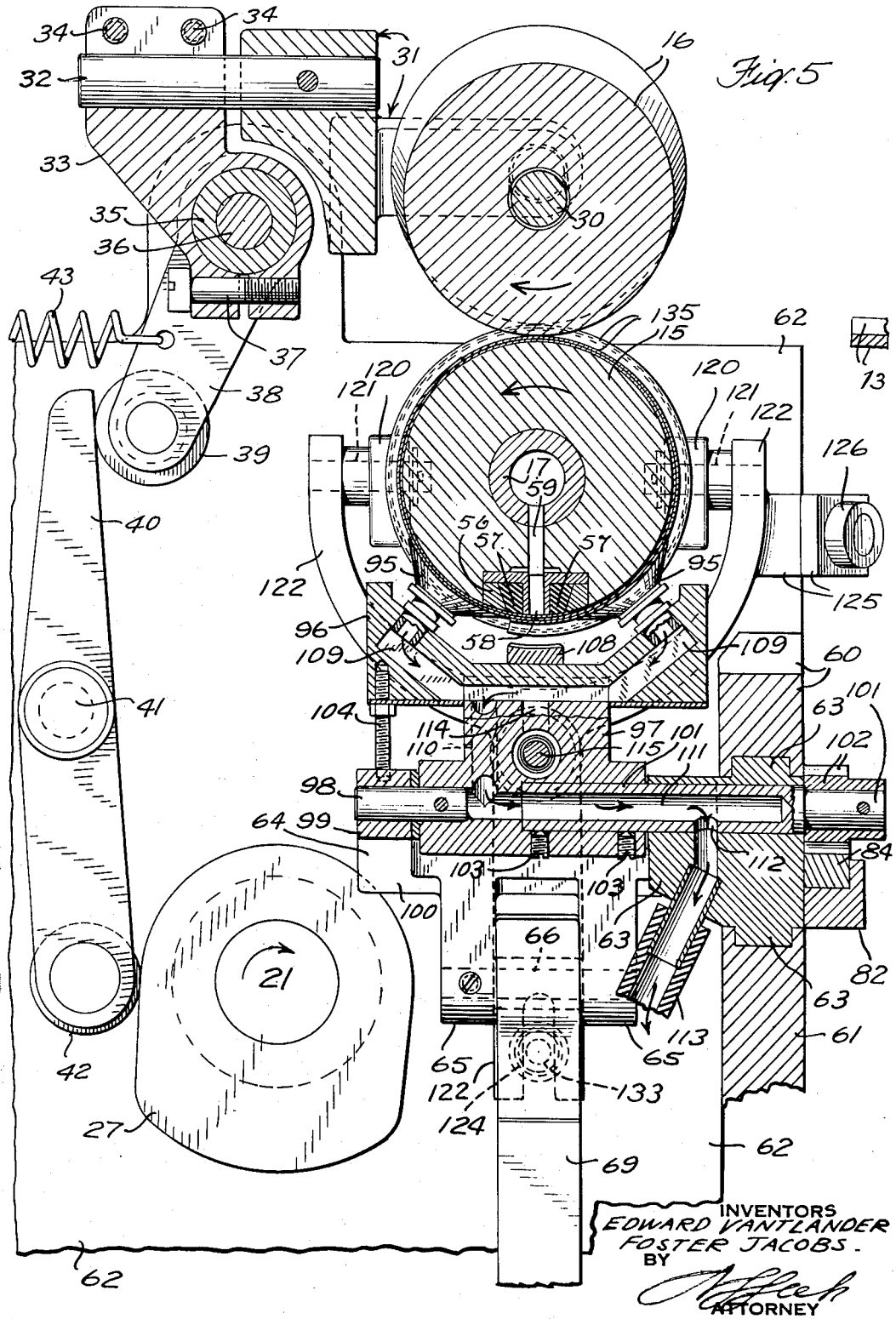
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EDWARD VANTLANDER
FOSTER JACOBS
BY
ATTORNEY

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Fig. 5



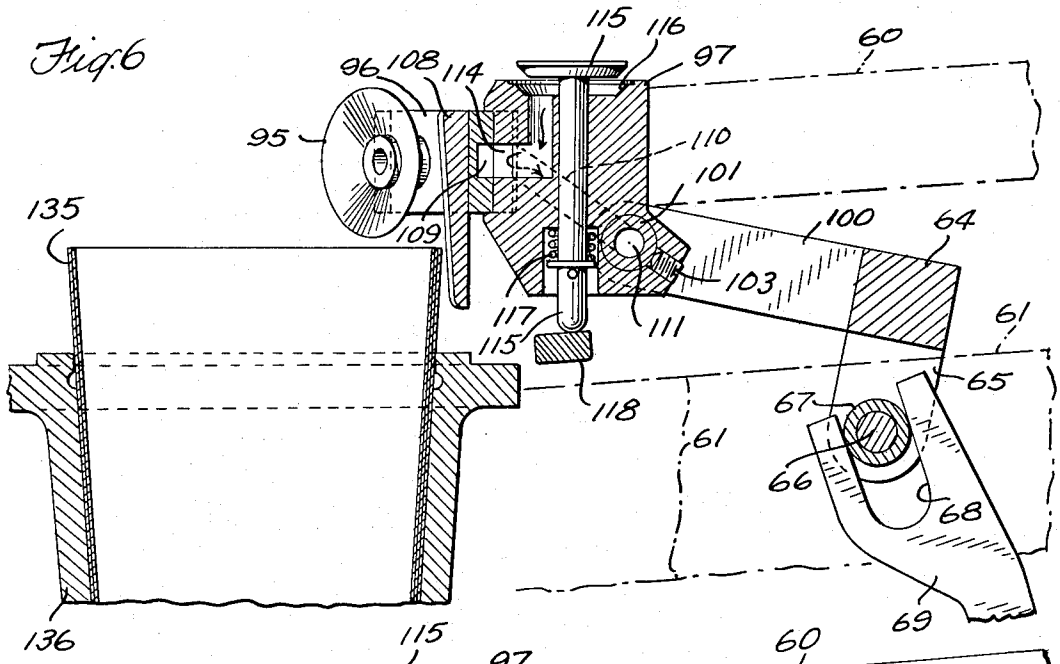

INVENTORS
EDWARD VANTLANDER
FOSTER JACOBS.
BY
ATTORNEY

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Fig. 6



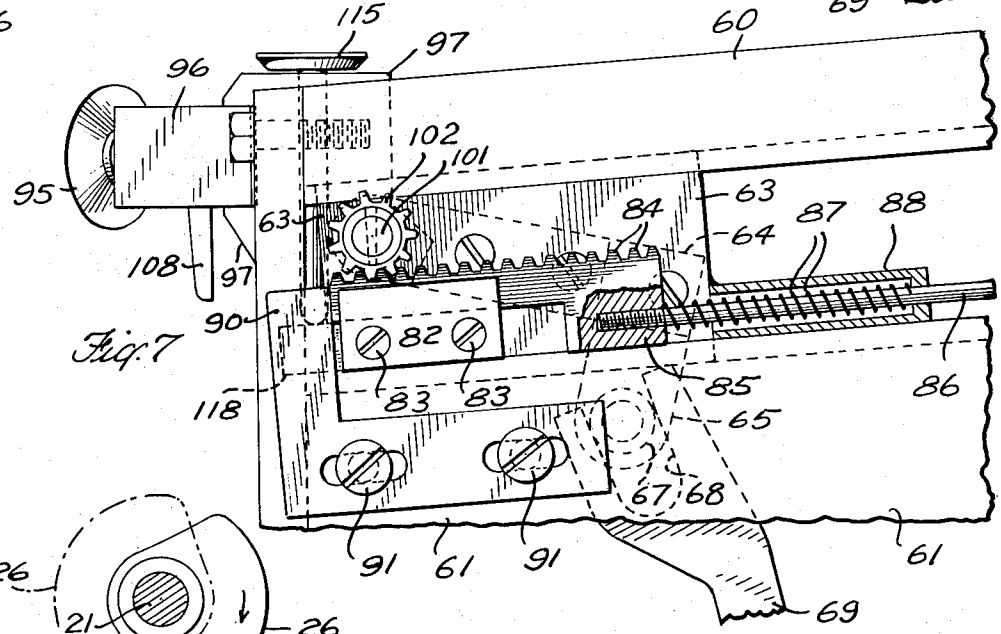




Fig. 7

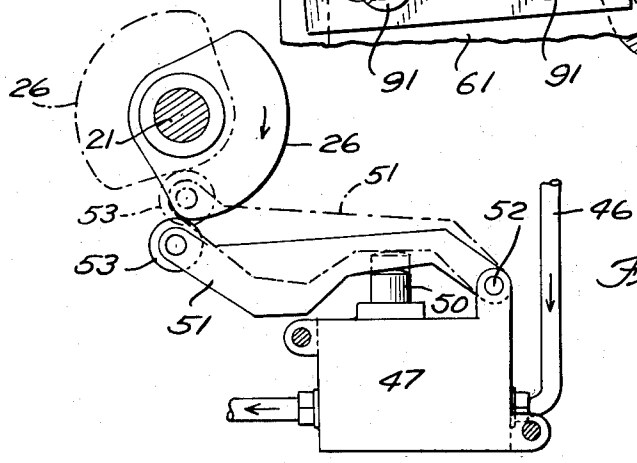



Fig. 8

INVENTORS
EDWARD VANTLANDER
FOSTER JACOBS
BY
ATTORNEY

United States Patent Office 2,746,626 Patented May 22, 1956



2,746,626

# CUP-MAKING MACHINE

Edward Vantlander, Long Island City, and Foster Jacobs, Levittown, N. Y., assignors to Constellation Cup Corporation, Long Island City, N. Y., a corporation of Delaware

Application March 1, 1954, Serial No. 413,204

4 Claims. (Cl. 214—146.5)

This invention relates to cup-making apparatus and more particularly to apparatus for rolling a gummed blank into cup form and transferring the same to a conveyor for further treatment.

An object is to provide a cup-making machine having novel and improved characteristics.

Other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The invention provides improved mechanism for winding a cup blank around a mandrel to shape the cup walls and for transferring the partially formed cup from the mandrel to a dial plate or the like which delivers the partially formed cup to other stations at which subsequent forming steps are performed. The invention is particularly applicable to the formation of paper cups for hot drinks. Such cups have frustoconical or flared side walls, a disc bottom, a rolled top bead, and an internal groove near the top in which a closure disc can be seated.

The nature of the invention will be better understood by referring to the following description taken in connection with the accompanying drawings in which a specific embodiment has been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of a cup-forming machine embodying this invention;

Fig. 2 is an enlarged partial section taken on the line 2—2 of Fig. 1 showing the forming mandrel about to receive a blank;

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary view showing the mandrel and cup transfer mechanism;

Fig. 5 is a section taken on the line 5—5 of Fig. 4 but on a larger scale;

Fig. 6 is a fragmentary view in section similar to Fig. 3 but on a larger scale showing the transfer mechanism in delivery position;

Fig. 7 is a detail view partly in section of the transfer mechanism in delivery position; and

Fig. 8 is a detail view taken on line 8—8 of Fig. 3 showing the vacuum control mechanism.

Referring to the drawings more in detail, Fig. 1 shows the mechanism as comprising a series of conveyor belts 10 feeding a succession of cup blanks 11 into forming position. The conveyor belts 10 are driven by suitable means not shown and a series of idler rollers 12 are provided for holding the blanks 11 in frictional engagement with the conveyor belts. Blanks 11 are fed by the conveyor belts 10 to a slightly inclined table 13 provided with an arcuate flange 14 which forms a stop for positioning the blanks in registration with the forming mandrel to be described. The idler rollers 12 are so positioned as to free the blank from contact with the rollers when the blank is in position against the flange 14.

When the cup blank 11 is in position against the flange 14 the lefthand end of the blank as seen in Fig. 1 is positioned over a driven mandrel 15 and under an idler roller 16, which at that instant is raised to provide clearance for the blank. Referring to Fig. 3 the mandrel 15 is shown as frustoconical in shape with its upper surface in the plane of the table 13. It is mounted on a hollow shaft 17 journaled in bearings 18. A pinion 19 is keyed to the hollow shaft 17 positioned between the bearings 18 and engages a gear 20 which makes one revolution per cup. The gears 19 and 20 are shown as having a ratio of 4 to 1 so that the mandrel 15 makes 4 revolutions per cup.

The gear 20 is keyed to a shaft 21 journaled in bearings 22 and carrying a sprocket 23 driven by a chain 24 from a suitable source of power not shown.

The shaft 21 also carries at one end a cam 26 for controlling the suction supplied to the mandrel 15. The opposite end of the shaft 21 carries a cam 27 which is adapted to lift the idler roller 16 in synchronism with the blank feed.

The idler roller 16 is mounted for rotation on a shaft 30 supported in a bracket 31 which carries a pin 32 on which a split arm 33 is adjustably secured by means of screws 34. The arm 33 is mounted on a sleeve 35 which is journaled on a pin 36 attached to the frame of the machine. The arm 33 is clamped in position about the sleeve 35 by a screw 37. The sleeve 35 also carries an arm 38 on the end of which is a roller 39 which engages a lever 40 pivoted at 41 and carrying at its lower end a roller 42 engaging the cam 27.

The arm 38 is held against the lever 40 by a spring 43. A friction drag shown as a plug 44 is held against the end of the roller 16 by a set screw 44a to control the tension with which the blank is wound on the mandrel 15.

The hollow shaft 17 (Fig. 3) is provided with a slip connection 45 to a pipe 46 leading to a vacuum control valve 47 secured to the frame 48 of the machine.

The vacuum control valve 47 is actuated by a pin 50 (Fig. 8) which in turn is controlled by an arm 51 pivoted at 52 to the valve housing and carrying at its free end a roller 53 which engages the cam 26. In the form shown in Fig. 8 the suction is assumed to be supplied to the material when the pin 50 is down. Hence in the position of Fig. 8 suction has just been supplied to the hollow shaft 17 and the mandrel 15 is in the position to grip the leading end of a blank as shown in Figs. 1, 2, 3 and 8.

The mandrel 15 is provided with an elongated socket 55 carrying a holder 56 in which a rubber mouthpiece 57 is secured. The mouthpiece 57 is provided with lips to form an elongated suction opening 58. This opening communicates through a channel 59 in the mandrel 15 with the hollow shaft 17.

Referring to Figs. 6 and 7 a pair of rails 60 and 61 attached to the frame 62 form a track in which a slide block 63 is adapted to reciprocate. The track is shown as inclined to the horizontal and is parallel to the plane of the upper surface of the forming mandrel. The block 63 carries a fixed bracket 64 having ears 65 carrying a pin 66 on which a roller 67 is mounted. The roller 67 is engaged by the forked end 68 of an arm 69 pivoted at its lower end and actuated by a rod 70 which is pinned to the arm 69 by a pin 71 and is connected by a universal connection 72 to a pin 73 which is mounted on an arm 74 pivoted at 75 to a fixed post 76. The arm 74 carries on its lower surface a roller 77 riding in a cam groove 78 in a cam 79 which is driven by suitable means to make one revolution per cup and is adapted to oscillate the arm 74 about the post 76 so as to cause reciprocating movement of the link 70 and the arm 69. The block 63 carries a track 82 secured by screws 83 in which a rack 84 slides. The rack 84 at its rearward end is formed with a downwardly extending lug 85 carrying a pin 86 which is urged to forward position by a compression spring 87 mounted

within a tubular casing 88 attached to the block 63. The rack 84 is adapted to engage a stop member 90 which is adjustably secured to the rail 61 by set screws 91. The stop member 90 is set to limit the forward movement of the rack 84.

Vacuum cups 95 (Fig. 5) are carried on a bracket 96 forming a part of a valve housing 97 and attached at its lefthand end (Fig. 5) to a pin 98 which is journaled in a bearing 99 carried in an arm 100 attached to the block 63. The valve housing 97 also carries a hollow shaft 101 which is journaled in the block 63 and which carries at its free end a pinion 102 which engages the rack 84. The hollow shaft 101 is secured in the valve housing 97 by set screw 103. A screw 104 is adjustable in bracket 96 and engages the upper surface of the bracket 64 to limit the rearward movement of the bracket 96 as seen in Fig. 5.

The bracket 96 carries a guide arm 108 (Figs. 5 and 6) to assist in guiding the rolled blank into its receiver as it is shifted by the transfer mechanism.

The vacuum cups 95 communicate through ports 109 in the bracket 96 with a passage 114 in said bracket which in turn communicates through a passage 110 with a bore 111 in the hollow shaft 101. The bore 111 communicates through a port 112 with a pipe 113 leading to a suitable source of vacuum not shown. The port 112 is so designed that the communication with the vacuum cups 95 is cut off when the shaft 101 is rotated to delivery position as shown in Figs. 6 and 7. The passage 109 also communicates through a passage 114 in the valve housing 97 with a poppet valve 115 which is normally seated against a valve seat 116 in the valve housing 97 by a spring 117 but when raised as indicated in Figs. 6 and 7, the passage 114 is vented to the atmosphere. The valve 115 is raised by striking a stationary stop 118 when the bracket 96 is in delivery position.

Pusher blocks 120 are pinned by pins 121 to a U-shaped bracket 122 pivoted at 123 (Fig. 3) to the frame 62. The lower end of the bracket 122 is bifurcated to receive a pin 133 secured in the frame 62. A compression spring 124 is disposed about the pin 133 between the frame 62 and the bifurcated end of the bracket 122 so as to hold the pusher blocks retracted. The U-shaped bracket 122 carries an extension 125 carrying a roller 126 engaging a cam 127 on a driven shaft 128 (Fig. 1), driven by a chain 130. The chain 130 is driven by a sprocket 131 on a shaft 132 which is driven by a suitable source of power not shown.

The rolled cup 135 is shown in Fig. 3 as positioned in a receiver 136 which is carried by a dial plate 137 which may be in the form of a disk having a plurality of such receivers disposed about its periphery and adapted to be rotated by a suitable Geneva lock mechanism not shown for positioning successive receivers to receive cups from the delivery means.

*Operation*

In operation a series of gummed blanks 11 are fed from a stack not shown in timed spaced relaitonship by the belts 10 to the table 13 where the leading end of the blank is over the mandrel 15 to be gripped by the mouthpiece 57 as the mandrel 15 rotates. The idler roller 16 is raised by the cam 27 which is timed with the blank feed so as to allow the end of the blank to feed into position between the mandrel 15 and the idler roller 16.

After the blank is in position and before the mouthpiece 57 engages the underside of the blank the cam 27 allows the idler roller to engage the top of the blank and hold the blank against the rotating mandrel 15 and the cam 26 actuates the valve 47 to apply suction to the mouthpiece 57.

When the mouthpiece is brought into contact with the blank, as in Fig. 2, the suction causes the lips 58 to seal against the blank and to grip and pull the blank from the table 13. The blank is of a length to wrap around the mandrel twice with a slight overlap and carries a quick setting adhesive on the overlapping areas so that the blank is rolled into cup form and the walls adhesively secured before the rolled cup leaves the mandrel (Fig. 5).

After the blank has made slightly over one full turn on the mandrel so that the leading end is held by the sleeve or outer layer, the cam 26 actuates the valve 47 to cut off the suction to the mandrel. (Dotted line position, Fig. 8.)

When the blank has been fully rolled on the mandrel the transfer mechanism reaches the rearward limit of its stroke as shown in Figs. 4 and 5 and the suction cups 95 engage the lower side of the rolled blank on the mandrel. The port 112 (Fig. 5) is now open so that suction is applied to the cups 95 to cause them to grip and hold the rolled cup. The cam 79 now advances the arm 69 from the dotted line position in Fig. 3 toward the full line position, thereby sliding the block 63 toward the left (Fig. 3) along the track formed by the rails 60 and 61. The block 63 carries with it the bracket 96 and suction cups 95 which have now gripped the rolled cup and thus slide the cup from the mandrel in a direction parallel to the plane of the upper surface of the mandrel.

In order to start the cup in case it may adhere somewhat tightly to the mandrel the pusher blocks 120 are advanced by the cam 127 to strike the trailing edge of the cup and force it from the mandrel. The pusher blocks 120 act in conjunction with the suction cups 95 to remove the rolled cup from the mandrel. At the same time the cam 27 raises the idler roller 16 to release the cup. The pusher blocks 120 are freely pivoted at a point above their center of gravity so that they hang freely and adjust themselves to the contour of the cup edge.

During the initial portion of the advance stroke of the slide block 63 the rack 84 is held in advance position by the spring 87 and advances with the block 63. However when the forward end of the rack 84 strikes the stop 90 it is restrained and the track 82 slides along the rack to the position of Fig. 7. This relative movement of the block 63 and rack 84 rotates the pinion 102 and turns the bracket 96 and suction cups 95 about the axis of the sleeve 101 to the transfer position shown in Figs. 3, 6, 7 and 8. The suction is cut off by the turning of the sleeve 101 which shifts the port 112 out of registry with the pipe 113 and the cups 95 are vented to the atmosphere by the lifting of the poppet valve 115 as the valve stem strikes the stop 118.

The formed cup is then dropped by the suction cups 95 into the receiver 136 which at that time is positioned beneath the cup.

As the parts return to their initial position to receive and roll another blank, the dial plate 137 advances the receiver 136 with its cup to other finishing stations, such as a station for inserting a bottom disc, a station for rolling the top of the cup wall into a top bead and a station for forming an internal groove in the cup wall for seating a closure disc. As the dial plate advances step-by-step in synchronism with the cup forming mechanism other receivers 136 are brought into position to receive successive cups from the transfer mechanism above described.

It is to be understood that the cup forming and transfer mechanism above described may constitute a component of a machine for performing the sequence of steps above referred to or may constitute an independent unit for performing the rolling and transfer step as shown.

What is claimed is:

1. A transfer mechanism for a machine for making rolled paper cups and the like having a mandrel about which said cups are rolled, comprising a sliding carriage, a bracket pivoted to said carriage and carrying a suction cup to engage the rolled cup on said mandrel, means including a pinion on said bracket and a rack slidable on said carriage to rotate said bracket, means to cause said carriage to reciprocate with a definite stroke, means effective over a portion of said stroke to slide said rack so as to rotate said bracket to delivery position, and means

supplying suction to said suction cup including a valve actuated by said rotation of said bracket to cut off said suction and to vent said suction cup when said bracket is in delivery position.

2. A transfer mechanism for a machine for making rolled paper cups and the like having a mandrel about which said cups are rolled, comprising a sliding carriage reciprocating in a plane parallel to the top of said mandrel a bracket pivoted to said carriage and carrying a suction cup to engage the lower side of the rolled cup on said mandrel, means including a pinion on said bracket and a rack sliding on said carriage to rotate said bracket to delivery position, means to cause said carriage to reciprocate with a definite stroke, means effective over a portion of said stroke to shift said rack so as to rotate said bracket to delivery position, and means supplying suction to said suction cup including a valve actuated by said rotation of said bracket to cut off said suction and to vent said suction cup when said bracket is in delivery position.

3. A transfer mechanism for a machine for making rolled paper cups and the like having a mandrel about which said cups are rolled, comprising an idler roller engaging the cups on said mandrel a sliding carriage reciprocating in a plane parallel to the top of said mandrel, a bracket pivoted to said carriage and carrying a suction cup to engage the lower side of the rolled cup on said mandrel, means including a pinion on said bracket and a rack sliding on said carriage to rotate said bracket to delivery position, means to cause said carriage to reciprocate with a definite stroke, means effective over a portion of said stroke to shift said rack so as to rotate said bracket to delivery position, means supplying suction to



said suction cup including a valve actuated by said rotation of said bracket to cut off said suction and to vent said suction cup, and means synchronized with said carriage to raise said idler roller from said mandrel while said carriage is advancing in its delivery stroke.

4. A transfer mechanism for a machine for making rolled paper cups and the like having a mandrel about which said cups are rolled, comprising a sliding carriage, a bracket pivoted to said carriage and carrying a suction cup to engage the rolled cup on said mandrel, means to rotate said bracket to delivery position, means to cause said carriage to reciprocate with a definite stroke, means effective over a portion of said stroke to rotate said bracket to delivery position, means supplying suction to said suction cup including a valve actuated by said rotation of said bracket to cut off said suction and to vent said suction cup when said bracket is in delivery position, pusher means to engage the edge of the rolled cup and push the same axially of said mandrel, and means actuating said pusher means in synchronism with said carriage whereby said pusher means assists said suction cup in transferring the rolled cup from said mandrel.

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