

May 18, 1926.

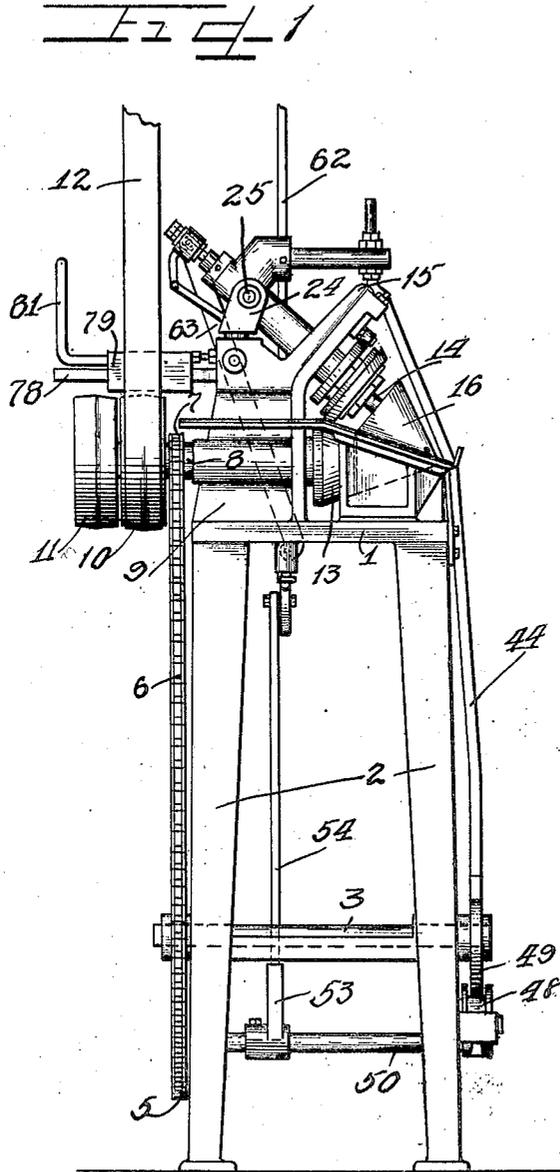
1,584,736

D. F. CURTIN

PAPER CUP FORMER

Original Filed August 25, 1920

5 Sheets-Sheet 1



WITNESSES  
*J. W. Angell*  
*Charles W. Hill, Jr.*

INVENTOR  
*David F. Curtin*  
*Charles W. Hill*  
ATTY

May 18, 1926.

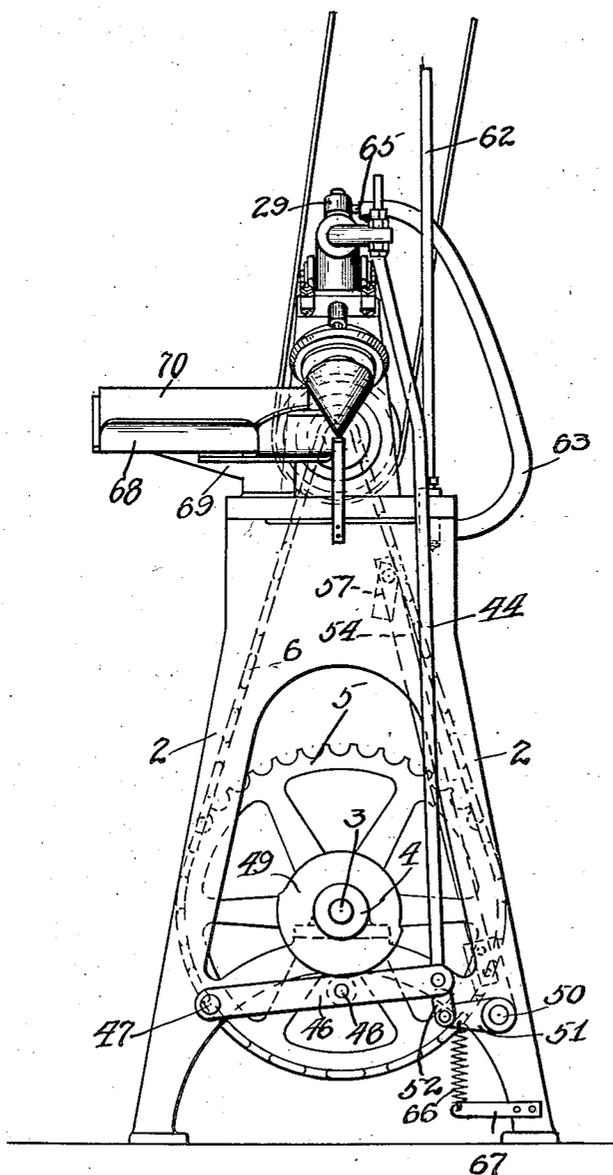
1,584,736

D. F. CURTIN

PAPER CUP FORMER

Original Filed August 25, 1920 5 Sheets-Sheet 2

Fig. 2



WITNESSES  
*W. Angell*  
*Charles H. [unclear]*

by

INVENTOR  
*David F. Curtin*  
*Charles H. [unclear]*  
Att.

May 18, 1926.

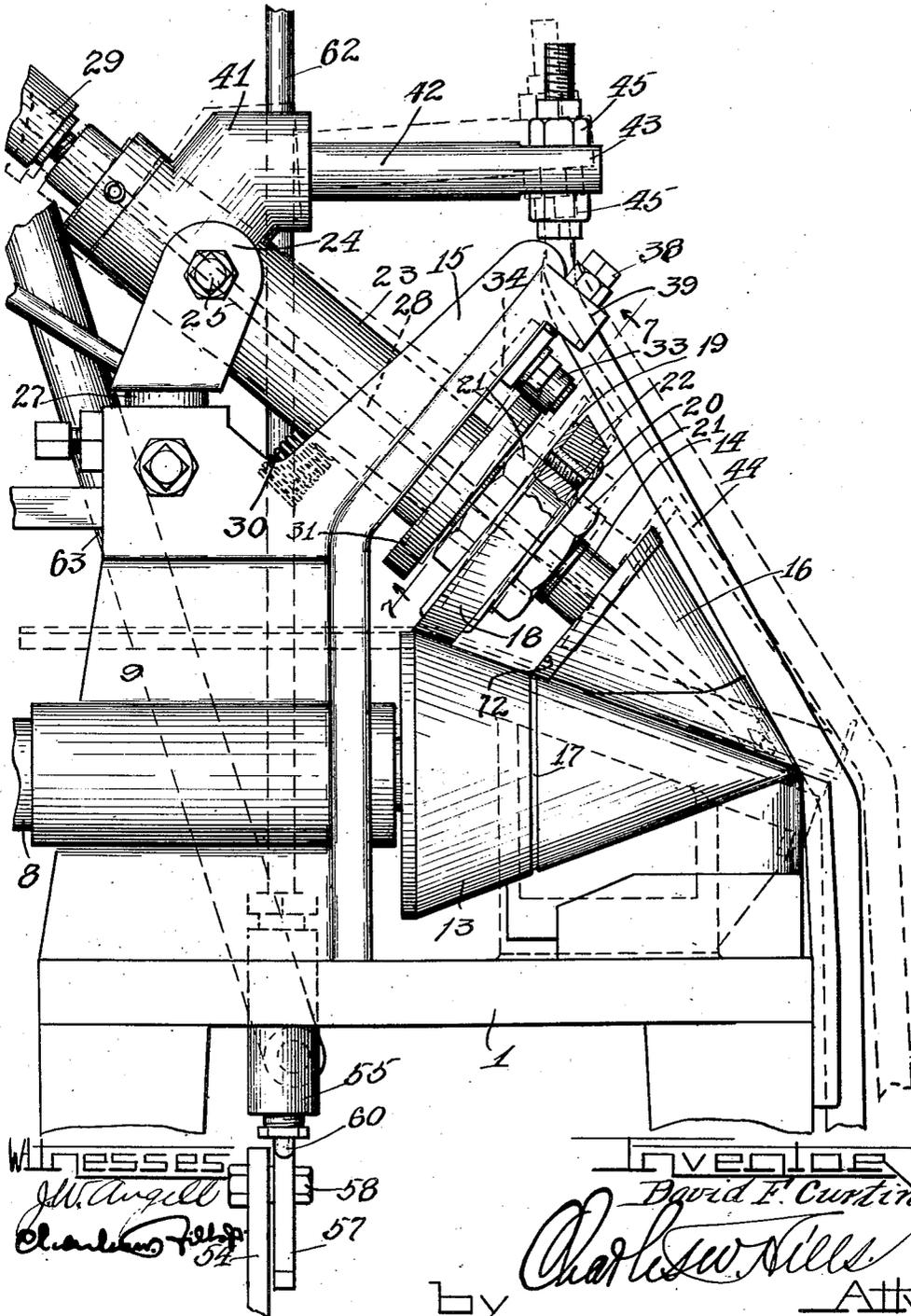
1,584,736

D. F. CURTIN

PAPER CUP FORMER

Original Filed August 25, 1920 5 Sheets-Sheet 3

Fig. 3



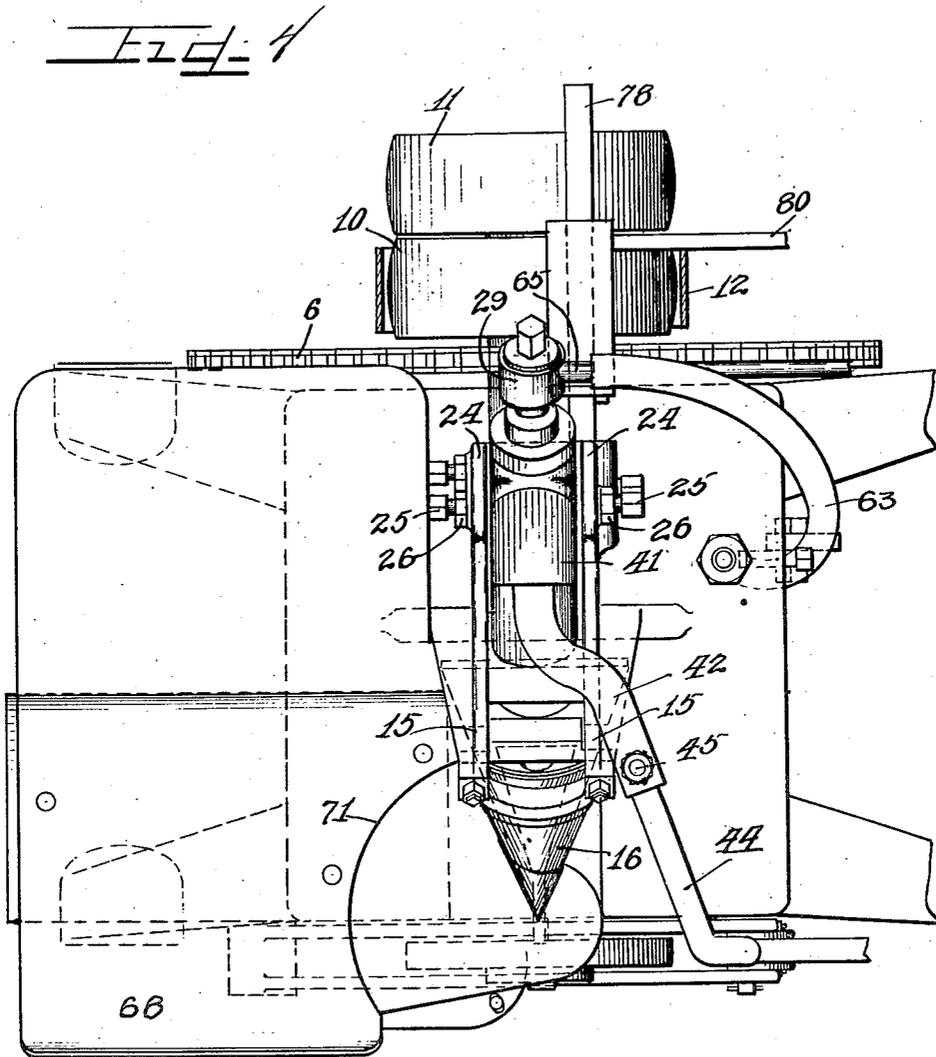
May 18, 1926.

1,584,736

D. F. CURTIN

PAPER CUP FORMER

Original Filed August 25, 1920 5 Sheets-Sheet 4



WITNESSES

*J. W. Angell*  
*Charles W. Hill*

by

INVENTOR

*David F. Curtin*  
*Charles W. Hill*

Att.

May 18, 1926.

1,584,736

D. F. CURTIN

PAPER CUP FORMER.

Original Filed August 25, 1920 5 Sheets-Sheet 5

Fig. 5

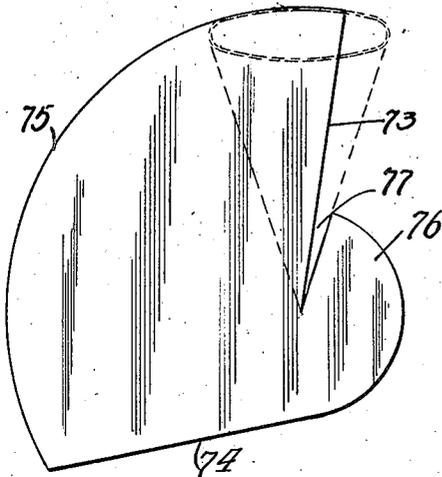


Fig. 6

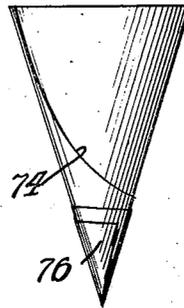


Fig. 7

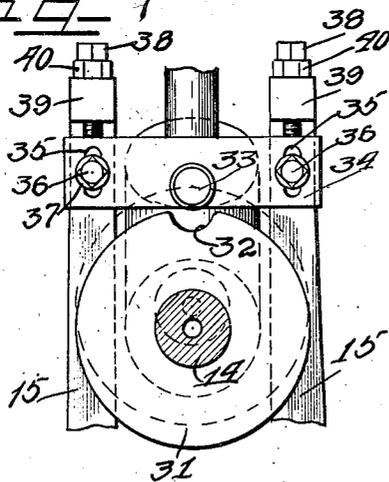
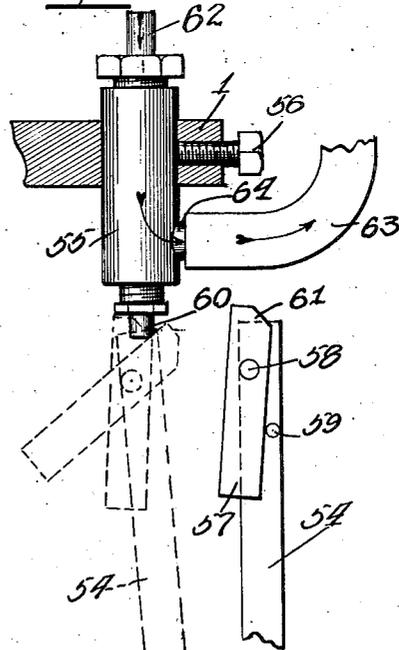


Fig. 8



WITNESSES

J. W. Angell  
Charles W. Hill

by

INVENTOR

David F. Curtin

Charles W. Hill

Att.

# UNITED STATES PATENT OFFICE.

DAVID F. CURTIN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO  
THE VORTEX MFG. CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## PAPER-CUP FORMER.

Application filed August 25, 1920, Serial No. 405,846. Renewed November 7, 1925.

My invention is an improvement in paper cup formers, and has for its object to provide a machine of the character specified, especially adapted for forming cups from a certain character of paper blanks, wherein means is provided for taking the blanks in succession into the machine, forming them into cups, and discharging them from the former or die.

Another object of this invention is the provision of means whereby a fluid tight, compact, and neat appearing cup is made from a one-piece blank.

Other and further important objects of this invention will be apparent from the disclosures in the drawings and specification.

The invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a side view of the machine.

Figure 2 is a front view.

Figure 3 is an enlarged side view of the cup forming mechanism.

Figure 4 is a top plan view of the machine.

Figure 5 is a plan view of the blank from which the cup is formed.

Figure 6 is a front view of the completed cup.

Figure 7 is a section on the line 7-7 of Figure 3, looking in the direction of the arrows, and

Figure 8 is a front view of the air valve and its operating mechanism.

As shown in the drawings:

The present embodiment of the invention comprises a table 1, supported by legs 2, having a shaft 3 journaled in sectional bearings 4 below the table. A sprocket wheel 5 is secured to the shaft outside of the frame constituted by the table and the legs, and a chain 6 connects the sprocket wheel 5 with a sprocket wheel 7 on the lower former shaft 8. This shaft is journaled in a bracket 9 extending upward from the table at one end thereof, and the shaft is provided with fast and loose pulleys 10 and 11, in rear of the bracket.

A belt 12 is provided for connecting the shaft with a suitable source of power, and a conical former or die 13 is secured to the shaft on the opposite side of the bracket

from the fast and loose pulleys. An upper or movable former shaft 14 is supported by angular extensions 15 from the bracket 9, and a conical former or die 16 is secured to the shaft 14, the movable former or die 16 is of less altitude than the fixed former or die 13, and they are arranged with their apices together.

The die 13 is provided with an annular groove 17 at its point of contact with the base of the upper die, and the upper former shaft 14 is rotated from the die 13 through a wheel to be described. The wheel comprises a body 18 of substantially cylindrical form and having at one end a radial flange 19. A washer 20 is fitted on the shaft at the other end of the body, and nuts 21 are threaded on to the shaft on opposite sides of the wheel to hold the washer and the body in place.

A ring 22 formed of rubber, leather or other suitable friction material is arranged on the wheel 18, and the outer surface of the ring is frusto-conical, as shown. This ring engages the fixed die 13 near its base. The shaft 14 is journaled in a sleeve 23 which is held between the arms 24 of a yoke, and the sleeve is pivoted to the arms by set screws 25. Each set screw is provided with a lock nut 26, and the sleeve is mounted to swing on the set screws. The body 27 of the yoke is connected with the upper end of the bracket 9 by means of set screws as shown.

The shaft 14 is channeled longitudinally as shown at 28, and the said channel opens near the apex of the die 16 in two or more branches, as shown more particularly in Figure 3. A sleeve 29 is rotatably secured upon the shaft 14, and air under pressure is supplied to the passage 28 through said sleeve, and the sleeve 23 is engaged by a helical spring 30 positioned between its pivotal mounting and the die 16 having one end resting on the bracket 9 and arranged to resiliently hold the movable die 16 away from the fixed die 13.

On the shaft 14 adjacent the end of the sleeve 23 is provided an annular disc or flange 31, having in its periphery a notch 32 (Fig. 7). The periphery of the disc 31 engages a roller 33 which extends laterally from a slide bar or plate 34, whose ends move on the front faces of the extensions 15 before mentioned. The ends of the plate

are transversely slotted as indicated at 35, and set screws 36 are passed through the slots into engagement with openings in the extensions.

8 A lock nut 37 is threaded on to each set screw and engages the face of the plate. Other set screws 38 are threaded through angular lugs 39, extending forwardly from the extensions 15 and each set screw engages the upper edge of the plate 34. Lock nuts 10 40 are threaded on to the set screws 38 for holding them in adjusted position. By these means the plate can be very accurately positioned and positively held in any desired 15 position.

The spring 30 normally tends to hold the die 16 away from the die 13, but the die 16 is held down in contact with the die 13 by the flange 31 except at such times when the 20 notch 32 is in position to allow the roller 33 to enter same. When this occurs the spring 30 will push the sleeve 23 and the shaft 14 upwardly slightly, unless additional means are provided to prevent such movement. 25 The sleeve 23 is provided with a projection 41 near its upper end extending upwardly and outwardly from the upper side of the sleeve, and an arm 42 is rigidly fixed at one end in the projection 41 with 30 the free end of the arm flattened as at 43 and positioned to one side of the center line of the dies (Fig. 4).

A rod or link 44 is provided, and the upper end of the link or rod is reduced and 35 threaded, the reduced portion being passed through an opening in the lug 43 and lock nuts 45 are threaded on to the reduced portion of the rod above and below the lug. At its lower end the rod is pivotally connected 40 to one end of a lever 46, whose other end is pivoted to the frame as indicated at 47 (Fig. 2).

A roller 48 is journaled on the lever 46 intermediate its ends, and the roller moves 45 in contact with a cam 49, secured on the shaft 3, before mentioned. A shaft 50 is journaled in the frame below the shaft 3 and to one side thereof, and the shaft 50 is provided with a radial arm 51 which is 50 connected to the end of the lever 46 adjacent to the link 44 by a link 52. Thus when the lever 46 is moved by the cam, the rod or link 44 will be moved longitudinally and the shaft 50 will be oscillated.

55 The shaft 50 is provided with a radial arm 53 intermediate its ends, and a link 54 is rigidly connected to the arm, the link having means for operating the air valve 55. This valve, which controls the air or fluid 60 under pressure, is arranged in an opening in the table 1, and is held in adjusted position by means of a set screw 56 which is passed through the table into engagement with the casing. (Fig. 8.)

65 A lever 57 is pivoted to the upper end of

the link 54 as indicated at 58, and a stop 59 is provided on the link for engagement by the lower end of the lever. The upper end of the lever is in position to engage the valve stem 60 of the valve in the casing 55, to 70 open the said valve. The lever 57 is pivoted nearer its upper end than its lower, in such position that when the upper end of the lever engages the valve stem, the lever will 75 be swung as indicated in dotted lines in Figure 8, to release the lever from the stem.

It will be noted that one of the upper corners of the lever is beveled as indicated at 61, the corner being that adjacent to the stop 59. The valve is connected by means 80 of a pipe 62 with a source of supply for air under pressure, and a flexible pipe 63 leads from a lateral port 64 in the valve to a nipple 65, extending laterally from the sleeve 29, before mentioned. 85

When the valve stem is moved upward by the lever 57 on account of the link 54 passing under the valve when the arm 53 is oscillated, air passes by way of the valve casing 55 from the supply pipe 62 to the flexible tube 63, and is delivered to the sleeve 29 before mentioned. The valve in this casing controls the passage of the air from the flexible pipe 63 to the passage 28 in the shaft 14. It will be noted that the said passage 95 extends to near the apex of the upper die 16, delivering near the apex.

A coil spring 66, which is weaker than the spring 30, is arranged between the arm 51 of the shaft 50, and a bracket arm 67 100 extending laterally inward from one of the legs of the frame, and the said spring acts normally to swing the shaft 50 and the lever 57 to lowered position. A magazine 68 is supported by a bracket 69 from the table, 105 and the blanks 70 from which the cups are formed, are supported by the magazine. It will be noted that a portion of the magazine inclines downwardly parallel with the contacting surfaces of the two dies, and the blanks are slipped on to this portion to permit them to be grasped between the dies. 110

The magazine is cut away adjacent to the dies as shown at 71, in Figure 4, and the blanks are fed by hand to the dies. The 115 upper die is provided with a pin 72, which enters the groove 17 of the lower die 13. The upper die 16 is arranged to contact with the lower die 13, as shown in Figure 3, and the spring 30 pushes upward at all times against the supporting means for the upper die to move the said die away from the lower die. This movement, however, cannot take place except when the cam 49 is in position 120 to allow an upward movement of the rod or link 44, and also when the notch 32 is in register with the roller 33. When this occurs, the die will move upward to permit the insertion of a blank. 125

It will be noted from an inspection of 130

Figure 5, that each blank has two approximately straight sides 73 and 74 respectively, and a curved edge 75. The blank is in fact somewhat more than a quadrant of a circle.

5 At the angle where the sides 73 and 74 would join, a flap or extension 76 is left on the blank, the said flap or extension being of semi-circular shape. The blank is slit as indicated at 77 to partially separate the flap or extension 76 from the body of the blank. This slit extends about half the diameter of the extension.

The operation is as follows:

15 A blank is fed between the dies with the straight edge 73 at the line of contact between the dies, and when the upper die is in lifted position. As soon as the portion of the cam 49 of greater radius contacts with the roller 48, the upper die is pulled downward into contact with the lower die thus gripping the paper between the dies and as the die is rotated the blank is drawn between them, held in position by the pin 72, and is wrapped around the upper die. The upper die commences to rotate as soon as it is pulled down, the ring 22 engaging with the lower die at this moment. The upper die is held in contact with the lower die during three complete rotations of the dies after which time the roller 48 passes off of the portion of the cam 49 of greater radius onto the portion of less radius and the notch 32 of the disc 31 comes into register with the roller 33 and the spring 30 immediately forces the upper die upward. The roller 33 enters the notch 32 and the upper die is held from rotation until it is again lowered by the cam 49. Whenever the upper die is released by the cam 49 so that the spring 30 may move the die upward, the notch 32 of the rib 31 is in register with the roller 33 and the engagement of the roller with the notch, when the die is lifted, stops the rotation of the die and holds it from rotation until it is again lowered. As soon as the cam 49 acts to depress the former 16, the notch 32 passes the roller 33 and the upper die is pushed downwardly to clamp the edges 73 of the blank between the dies, and the blank is rolled around the upper die. The extension 76 curls around the apex of the cup as shown in Figure 6, and this flap or extension may be provided with an adhesive if desired, which adhesive extends along the edge 74, to seal the same to the cup, to prevent unfolding of the blank. It will be noticed that the cam 49 consists of two equal portions of unequal radius. While the portion of the cam of greater radius contacts with the roller of the lever 46, the upper cone is held down in contact with the lower cone or die, while when the portion of short radius is in contact with the roller the upper cone is released from the lower cone. That is while the portion of the cam

49 of lesser radius is in contact with the roller of lever 46 the upper cone or die is not rotated, being held from motion by the engagement of the roller 33, with the notch 32 of the flange 31. The driving shaft 3 rotates once for each six complete rotations of the lower cone or die 13. Hence the said die 13 will rotate three times while the portion of the cam 49 of lesser radius contacts with the roller 48, and the cone or die will make three revolutions while the portion of greater radius is in contact with the roller.

Three turns of the upper die are necessary to form a cup, as will be evident from the nature of the extension 76 of the blank, and as soon as the notch 32 again registers with the roller 33 the upper die is lifted and at the same time the link 54 is moved across to cause the cam portion 61 of the lever 57 to engage with the stem 60 of the controlling valve. The movement of the stem at once admits air to the passage 28, and the completed cup is blown off the upper die, while at the same time another blank is fed between the dies. Although the upper die is released once during each complete rotation of the said upper die it is not lifted until the link 44 is released by the cam 49, and this cam may be arranged to release the upper die whenever desired. In practice the arrangement is such that the upper die is released at the end of each three rotations of the said die, that is, when a cup is completed. In order to wrap the tail flap 76 around the apex of the cup three complete rotations of the upper die is necessary. The air is not admitted to the die to discharge the cup, except when the die is released by the link 44.

105 It will be noted from an inspection of Figure 3 that the upper die is cut away at its upper end, that is, that portion of the die which would be above the edge 75 of the blank. The completed blank is sealed only at the flap or extension 76 and along the edge 74. By providing a blank slightly greater than a quadrant there is left, after the folding of the paper, enough surplus at the edge 74 to lap over the edge 73.

115 The shaft 8 is rotated continuously from the fast pulley 10, by means of a belt 12, and a shifting device is provided for shifting the belt from the fast to the loose pulley or in the opposite direction. This device comprises a guide bar 78, upon which is slidably mounted a block or sleeve 79. An arm 80 extends laterally from the block, the said arm engaging the belt 12, and a handle 81 is connected with the block for convenience in moving the same on the bar. The shaft 8 drives the shaft 3 through the sprocket chain 6, and this shaft operates the lever 46.

125 I am aware that numerous details of construction may be varied through a wide range without departing from the principles

of this invention, and I therefore do not purpose limiting the patent granted otherwise than necessitated by the prior art.

I claim as my invention:

- 5 1. A paper cup former, comprising a supporting table, a bracket mounted upon said table, a shaft journaled in the bracket and provided at one end with a conical die, a yoke extending upwardly from the bracket, a sleeve pivoted between the arms of the yoke, a shaft journaled in the sleeve and provided with a die having its peripheral surface contacting with that of the lower die, said upper die being movable away from the lower die, means tending to hold the upper die away from the lower die, a disk arranged coaxial with the upper die and having a notch in its periphery, means above the disk adapted to engage the periphery of the disk to hold the upper die toward the lower, said upper die moving upward when the notch is in engagement with said means, a driving connection between the upper die and the lower die, releasable when the upper die is moved upward, said shaft and upper die having an axial passage for fluid under pressure opening near the apex of the die, means for supplying air under pressure to the passage, a valve for controlling the supply, means connected to the lower die for releasing the upper die at predetermined intervals, and for operating the valve to admit air to said passage when the upper die is lifted.
- 20 2. A paper cup former, comprising a support, a shaft journaled horizontally in the support and provided at one end with a conical die, means for connecting the shaft with a source of power, a yoke connected with the support above the shaft, a sleeve pivoted between the arms of the yoke, a shaft journaled in the sleeve, an upper die secured to the shaft and arranged to contact at its periphery with the periphery of the lower die, a driving connection between the shafts of the upper die and the lower die, a feed table adjacent to the contacting surfaces of the dies for holding blanks to be fed between the dies, a pin on the upper die for engaging a blank, the lower die being annularly grooved to receive the pin, means for holding the upper die in contact with the lower die, and adapted to release the upper die at predetermined intervals, means connected to the lower die for periodically moving the upper die toward the lower die and fluid controlled means for discharging the formed articles from the upper die.
- 35 3. A paper cup former, comprising a fixed lower conical die, means for rotating the said die, an upper conical die adapted to cooperate with the lower die and contact with the periphery thereof, a releasable driving connection between the dies, said upper die being mounted to swing away from the lower die, means normally pressing the upper die away from the lower die, a feed table adjacent to the contacting surface of the dies, means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, means, controlled by the lifting of the die, for ejecting the formed blank when the upper die is lifted, and means for holding the blank to the upper die.
- 40 4. A paper cup former, comprising a fixed lower conical die, means for rotating the said die, an upper conical die adapted to cooperate with the lower die and contact with the periphery thereof, a releasable driving connection between the dies, said upper die being mounted to swing away from the lower die, means normally pressing the upper die away from the lower die, a feed table adjacent to the contacting surface of the dies, means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, means, controlled by the lifting of the die, for ejecting the formed blank when the upper die is lifted, and a means at the base of the upper die for engaging a blank to secure the same to the die, the lower die having an annular groove for receiving said engaging means.
- 45 5. A paper cup former, comprising a fixed lower conical die, means for rotating the said die, an upper conical die adapted to cooperate with the lower die and contact with the periphery thereof, a driving connection between the dies, said upper die being mounted to swing away from the lower die, means normally pressing the upper die away from the lower die, a feed table adjacent to the contacting surface of the dies, means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, means, controlled by the lifting of the die, for ejecting the formed blank when the upper die is lifted, and means for holding the blank to the upper die.
- 50 6. A paper cup former, comprising a fixed lower conical die, means for rotating the said die, an upper conical die adapted to cooperate with the lower die, a driving connection between the dies, said upper die being mounted to swing away from the lower die, means normally pressing the upper die away from the lower die, a feed table adjacent to the contacting surface of the dies, means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, means for ejecting the formed blank when the upper die is lifted, said means being controlled by the lifting of the die, a pin at the base of the upper die for engaging a blank to secure the same to the die, the lower die having an annular groove for receiving said pin, and means connected to the lower die for periodically preventing the lifting of the upper die when it is released.
- 55 7. A paper cup former, comprising a fixed lower conical die, means for rotating the said die, an upper conical die adapted to cooperate with the lower die and contact with the periphery thereof, a releasable driving connection between the dies, said upper die being mounted to swing away from the lower die, means normally pressing the upper die away from the lower die, a feed table adjacent to the contacting surface of the dies, means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, means for ejecting the formed blank when the upper die is lifted, said means being controlled by the lifting of the die, a pin at the base of the upper die for engaging a blank to secure the same to the die, the lower die having an annular groove for receiving said pin, and means connected to the lower die for periodically preventing the lifting of the upper die when it is released.

means for holding the upper die rigidly against the lower die, and for releasing the upper die at predetermined intervals to permit the upper die to lift, and means, controlled by the lifting of the die, for ejecting the formed blank when the upper die is lifted.

7. In a paper cup former, upper and lower conical dies contacting at their peripheries, means for rotating the lower die, said upper die being mounted for movement toward and from the lower die, means for positively holding the upper die in contact with the lower die, and for releasing the upper die at predetermined intervals, said upper die having an axial passage for fluid under pressure opening near the apex thereof, means for admitting fluid under pressure to the passage to eject the formed article, and means controlled by the rotation of the lower die for positively lifting the upper die when it is released.

8. In a paper cup former, upper and lower conical dies contacting at their peripheries, means for rotating the lower die, said upper die being mounted for movement toward and from the lower die, means for positively holding the upper die in contact with the lower die, and for releasing the upper die at predetermined intervals, said upper die having an axial passage for fluid under pressure opening near the apex thereof, means for admitting fluid under pressure to the passage to eject the formed article.

9. In a paper cup former, upper and lower conical dies mounted to contact along their peripheries, means for rotating the lower die, said upper die being mounted for movement toward and from the lower die, a spring normally pressing the upper die away from the lower die, means for positively holding the upper die in contact with the lower die, and for releasing the upper die at predetermined intervals, means for ejecting the formed article from the upper die, and means controlled by the lifting of the upper die for operating the ejecting means.

10. A paper cup former comprising a pair of superimposed movable and fixed conical dies, the lower die being fixed, means for rotating the fixed die, said movable die being pivotally mounted to swing away from the fixed die, means in the pivoted die for ejecting a formed cup therefrom, means for lifting the pivoted die away from the fixed die, and means for releasing the pivoted die at predetermined intervals to permit the same to be lifted.

11. A paper cup former comprising a fixed die, means for rotating said die, a die mounted to swing toward and from the fixed die, means tending to normally hold the movable die away from the fixed die, means operated by the fixed die rotating

means for holding the movable die in contact with the fixed die during predetermined intervals and for releasing the movable die at predetermined intervals to permit said movable die to swing away from the fixed die, ejecting means for the cup in connection with the movable die, and means operated by the movable die rotating means for controlling the said ejecting means.

12. A paper cup former comprising upper and lower conical dies, the lower die being fixed, means for rotating the lower die, said upper die being mounted to swing away from the lower die, means for ejecting a formed cup from the upper die, means for normally raising the upper die away from the lower die, and means for releasing the said upper die at predetermined intervals to permit the same to be lifted.

13. A paper cup former comprising a fixed lower die, means for rotating said die, an upper die mounted to swing toward and from the lower die, a spring normally pressing the upper die away from the lower die, means operated by the lower die rotating means for holding the upper die in contact with the lower die during predetermined intervals and for releasing the upper die at predetermined intervals to permit the spring to move the said upper die away from the lower die, ejecting means for the cup in connection with the upper die, and means operated by the lower die rotating means for controlling the said ejecting means.

14. In a paper cup former, upper and lower conical dies mounted to contact along their peripheries, means for rotating the lower die, said upper die being mounted for movement toward and from the lower die, means for positively holding the upper die in contact with the lower die, and for releasing the upper die at predetermined intervals, means for ejecting the formed article from the upper die, and means controlled by the lifting of the upper die for operating the ejecting means.

15. A paper cup former comprising a fixed lower die, means for rotating said die, an upper die mounted to swing toward and from the lower die, means tending normally to hold the upper die away from the lower die, means operated by the lower die rotating means for holding the upper die in contact with the lower die during predetermined intervals and for releasing the upper die at predetermined intervals to permit the said upper die to move away from the lower die, ejecting means for the cup connected with the upper die, and means operated by the lower die rotating means for controlling the said ejecting means.

16. In a paper cup former in combination a pair of dies adapted to cooperate to form a cup, one of said dies being relatively movable and means for alternately turn-

ing the movable die through three revolutions of both dies together to form a cup and then holding the movable die from turning during three revolutions of the relatively fixed die.

17. In a paper cup former in combination a pair of dies adapted to cooperate to form a cup, one of said dies being relatively movable, means for alternately turning the movable die through three revolutions of both dies together to form a cup and then holding the movable die from turning during three revolutions of the relatively fixed die, and means for removing a formed cup from the relatively movable die while it is prevented from turning.

18. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, mechanism for continuously rotating one of said rollers, means on the other roller for engaging a blank to hold it in position upon said roller during the forming operation, and means for separating said rollers and releasing the cup when the forming operation is completed.

19. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, means for supporting said rollers and mechanism for continuously rotating one of said rollers and intermittently rotating the other roller.

20. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, resilient means tending to force said rollers apart, additional means adapted to hold said rollers together except at predetermined intervals, mechanism for continuously rotating one of said rollers, and means for separating said rollers stopping the rotation of one of them, and releasing the cup when the forming operation is completed.

21. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to resiliently engage a blank between them, a movable carriage, a bearing mounted upon said carriage for supporting said forming roller, and mechanism for continuously rotating the pressing roller in combination with means for automatically moving said carriage to separate said rollers to release the cup.

22. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, resilient means tending to force said rollers apart, additional means

provided to hold said rollers in contact with each other except at predetermined intervals, said means being adapted to stop the rotation of the forming roller when the rollers are separated.

23. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, a movable carriage, a bearing mounted upon said carriage for supporting said forming roller, means operatively connected to said rollers for automatically moving said carriage after a plurality of rotations of the rollers to change the distance between the rollers, and mechanism for continuously rotating the pressing roller in combination with means co-operating with said forming roller to hold a blank in position during the forming operation, and means for separating said rollers and releasing the cup when the forming operation is completed.

24. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, a movable carriage supporting said forming roller, means co-operating with the movable carriage tending to force the rollers apart, additional means provided to hold said rollers together except at predetermined intervals, said means comprising a disk on the forming roller and a roller co-operating therewith, an adjustable stop adapted to co-operate with said last named roller to limit the pivotal movement of the forming roller.

25. In a machine for forming paper cups from suitably formed blanks, a pair of conical rollers comprising a forming roller and a pressing roller adapted to engage a blank between them, a carriage supporting said forming roller, an adjustable stop for controlling the minimum distance between said rollers, resilient means tending to hold said carriage against said stop, and mechanism for rotating the rollers, in combination with means for automatically separating the rollers and releasing the cup when the forming operation is completed.

26. A machine for forming receptacles from blanks including a feed means, an intermittently operated forming means, and a discharging means for the receptacles, said feed means supporting a blank holding magazine.

27. A machine for forming receptacles from blanks including a feed means, an intermittently operated forming means, and a discharging means for the receptacles, said feed means including a blank holding magazine and a single blank holding means.

28. A machine for forming receptacles from blanks including a feed means, a form-

70

75

80

85

90

95

100

105

110

115

120

125

130

ing means, and a discharging means for the receptacles, said forming means including a continuously operated die, and an intermittently operated die.

29. A machine for forming receptacles from blanks including a feed means, a forming means, and a discharging means for the blanks, said forming means including a pair of coacting dies, each of said dies being rotated a different number of revolutions during the formation of each receptacle.

30. A machine for forming receptacles from blanks including a feed means, a forming means, and a discharging means for the blanks, said forming means including a pair of coacting dies, said dies being rotated a different number of revolutions in the formation of each receptacle, and being in contact only when both are rotating.

31. A machine for forming receptacles from blanks, including a feed means, a forming means, and a discharging means for the receptacles, said forming means including a pair of coacting dies, one of which is relatively fixed and continuously operated.

32. A machine for forming receptacles from blanks including a feed means, a forming means, and a discharging means for the receptacles, said forming means including a pair of coacting dies, one of which rotates continuously and the other intermittently, said dies being rotated a plurality of times in the formation of each receptacle and being in contact during said revolutions and separated when only one of said dies rotates, and automatic means for moving said dies into and out of operative relation.

33. A machine for forming receptacles from blanks including a feed means, continuously operated and intermittently operated forming dies, and a discharging means for the receptacles, said discharging means including a fluid pressure device.

34. A machine for forming receptacles from blanks including a feed means, a continuously operated die, an intermittently operated die, a discharging means for the receptacles, said discharging means including a fluid pressure device, automatically operated, once for each receptacle formed.

35. A machine for forming receptacles from suitable blanks including a continuously operated pressing cone, and an intermittently operated forming cone.

36. In a machine for forming receptacles from suitable blanks, a forming means including a pair of conical dies of different lengths one of which is continuously operated and the other of which is intermittently operated.

37. In a machine for forming receptacles from suitable blanks, a forming means, said

forming means including a pair of conical dies, one of said dies being relatively fixed and continuously operated, the other movable to and from the first die and rotated only when in contact with the first die.

38. In a machine for forming receptacles from suitable blanks, a forming means, said forming means including a pair of conical dies of different lengths, the longer of said dies being relatively fixed and continuously operated while the shorter of said dies is movable to and from the first die and is intermittently operated.

39. In a machine for forming receptacles from suitable blanks, a forming means, said forming means including a pair of conical dies, one of said dies being relatively fixed and the other movable to and from the first die, one of said dies being automatically rotated six times in the formation of each receptacle, and the other die being in contact with said first die during three of said revolutions.

40. In a machine for forming receptacles from suitable blanks, a forming means, said forming means including a pair of conical dies, one of said dies being relatively fixed and continuously rotated and the other movable to and from the first die, automatic means for moving said dies into and out of operative relation, and means associated with the second die adapted to contact and receive a drive from the first die when said dies are in operative relation.

41. In a machine for forming receptacles from blanks, an intermittently rotated forming means and a discharging means, said discharging means including a fluid pressure device automatically operated once for each receptacle when the forming means is stationary.

42. In a machine for forming receptacles from blanks, a continuously rotated fixed shaft, a pressing cone secured thereon, a pivotally mounted shaft, a forming cone thereon, means for intermittently moving said forming cone into and out of cooperating relation with the pressing cone, means on said pivotally mounted shaft adapted to engage said pressing cone to receive a drive therefrom to cause rotation of the forming cone when the pivotally mounted shaft is lowered, a notched member on said pivotally mounted shaft, and a stationary stop adapted to be engaged by the notched member to hold the pivotally mounted shaft and the forming cone against rotation when the pivotally mounted shaft is raised.

43. A machine for forming receptacles from blanks including a feed means, a pivotally mounted forming die, and a receptacle discharging means within said pivoted forming die.

44. A machine for forming receptacles from suitable blanks including a continu-

ously operated pressing cone, an intermittently operated forming cone, and means within the intermittently operated forming cone for discharging receptacles therefrom.

5 45. The combination with a receptacle forming machine, of a pivoted intermittently operated forming cone having receptacle discharging means therein.

10 46. In a machine for forming receptacles, a forming means including a pair of dies of different lengths the longer of said dies

being peripherally grooved where the shorter die ends.

47. In a machine for forming receptacles from blanks, forming means including conical dies of different lengths, shafts for said dies, and a bevelled wheel on the shaft of the shorter die adapted to engage the longer die to cause rotation of the shorter die.

In testimony whereof I have hereunto subscribed my name.

20 DAVID F. CURTIN.