April 17, 1956 E. W. BRIDGE, SR 2,741,958

CUP FORMING MACHINES

Filed June 9, 1953 2 Sheets-Sheet 1

FIG. 1

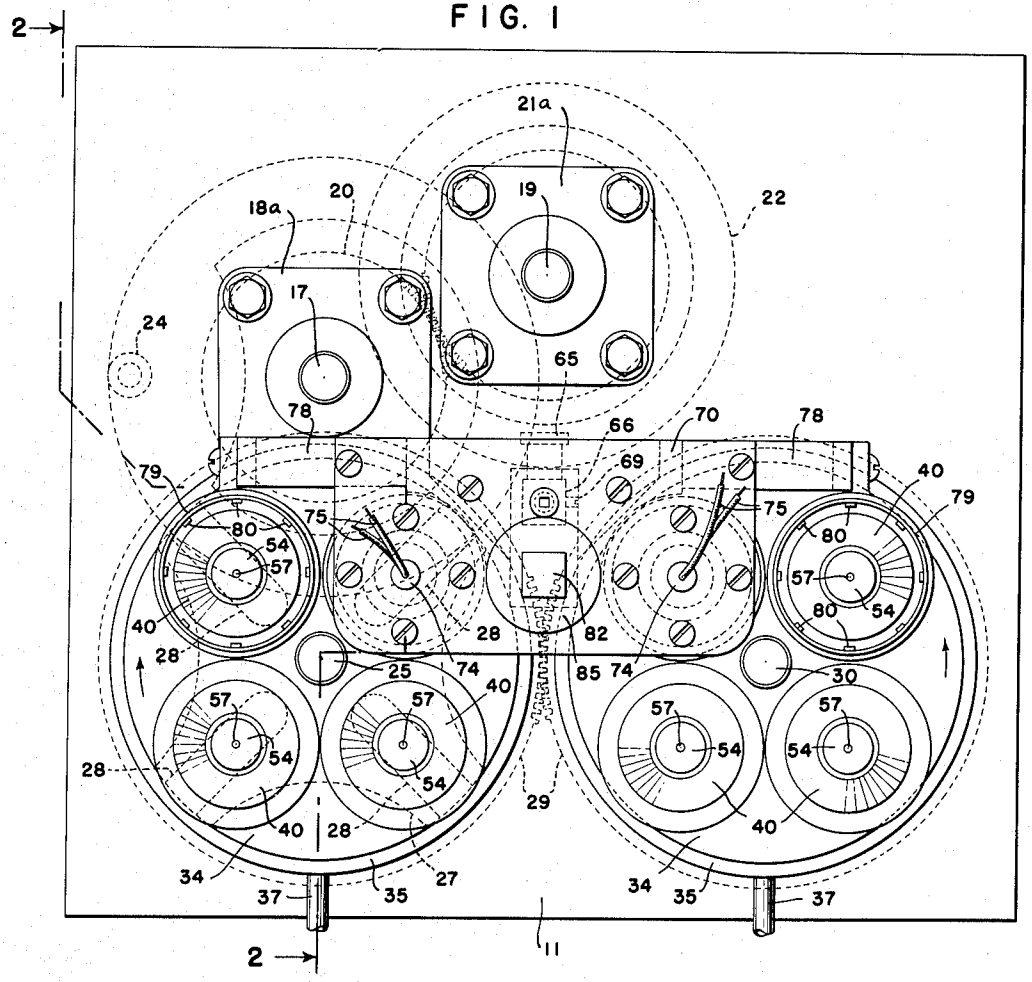


FIG. 3

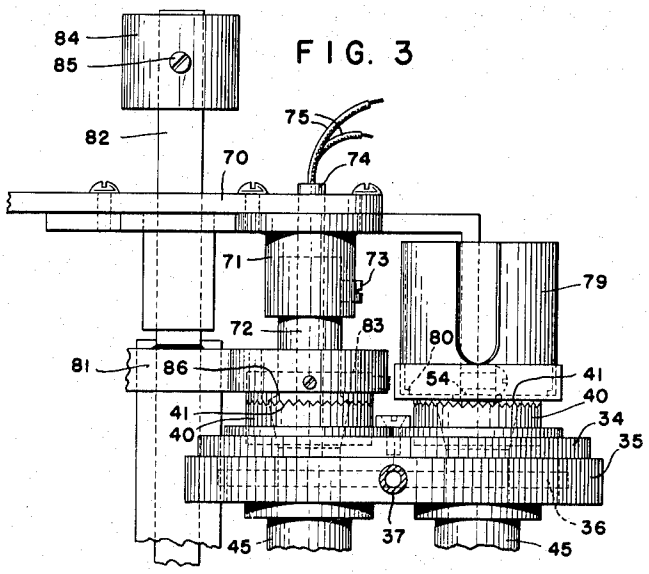
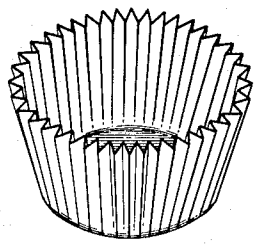


FIG. 4



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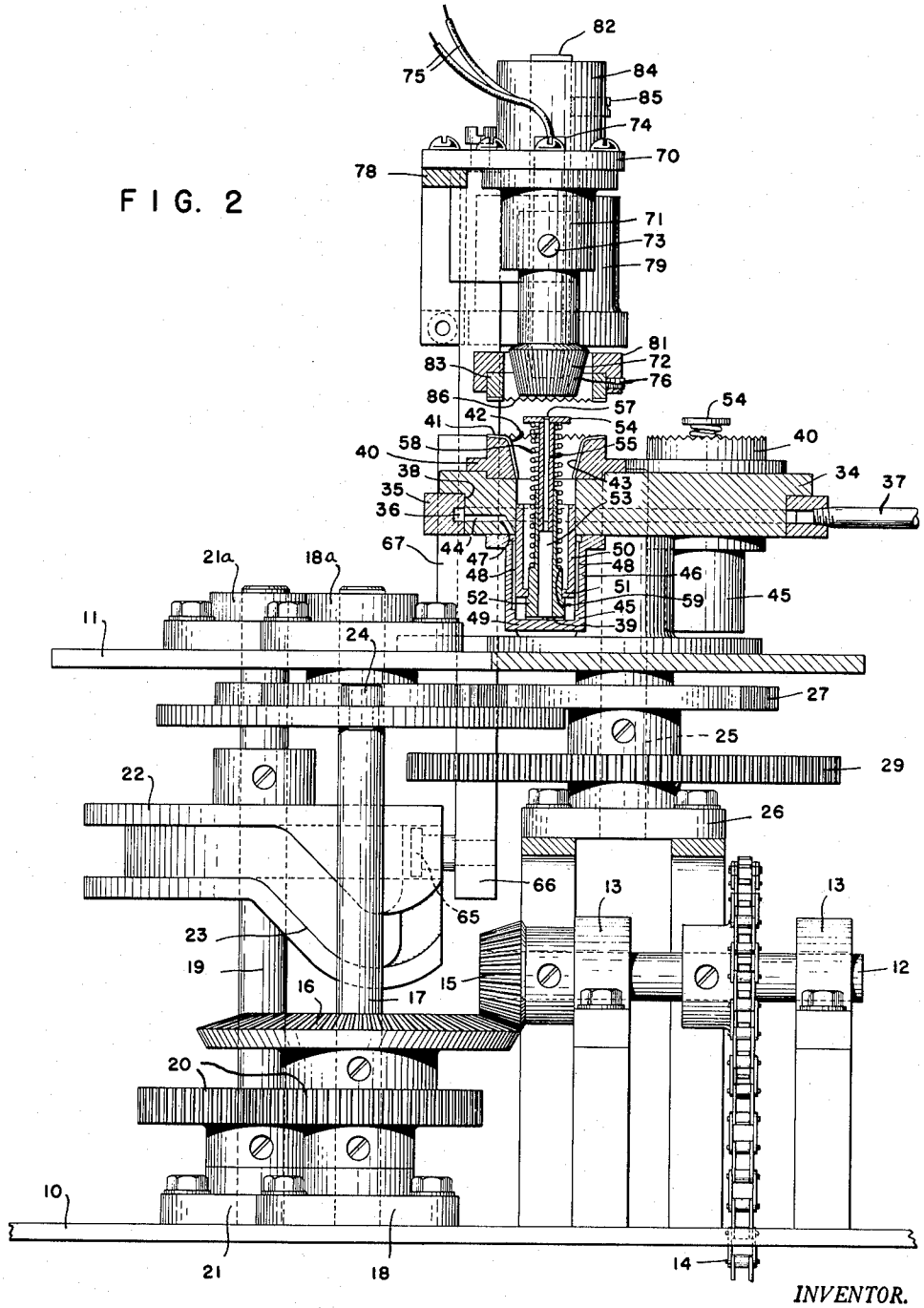
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FIG. 2



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CUP FORMING MACHINES

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2 Claims. (Cl. 93—60)

This invention relates to cup forming machines and more particularly to a machine for forming and retaining paper cups for the reception of confections and the like for packaging.

It has heretofore been proposed to form paper cups having flat bottom portions and fluted sides suitable for the packaging of candy and the like, by simultaneously punching and forming a plurality of nested cups from a stack of sheets. The separation of the cups after their formation and filling with the desired articles requires an excessive amount of time, which at relatively high labor costs unnecessarily increases the cost of the packaged articles.

It has also heretofore been proposed to form cups by impelling a movable die upwardly, the cups thus formed being upside down and not in position for use.

It is the principal object of the present invention to provide improved apparatus for forming cups from circular paper blanks.

It is a further object of the present invention to provide a machine for forming paper cups having improved arrangements for the control of the blank from which the cup is formed.

It is a further object of the present invention to provide a machine for forming paper cups having adjustments to accommodate the characteristics of the material from which the blanks are made.

It is a further object of the present invention to provide a machine for forming paper cups in which, after their formation, the cups are retained for manual filling and removal.

Other objects of the invention will be apparent from the specification and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part thereof, in which:

Figure 1 is a top plan view of a cup forming machine in accordance with the present invention;

Figure 2 is a vertical sectional view taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary view in elevation, of the right half of the machine as shown in Fig. 1, showing the forming dies in lowered position; and

Fig. 4 is a view in perspective of a cup formed with the machine of the present invention.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

In the machine of the present invention, blank holders are provided from which blanks for the formation of the cups are withdrawn at one pair of locations. The blanks are then formed by heated dies at another pair of locations, the formed cups are then advanced to another pair

of locations for cooling, and the cups are then advanced to another pair of locations for filling and removal. The operations are carried out continuously and simultaneously at the various stations in timed relation.

The paper from which the cups are formed may be of well known type, with resin or wax impregnation, may be brown or any other desired color, and is preferably prepared in the form of circular blanks for use in the machine to be described.

Referring now more particularly to the drawings, a machine frame is shown generally at **10** having a horizontal platform **11**.

A main drive shaft **12** is provided, journalled in bearings **13** carried by the frame **10**, and driven in any suitable manner, such as by a sprocket chain **14**, from an electric motor (not shown).

The shaft **12** is provided with a bevel pinion **15** which is in engagement with a bevel gear **16** secured on a vertical intermediate shaft **17**. The shaft **17** is journaled in bearings **18** and **18***a*, the bearing **18***a* being carried by the platform **11**.

The intermediate drive shaft **17** is connected to a vertical cam shaft **19**, by gears **20**, preferably in a one to one driving relation. The cam shaft **19** is preferably journaled in bearings **21** and **21***a*, the bearing **21***a* being carried by the platform **11**. The cam shaft **19** is provided with a cam **22** having a portion **23** for effecting a downward and upward movement as hereinafter explained.

The intermediate drive shaft **17** is also provided with the driving portion of an intermittent driving mechanism, shown as a Geneva mechanism, having a driving pin **24**.

A vertical shaft **25** is provided, journaled in a bearing **26** carried by the frame **10**, the shaft having the driven portion **27** of an intermittent driving mechanism mounted thereon, the driven portion for a Geneva mechanism having four radial slots **28** for successive engagement by the pin **24** to actuate the shaft **25** in intermittent timed step by step rotation.

The shaft **25** is connected by gears **29** in a one to one relation to a vertical shaft **30** which is supported in the frame **10** in a similar manner to the shaft **25**.

Above the platform **11**, the shafts **25** and **29** have circular tables **34** secured thereto for movement therewith. Each of the tables **34** has a ring **35** extending around the periphery thereof. The ring **35** has an interior groove **36** extending therearound which is connected, by a pipe **37**, to a suitable source of suction (not shown).

Each of the tables **34** is provided, at quadrant locations, with vertical openings **38**, above which lower forming dies **40** are mounted. Each of the dies **40** has a relatively flat frusto-conical portion **41**, connected by curved portions **42**, with lower frusto-conical portions **43**, the shape being dependent upon the shape and dimensions of the cup to be formed. The interior portions of the dies **40** have alined inwardly and downwardly extending V-shaped grooves for aiding in the formation of the cup. Passageways **44** are provided in each of the tables **34** for establishing communication between the groove **36** and the lower face of the table **34** at each opening **38**.

Beneath each of the openings **38**, a closure **45** is secured to the bottom faces of the tables **34**, each of the closures **45** having a cylindrical side wall **46**, provided with a circular horizontal groove **47** and one or more vertical grooves **48**, and a bottom wall **49**. Within the interior of the closure **45** an outer sleeve **50** is provided extending above and isolating the groove **47** and having an inwardly extending flange **51** in engagement with a central sleeve **52**. The sleeve **52** has a central opening **53** therein which is in communication, through slots **39** at the bottom of the sleeve **52**, with the space below the flange **51** in engagement with a central sleeve **52**. The sleeve **52** has vertically slidably mounted in the opening

53, a piston having a head 54 and a stem 55. The head 54 may have its upper surface slightly convex to aid in the holding of the blank and removal thereof. A central bore 56 is provided in the stem 55 with an enlargement 57 at the upper end, which communicates with the pipe 37 so that suction is available therein.

A spring 58 is provided, interposed between and secured at its ends to the head 54 and a shoulder 59 on the sleeve 52 for normally urging the head 54 above the top of the die 40, and limiting the upward movement of the stem 55, but permitting downward movement to the bottom of the die 40 for cup forming.

The cam 22 has a follower roller 65 in engagement therewith. The roller 65 is mounted on a vertical post 66, preferably square in horizontal cross section which extends upwardly through a guide 67 secured to the platform 11.

The post 66 has adjustably secured thereto, by one or more set screws 69, an upper bracket plate 70. The bracket plate 70 has mounted thereon a pair of die sockets 71 within which dies 72 are mounted for vertical adjustment and held by set screws 73. The dies 72 have interior electric heating elements 74, power leads 75 being provided to supply the electrical energy for heating. The lower end faces of the dies 72 are preferably flat and extending upwardly therefrom are frusto-conical sections 76 complemental to the frusto-conical portions 43 of the dies 40 and with upwardly extending teeth complemental to the end interfitting with teeth of the portions 43.

The bracket plate 70 has outwardly extending arms 78 which support cylindrical blank holders or magazines 79 for the reception of the circular blanks of paper from which the cups are formed. The magazines 79 are open at the top and at the bottom have inwardly extending abutments 80 which support the stack of blanks and permit withdrawal of the blanks, one at a time, as hereinafter explained.

A shaft 82, preferably square in cross section, is vertically slidably mounted in the bracket plate 70 and has a lower bracket plate 81 secured thereto with ring dies 83 mounted thereon which surround the dies 72. The shaft 82 at its upper end and above the bracket plate 70 has a weight 84 adjustably secured thereto by a set screw 85. The positioning of the weight 84 on the shaft 82 determines the extent of permissible downward movement of the dies 83 and the size of the weight 84 determines the pressure applied by the dies 83.

The dies 83 have lower toothed portions 86 supplemental to and interfitting with the frusto-conical portions 41 of the lower forming dies 40.

The mode of operation will now be pointed out.

Rotation of the drive shaft 10 is effective for continouusly rotating the intermediate drive shaft 17 and, through the gears 20, the cam shaft 19. The rotation of the cam shaft 19 is effective to rotate the cam 22 which retains the follower roller 65 in a dwell position for a part of its rotation and effects a downward and upward movement in the other part of its rotation to lower and raise the post 66 and the structure carried thereby for purposes to be explained.

As the intermediate drive shaft 17 is rotated, also, the driving pin 24 engages in one of the slots 28 of the driven portion 27 of the Geneva mechanism so that the shaft 25 is rotated through an angle of 90°, or one fourth of a complete rotation, and then remains at rest. Movement of the shaft 25 is effective through the gears 29 to impart a corresponding timed movement to the shaft 30 but in opposite directions, the shaft 25 as seen from above moving clockwise and the shaft 30 moving counterclockwise.

Upon movement of the shafts 25 and 30 the circular tables 34 carried thereby are likewise intermittently moved.

The downward and upward movements of the post 66 are effected while the tables 34 are at rest.

As the post 66 moves downwardly, the magazines 79 are likewise moved downwardly so that the lowermost blanks therein are available for engagement by and are engaged by the heads 54. The vacuum in the central bores 56, applied against the lower face of each of the lowermost blanks is effective, with the rising movement of the magazines 79, for withdrawing the lowermost blanks from each of the magazines 79 at this station, and holding these blanks on the heads 54 for the next operation.

As the shaft 17 continues to rotate, the pin 24 engages in the next slot 28 of the driven portion 27 of the Geneva mechanism so that the shaft 25 is again rotated through an angle of 90° and then remains at rest. The tables 34 are thus rotated through an angle of 90° so that the blanks held by the vacuum on the heads 54 are brought to the next station and centered beneath the dies 83 and 72.

Upon the next downward movement of the post 66, the dies 83 first engage each of the blanks at the outer portions thereof and hold the blanks against the portions 41 of the dies 40 imparting a crimp to the portions of the blanks thus gripped. The shaft 82 is thus at rest and the gripping force applied on the outer portions of the blanks is determined by the weight of the assembly which includes the dies 83, the shaft 82 and the weight 84. The gripping force may be varied as desired, and in accordance with different material employed for the blanks.

Upon further downward movement of the post 66 the dies 72 engage with the blank, force it with a crimping action into engagement with the portions 43 of the lower dies 40 and move the blanks downwardly out of engagement with the dies 83 and the die portions 41. The heads 54 move downwardly as urged by the dies 72. The heat from the dies 72 is effective for imparting a permanent crimp to the fluted side walls of the cup formed from the blank.

As the post 66 moves upwardly, the dies 72 are first withdrawn from engagement with the formed cups, and upon further upward movement of the post 66, the bracket plate 70 engages the weight 84 and moves the shaft 82 and the ring dies 83 carried thereby upwardly. The cups are held by vacuum on the heads 54 and elevated by the springs 58.

As the shaft 17 continues to rotate, the pin 24 engages in the next slot 28 of the driven portion 27 of the Geneva mechanism so that the shaft 25 is again rotated through an angle of 90° and then remains at rest. The tables 34 are thus rotated through an angle of 90° so that the formed cups, held by vacuum on the heads 54 are brought to the next station and held there for cooling.

As the shaft 17 continues to rotate, the pin 24 engages in the next slot 28 of the driven portion 27 of the Geneva motion so that the shaft 25 is again rotated through an angle of 90° and then remains at rest. The tables 34 are thus rotated through an angle of 90° and the formed cups are brought to the last station.

The formed cups are retained on the heads 54 by the vacuum in the bore 56 and the formed cups are then available at convenient locations for manual filling with the desired objects, such as candy, removed manually with their contents from the heads 54 and placed in boxes to be shipped.

It will be noted that there are four steps in the cycle of movement of the tables 34, a blank delivery step, a cup forming step, a cup cooling step and a cup filling step, that these steps are occurring simultaneously at each of the four stations, and that the operations are duplicated by the use of the two tables 34.

I claim:

1. In a machine for forming paper cups from blanks, a rotatable horizontally disposed supporting member, means for rotating said supporting member in a step by step relation for the positioning thereof at a plurality of stations, a slidably mounted head vertically movable with respect to said supporting member, a plurality of paper holding members carried by said supporting member for

engagement with the central portion of a blank, said holding members each having a suction opening for engagement by a blank, forming dies surrounding each of said holding members, a connection to a source of suction, the suction openings of each of said holding members being connected to said connection, a blank magazine carried by said head at one station located and having a blank delivery opening accessible successively to said paper holding members, forming dies carried by said head at another station location and movable into blank engaging relation to one of said first-mentioned forming dies, said last mentioned forming dies including a die for engagement with the outer portions of the blank and a die for engagement with the central portion of the blank.

2. In a machine for forming paper articles, a rotatable supporting member, a member in engagement with said supporting member having a fluid passageway therein and a connection from said passageway to a source of suction, and members carried by said supporting member for holding a blank from which the article is to be formed, said last members each comprising a closure member

carried by said supporting member, a sleeve in said closure member having a bore, said supporting member and said closure having passageways for establishing communication between said first mentioned passageway and said bore, and a movable member in said bore and having an interior passageway in communication with said bore, said movable member having a head portion with a face for engagement with the blank and said interior passageway terminating at said face.

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