

June 8, 1943.

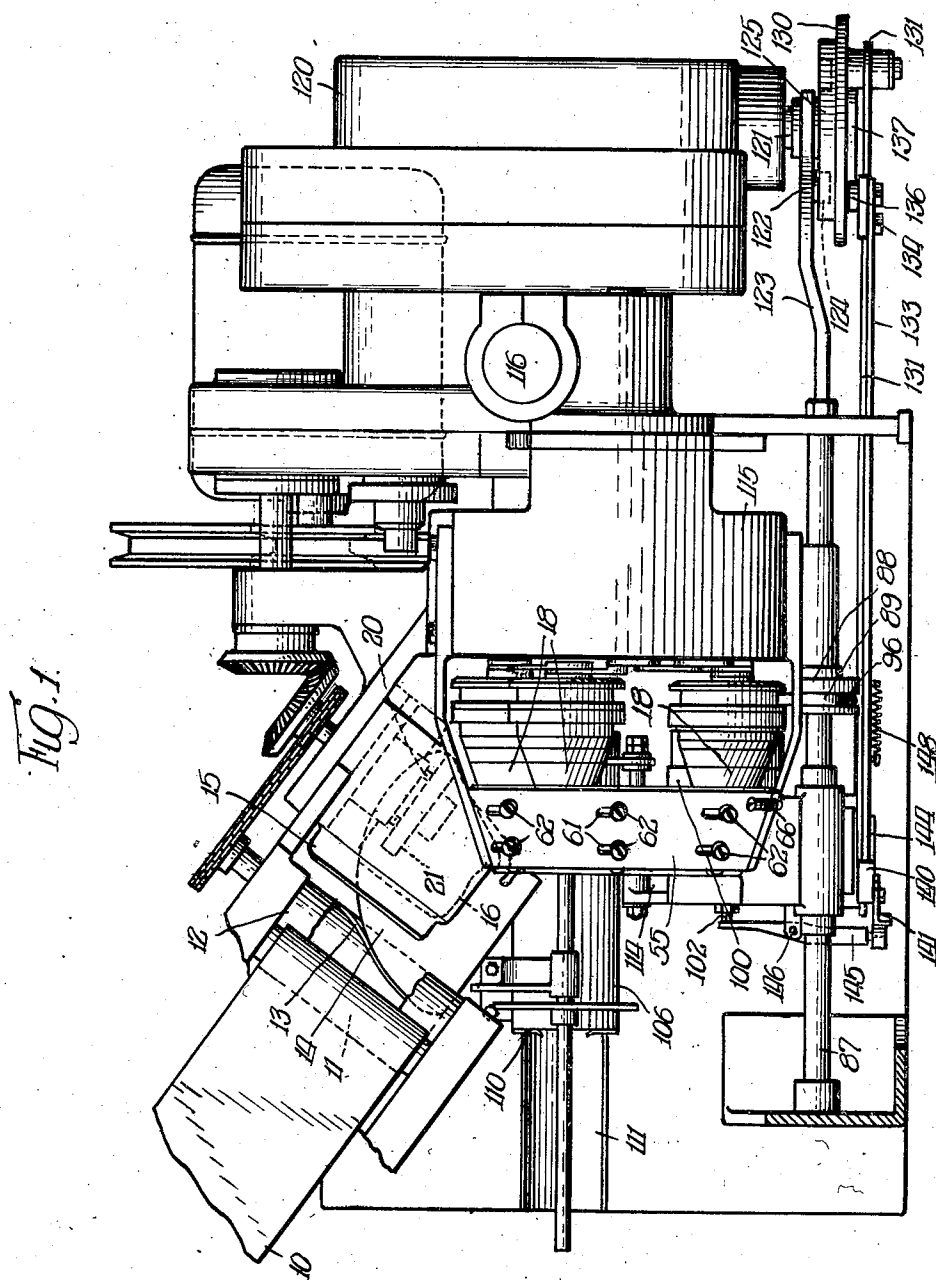
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2,321,407

CUP MAKING MACHINE

Filed Aug. 30, 1940

6 Sheets-Sheet 1



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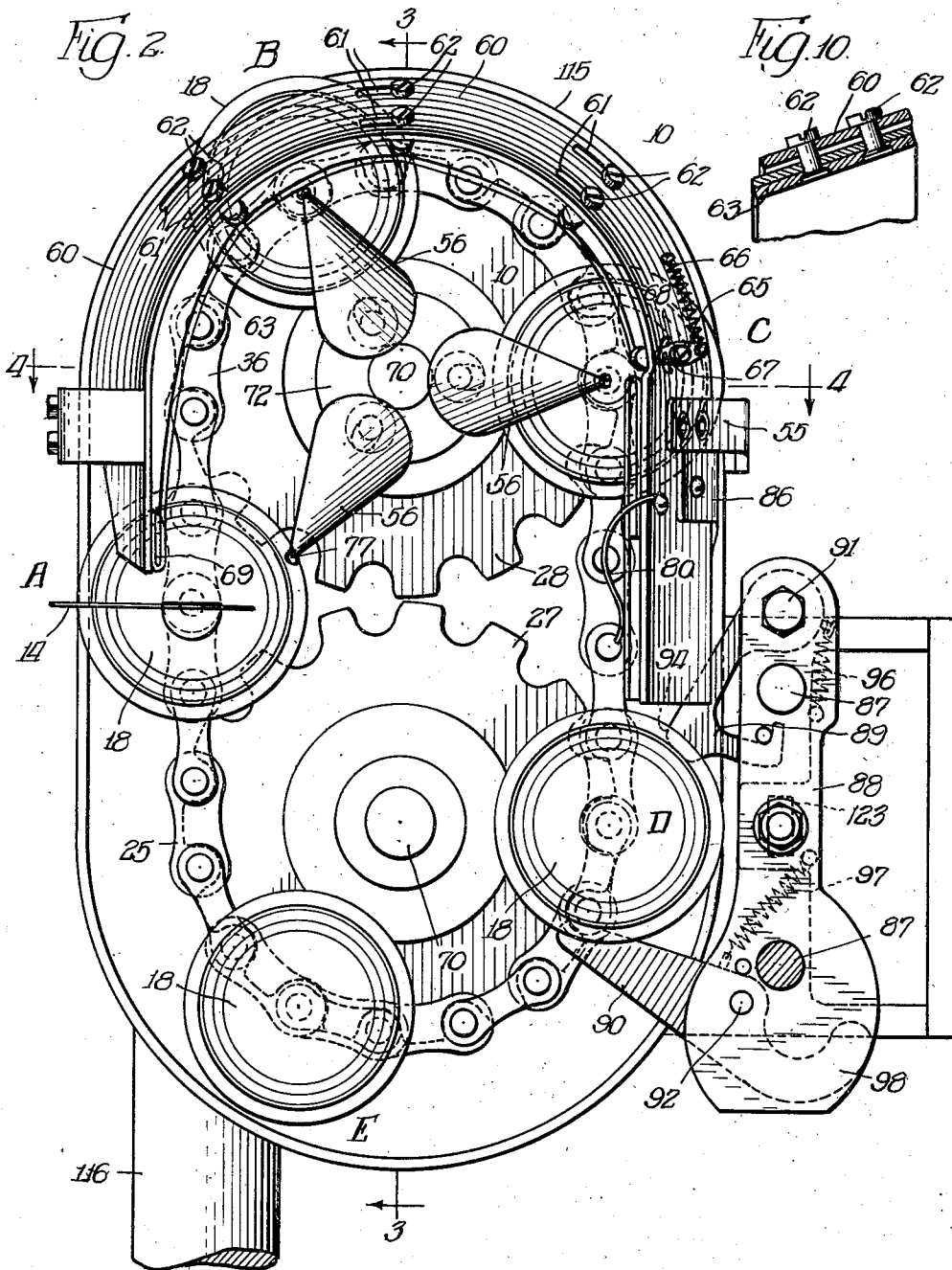
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CUP MAKING MACHINE

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6 Sheets-Sheet 2



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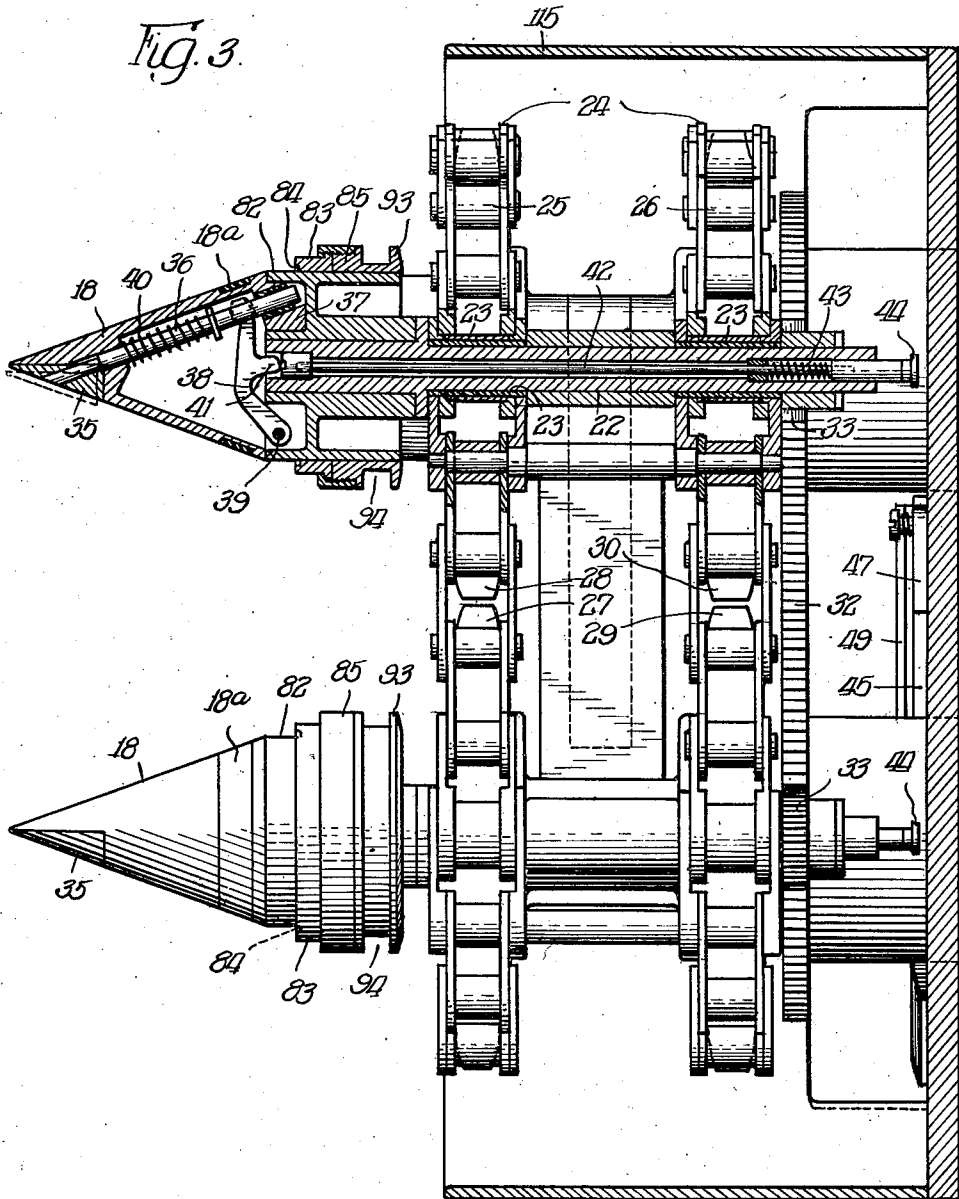
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CUP MAKING MACHINE

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6 Sheets-Sheet 3



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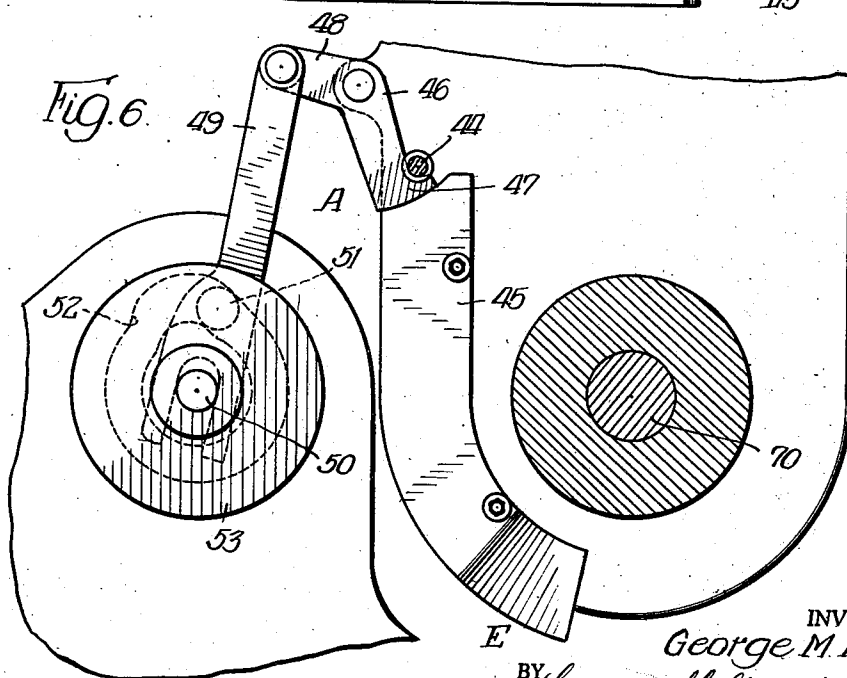
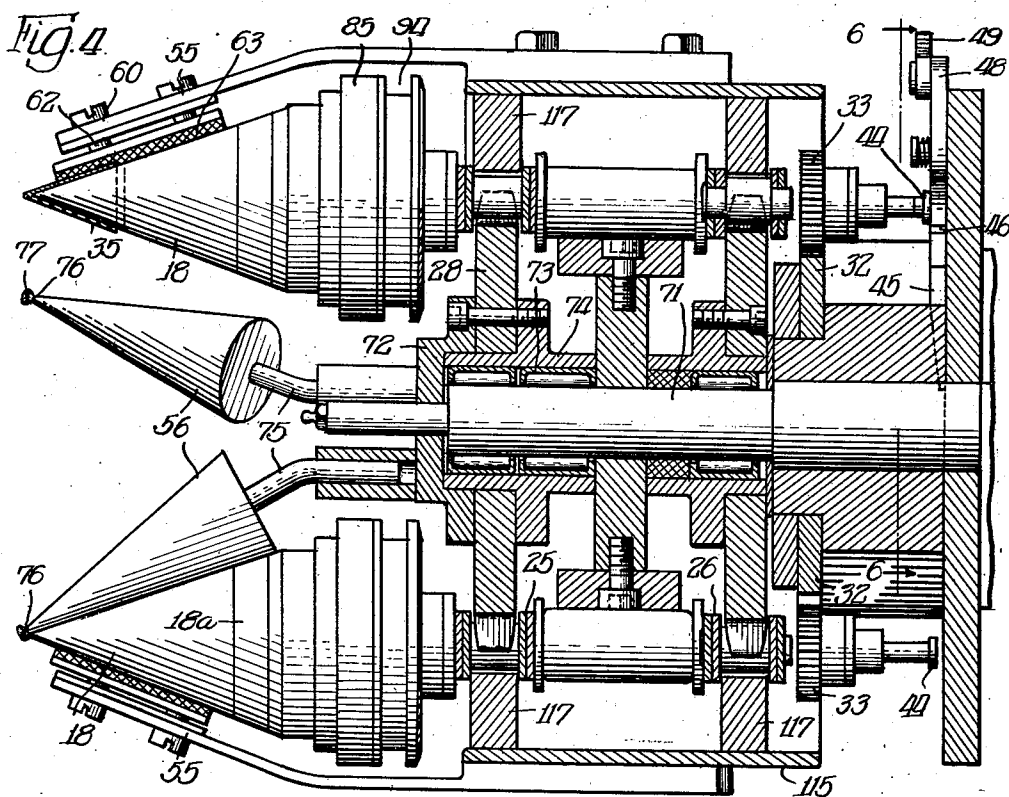
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CUP MAKING MACHINE

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6 Sheets-Sheet 4



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CUP MAKING MACHINE

Filed Aug. 30, 1940

6 Sheets-Sheet 5

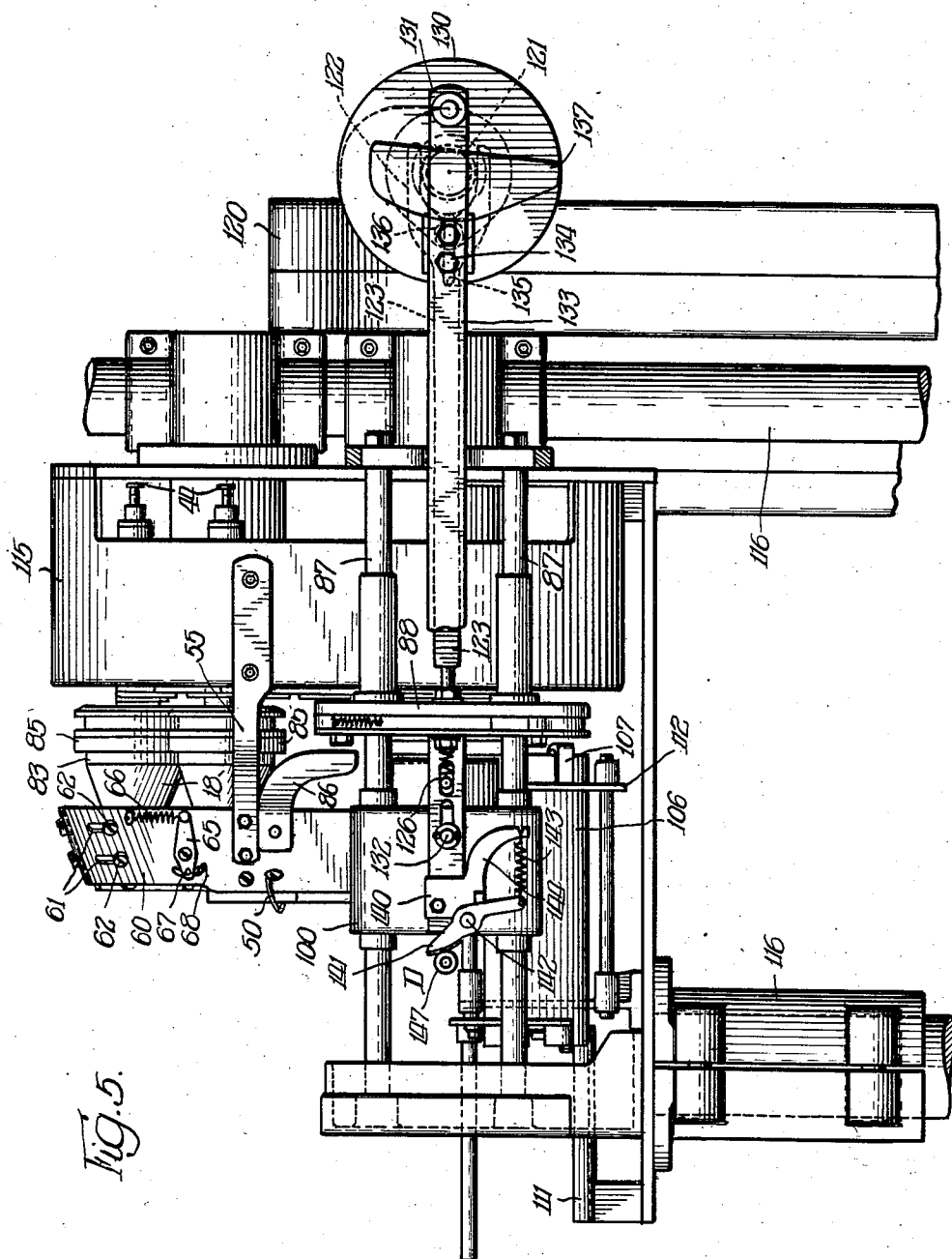


Fig. 5.

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Fig. 7

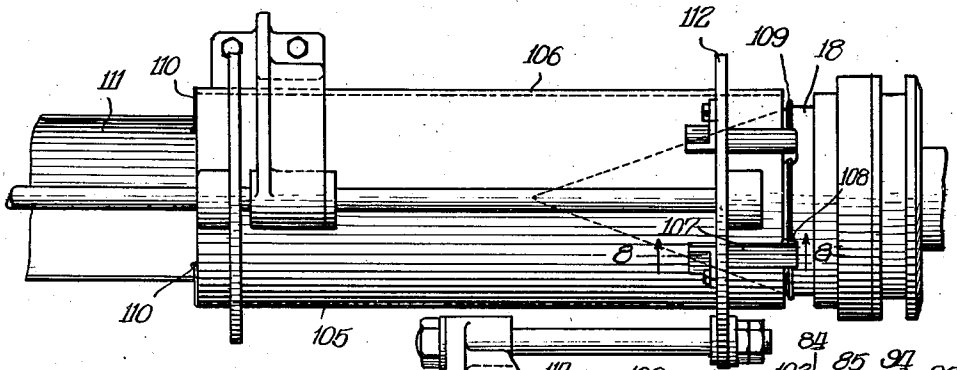


Fig. 8

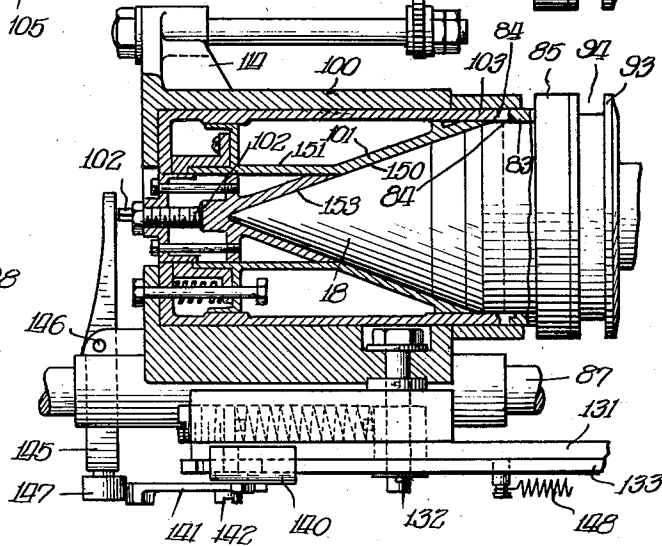
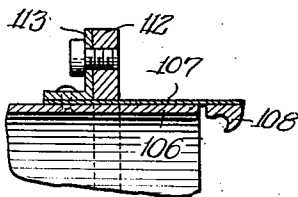
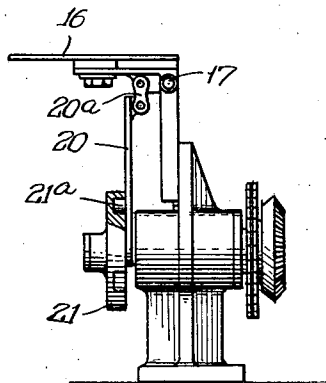


Fig. 9



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UNITED STATES PATENT OFFICE

2,321,407

CUP-MAKING MACHINE

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Application August 30, 1940, Serial No. 354,781

33 Claims. (Cl. 93—36.2)

The present invention relates to improvements in a cup-making machine and more particularly to machines for making sanitary conical cups from paper for use as drinking receptacles, ice cream cups, or the like, that may be thrown away and disposed of after use. The invention has other uses and purposes that will be apparent to persons skilled in the art.

Various cup-making machines have been known heretofore and changes and improvements have been attempted for the purpose of making paper cups more economically through savings in paper, mechanical operations and space, and by increasing the speed of production. The machines now in use are relatively complicated structures requiring exact timing and accuracy of operation to make a neat appearing and desirable cup. Many of the machines work by means of intermittent motion, translating cups from station to station for various finishing operations on the cup. In a number of instances the cups must be transferred to another machine or another portion of the same machine as the machines are necessarily limited, from the point of view of space and economy, to a maximum number of mandrels and stations that can be arranged around the translatory path of the mandrels when mounted on a turret.

The present invention makes use of various combinations of structures to provide a machine that is relatively simple in its structure and operation and one that can perform as many or as few finishing operations on the cup as may be desired. By use of the present invention much structure heretofore thought essential may be omitted while making a stronger and better cup and a greater number of cups can be made from an equivalent roll of paper than has been accomplished heretofore. It was with the deficiencies of earlier machines in mind and with the object of efficiency, economy, elasticity of operation and simplicity of structure in view, that the present invention was conceived.

Certain of the objects of the present invention are to provide more cups from a given quantity of paper; to provide cups in a more sanitary manner; to provide a simplified structure for making cups of this kind; to provide additional strength, attractiveness and value to the cups; and to provide a machine that will perform efficiently, economically and automatically with but little supervision.

Other objects are to provide a machine that can be made in various shapes and sizes and can readily be adapted to various requirements

of a manufacturer. Further objects are to improve the feeding and cutting of blanks, increase accuracy and to eliminate the distribution of dust and dirt among the cups.

For purposes of exemplification, one embodiment of the invention is shown in the drawings and described herein. The invention may be embodied in various other modified forms as will be apparent to those skilled in the art.

In the drawings

Fig. 1 is a plan view of a machine containing an embodiment of the present invention with portions of the feeding mechanism omitted for clarity;

Fig. 2 is an enlarged detailed front elevational view of the carrier mechanism of the machine of Fig. 1;

Fig. 3 is a view on the line 3—3 of Fig. 2;

Fig. 4 is a sectional plan view on the line 4—4 of Fig. 2, omitting the tensioning device;

Fig. 5 is a view in side elevation of the machine;

Fig. 6 is a view on the line 6—6 of Fig. 4;

Fig. 7 is an enlarged detailed plan view partly in section of the rim forming and cup discharge structure;

Fig. 8 is an enlarged detailed view of a portion of the cup discharge structure;

Fig. 9 is an enlarged detailed view of the reciprocating feed table structure; and

Fig. 10 is a view on the line 10—10 of Fig. 2.

In accomplishing the objects of the invention various new combinations of structure have been employed. For simplification in feeding blanks to the machine from a roll of paper, a combination feed and cutting roll is used. The blanks themselves are fed to the cup-forming mandrels and are mechanically gripped by the mandrels in that portion of the mandrel rotating at the lowest surface speed so that the feeding can be carried out with more accuracy and with better timing. The mandrels themselves travel a path that is flexible and may readily be changed in shape, size and direction to add to or subtract from the path of the mandrels various mechanical operations depending upon the desires and requirements of the manufacturer. In translating the mandrels from station to station, an intermittent mechanical motion is preferably used and may be obtained through various well-known Geneva movements or the structure of my co-pending application filed concurrently herewith may be used for this purpose.

This invention also contemplates the use of a less number of forming rollers than there are

mandrels for purposes of economy without harming the utility of the machine. These forming rolls may have an extension thereon for rounding the bottom of the cups as they are formed, thus omitting a separate operation heretofore thought essential. A round bottom cup can be formed or rolled by use of these improved forming rolls, regardless of the type of finish in the paper.

At the discharge station a mechanical discharge member is used to release the finished cup from the mandrel and force it into the stacking mechanism. It will therefore be seen that there is a saving in the omission of vacuum forming apparatus for gripping the cup to the mandrel and in the omission of compressed air blower means for discharging the cup from the mandrel. Besides economy in operation, this absence of blown air in the vicinity of the machine tends to the formation of more sanitary cups as accumulations of dust are not disturbed or blown into the finished containers.

In forming the blanks from the paper roll for use in the machine, an economical shape of blank has been devised that brings about a great saving in paper over other known blanks. With this form of blank and cut, not only can cups of equal size be obtained but a reinforcing rolled rim can be placed on the cup which strengthens the same, makes the cup more attractive and prevents the cutting of user's lips as is now possible on the usual sharp edged cups.

The invention may be embodied in a machine having a supporting base frame on which the various structure is mounted. A paper roll may be mounted on a well-known tension roll stand and a strip or web of paper from the roll may be fed through and over various idler rolls past a gluing mechanism, not shown, to a combination feed and cutting roll mechanism. The mechanism not only pulls the strip of paper, but cuts it into properly shaped blanks and feeds the cut blanks over a feeding table by which they are guided to one of a plurality of cup-forming mandrels.

It will be noted that these mandrels are mounted on a flexible drive comprising a chain carrier and sprocket arrangement driven intermittently to carry the mandrels successively from station to station in a circuit until the return of a mandrel, from discharging a cup, to the feeding or drop table. While a simplified circuit is shown, by placing additional sprocket wheels in the circuit and lengthening the chain carrier a meandering path can be formed with additional stations interposed in the circuit for printing, waxing or other operations.

Behind the chain carrier assembly a stationary rack member is mounted in the path of the carrier and a gear assembly is mounted to the rack member and mandrel to rotate the mandrel upon movement of the chain carrier. Thus a blank will be picked up by the mandrel adjacent the drop table during a pause in the intermittent movement of the chain carrier and upon movement of the chain carrier the mandrel will be rotated to wrap the blank into a conical shape. A forming idler and a pressing mechanism assist in this as the chain carrier passes these points to a rim rolling mechanism and from there to a discharge mechanism from whence a mandrel is again returned to the drop table.

A type of cup that may be formed through the use of this invention and the blank and cut for making a cup of this kind are shown in my co-

pending application Serial No. 183,143 filed January 3, 1938.

Various stations from A to E are indicated on the drawings illustrating the various intermittent stops made by the mandrels in their translatory path. Station A is the blank receiving station. Stations B and C are pauses made during the forming of the blank 14 into a conically shaped cup while other operations are being performed at other stations. At station D a beaded rim is formed on the cup while at station E the cup is discharged from the mandrel.

With reference to Fig. 1 it will be noted that a web 10 of paper is fed from a roll of paper to feed rolls 11 and is led from the feed rolls to the cutting and blank feeding rolls 12 mounted therebelow.

Preferably feed rolls 11 are driven slightly faster than the cutting rolls 12 to relieve the latter from pressure or tension and to assure an accurately and equally sized blank at all times. While these feed rolls 11 might be omitted at times, there is a tendency for the web to slip were the cutting rolls alone used, thus causing a variation in the size and possibly in the shape of the blank.

The cutting rolls 12 have knives 13 mounted thereon, shaped in a desired configuration for cutting a blank, and embedded in an elastic or resilient material such as rubber. This resilient material should extend slightly above the cutting edges of the knives so that the resilient material will grip the web of paper from the roll and guide and hold it to the cutting knives. The rolls should be placed in a close proximity so that the resilient material will be pressed inwardly toward the roll cores adjacent the knives 13 to bare them and permit a cutting action at the proper time while holding the web and cut blank 14 in a proper position and feeding the latter onward to the cup-forming devices.

A blank 14 formed by the cutting roll 12 is fed outwardly by them to a feeding and guide table which, as shown, includes a stationary upper guide plate 15 and a lower guide or drop plate 16 (Fig. 9) between which the blank 14 is guided. As a blank is fed between these guide plates, a mandrel 18 comes to rest adjacent the feeding table to receive the blank. The blank is fed between the plates into contact with a gripping mechanism on the mandrel, and, as the mandrel is forced onwards in its translatory circuit the blank is properly gripped and is wound about the mandrel to form a conical cup. To prevent the blank from tearing, the drop plate 16 (Fig. 9) is pivoted or hinged at its inner edge 17 to drop or swing downwardly upon translatory and rotating motion of a mandrel 18 to permit the blank 14 freely to be pulled from the table and wound on its mandrel. An arm 20 is pivoted to the drop table through the link 20a therebeneath and is connected through a roller 21a to a cam member 21 operatively connected to the feeding mechanism for proper timing with the cutting, feeding and winding operations. As a further blank is cut and fed forwardly, the plate 16 is lifted or reciprocated by this cam mechanism to support the blank 14 and to hold it for and to guide it to a mandrel.

With reference to Fig. 3 it will be noted that the mandrels 18 are formed in a conical shape with a rounded apex so that a rounded bottom cup may be formed thereon. Each mandrel is keyed to a hollow tubular shaft 22 journaled in bearings 23 in a carrier member 24. The flexi-

ble carrier member, as shown, comprises spaced double roller chain members 25 and 26 trained around suitable sprocket wheels to form a flexible drive to meet a manufacturer's desires. Chain member 25, as shown, is trained around sprocket wheels 27 and 28 (Fig. 2) to form a translatory path for the chain member. Chain member 26 is trained about corresponding sprocket wheels 29 and 30 to form a similar and corresponding path.

Mounted adjacent and following the configuration of the translatory path of the carrier member 24 is a rack plate 32. Keyed to the extension member 22 of each mandrel is a gear member 33 that meshes with the rack member and provides means for rotating the mandrels 18 upon translatory movement of them on the carrier member 24.

Adjacent the apex of the mandrels 18 a gripper mechanism is formed. This gripper mechanism, in gripping position, preferably lies within the peripheral configuration of the conical mandrel so that a substantially true shaped conical cup may be formed thereon. When located adjacent the apex of the cone, the gripper mechanism will have a relatively less surface speed of rotation than portions of the cone located further from the apex. This permits a more accurate gripping and tends to assist in holding the blank in proper position to be formed. The gripper element may be formed in a plane of the axis of the cone, such as is indicated at 35, so that a portion of the blank 14 may be inserted and gripped adjacent the apex. The gripper mechanism also includes the spring-pressed operating arm 36 extending within the hollow mandrel 18 from a mounting on the element 35 to a sliding bearing on a shoulder 37 formed within the mandrel. A link 38, pivoted as at 39, may be formed with a lug 41 extending adjacent one end of the tubular shaft 22. A spring 40 is mounted on the arm 36 with proper stop elements to hold the arm 36 and element 35 in a normally extended, open, blank-receiving position.

Within the shaft 22 is a spring-pressed shaft 42 or stem member normally held in retracted position within shaft 22 by the spring member 43, and having the button portion 44 extending outwardly beyond shaft 22 for predetermined contact with a cam member 45 (Figs. 4 and 6) formed to follow the configuration of the translatory path of the carrier member 24 adjacent and to the rear of the path traced by the button member 44. The cam 45 is mounted to trace the path of the button member 44 and to actuate the same to hold the gripper element open from a position of the button member at the cup discharge station E to a position adjacent the cup blank receiving station A opposite the feeding table 15-16.

Gripper actuating mechanism is mounted adjacent the termination of cam 45 to cooperate with the cam in holding the gripper mechanism in open position opposite the blank receiving station A. This mechanism is so arranged that substantially simultaneously with the movement of the carrier member to translate a mandrel 18 from the station A the button member 44 will be released, causing the gripper mechanism to be actuated through the spring means 40, 43, to seize a blank inserted therein.

This actuating mechanism is best seen in Figs. 4 and 6 and includes a rocker arm member 46 having a button bearing extension 47 that in-

terfits with the end of the cam 45 to receive the button member 44 opposite station A and to hold the gripper 35 in open position while a blank is fed therein. The rocker arm 46 has an arm 48 pivoted to a cam actuated arm 49. The arm 49 is yoked to fit with a guide stud 50 and carries an operating roller 51 riding in a cam slot 52 of a cam wheel 53. The cam wheel 53 is timed and intergeared with the feeding mechanism and the carrier member to withdraw the bearing surface 47 from its operative position with the button member 44 after a blank 14 has been fed to the gripper element 35 and just before the carrier member 24 has moved the mandrel from the feeding station A.

As the carrier member translates a mandrel from station A, the guide table 16 drops permitting the gripped blank to begin to be formed on the mandrel by the rotation imparted through the rack 32 and gear 33 assembly. When leaving station A the blank 14 is passed adjacent and between forming means positioned both exteriorly and interiorly of the carrier member. The exterior forming mechanism comprises the wiping and pressing means 55 while the interior forming mechanism comprises the roller members 56 (Figs. 2 and 4).

The exterior pressing means 55 is preferably stationarily mounted on the frame 115 of the carrier member and includes a rigid metal backing member or supporting strap 60 curved or formed to fit the translatory path of the carrier member and having the apertures 61 therein. Stud 62 are mounted in said apertures to move therein for loosely suspending a smoothing resilient member 63 of leather or similar material in spaced relation to said strap 60 to wipe a cup blank with a yielding contact as it is being formed.

A tensioning device is provided for returning the smoothing member to its normal position after a mandrel has forced a cup blank against the member to obtain the wiping action. As shown, this tensioning device comprises a member 65 pivoted centrally in the strap member 60 and having one arm under tension to the strap through the spring member 66. The other arm has a stud 67 extending through an arcuate slot 68 in the strap and is secured to one end of the smoothing member 63. As the other end of the smoothing member is secured to the strap as at 69 the tensioning device tends to force the smoothing member into operative receiving position for the mandrels. Preferably, a resilient annular inset 18a of rubber is mounted on the mandrel 18 to hold the blank 14 from slipping under the wiping action of the smoothing member.

The sprocket wheel 27 (Fig. 2) is operatively keyed to a driven shaft 70 operatively connected to an intermittent drive mechanism, not shown herein, while the sprocket wheel 28 is rotatably mounted on an idler shaft 71 through the hub 74 and the bearings 73 (Fig. 4). Rigidly affixed to the sprocket wheel 28 is a former head 72 carrying the forming rollers 56. Angularly bent stem members 75 are formed to position the conical forming rollers 56 in frictional proximity to the mandrels 18 and the blanks being formed thereon. As the carrier member is translated by the driven sprocket wheel 28, sprocket wheel 27 is rotated bringing a forming roller 56 into frictional engagement with a mandrel immediately after the mandrel leaves station A and has come within the circular orbit of the forming

rollers around the forming head 72. Preferably the carrier member follows this orbit until the blanks 14 have been formed into a conical shape and are ready for further finishing operations or for discharge from the machine according to the desires of the manufacturer.

For rolling a rounded bottom on the cup during the formation of the same on the mandrel 18, the former rollers 56 may have a projecting stem member 76 that extends slightly beyond the end of the mandrel 18 and has the bottom rolling and rounding wheel member 77. This wheel may be knurled or deeply grooved to form a plurality of small fingers, as shown in Fig. 4. As the blank is being formed on the mandrel 18 between the exterior forming means 55 and the interior forming means or rollers 56, the wheel member 77 turns inwardly or rolls over the portion of the blank projecting beyond the rounded tip of the mandrel 18 and rounds and seals the bottom of the cup thereagainst thus insuring against funneling or leakage and furnishing a pleasing appearance. The wheel continuously presses the edge of the blank inwardly as the cup is being formed, thus overlapping portions of the edge to a plurality of plies of material. This rounded bottom is also of value in preventing injury to a user's hands from pricks and scratches often received in the use of the customary sharp pointed conical cups.

After leaving this orbit, the carrier member may be arranged to pass through various finishing operations by extending the same laterally through the addition of further sprocket wheels. In the simplified embodiment, as shown, the mandrels are carried next to a rim forming station designated as D (Fig. 2). The wiping band 63 terminates at a point where the idler rollers 56 are carried from the mandrels. A guide rod 80 mounted on an extension of strap 60 holds the conically formed blank in a proper relation from that point until an intermittent stop is made at station D.

The rim rolling mechanism will be described with reference to Figs. 1, 3, 5 and 7. In Fig. 3 it will be noticed that mandrel 18 is formed with a cylindrical bearing surface 82 at its base portion. Slidably mounted for movement longitudinally of this bearing surface is an annular die member 83 including the die recess 84 and the actuating collar 85. A die positioning member 86 (Fig. 5) is mounted to the strap member 60 in the translatory path of the mandrels to coact with the collar 85 of the die member to slide the same rearwardly along its cylindrical bearing surface to an operative position as the mandrel approaches station D.

At station D, adjacent one side of the device, two bearing rods 87 are mounted upon which a rim rolling die actuating member 88 is slidably mounted (Figs. 2 and 5).

Two die actuating fingers 89 and 90 (Fig. 2) are pivoted to the sliding member 88 at 91 and 92, respectively to be in the path of the oncoming mandrel and to engage the die member 83 in the annular groove 94 formed by the collar 85 and the rim 93. As the mandrel strikes the finger 89 it yields around its pivot point and is returned to operative position in the groove 94 by the spring member 96 attached thereto as the mandrel comes to rest at station D. After a rim has been formed on a cup, the translatory movement of the mandrel 18 will force the finger 90 out of the way around its pivot point 92 after which it will be returned to operative position by

its spring member 97 assisted by the counterweight extension 98 if desired.

Likewise, slidably mounted on the bearing rods 87 (Fig. 5) for reciprocating movement therealong is the die carriage 100 shown in detail in Fig. 7. The die carriage includes a female die member 101 shaped to receive the mandrel 18 and the cup carried thereby. The female die member 101 has a frusto conical portion 150 and a cylindrical portion or bore 151 which slidably receives a conical rounded bottom setting portion 153 to complete the conical female die. Extending rearwardly from the bottom setting member 153, and adjustably mounted with respect thereto, is an actuating pin 102. The die 101 has a cylindrical die portion 103 that is adapted to overlie the cylindrical portion of the mandrel, when the die is reciprocated into position, to force the rim of the rolled cup into a cylindrical shape between these cylindrical surfaces.

As this cylindrical rim is formed on the cup, the actuating pin 102 is operated to press the bottom setting member against the cup to iron or press the rolled crimped portions that may have been formed therein. While the die member 101 is still in place, but after the cylindrical rim has been formed thereon, the die actuating member 88 is operatively moved along the bearing rods 87 to force the fingers 89 and 90 (Fig. 2) against the collar 85 of the rim rolling die member 83 which brings the die recess 84 into a curling or rolling contact with the cylindrical rim of the cup and forms a tightly rolled bead from the cylindrical position as die 83 is forced into contact with die 101. The die 101 is then withdrawn from the mandrel 18 and the carrier mechanism translates the mandrel to the cup discharge station E.

Mechanism for reciprocating the die carriage and the bead rolling collar is shown in Figs. 1, 2, 5 and 7.

Housing 120 contains a continuously rotating drive shaft and the intermittent driven mechanism for the carrier assembly 24. Extending from the housing 120 (Fig. 1) is the continuously rotating driven shaft 121 operatively connected to said drive shaft. Guided over the driven shaft 121 by the yoked portion 122 is a die operating shaft 123. Affixed to the shaft 123 is a roller member 124 operating in a groove in a cam member 125 keyed to the driven shaft 121. This mechanism acts to force the fingers 88 and 90 (Fig. 2) against the collar 85 of the die member 83 to roll a bead on the previously formed cylindrical rim of the cup while held at station D. A spring member 126 positively returns the yoked arm to an operative position after movement by the cam.

To actuate the die carriage 100, a disc 130 is keyed to the driven shaft 121 (Figs. 1 and 5). A crank arm 131 is mounted eccentrically on this disc and is pivoted to the die carriage at 132 to reciprocate the carriage over the bearing rods 87. An auxiliary crank arm 133 is mounted to the crank arm 131 and driven by it through a stud member 134 extending through a slotted portion 135 in the crank 131. A roller member 136 also extends through the slot 135 from the arm 133 and cooperates with a cam member 137 on the shaft 121 to give the auxiliary hammer actuating arm a sudden driving action relative to arm 131 during the cranking movement. At its other end the auxiliary crank carries a head member 140 and is pivoted over the point 132.

Mounted on the die carriage 100 is a rocker arm 141 pivoted to the carriage at 142 through slotted portions in the crank arms 131 and 133 to permit the extension of the pivot member 142 from the carriage 100 (Fig. 7). The rocker arm 141 is held in operative position relative to the head member 140 by a spring attachment 143 (Fig. 5) attached to one arm of the rocker member 141 and to a lug 144 on the head member. The action of the cam member 137 causes the auxiliary arm 133 to move relatively to the crank arm 131 to rock the arm 141 into contact with a roller member 147 on a striker member 145 (Fig. 7) pivoted at 146 causing it to strike the hammer member 153 through the pin 102 for coaction with the rounded bottom of the cup on a mandrel 18. The spring member 148 returns the auxiliary arm 133 to its normal position with the crank arm 131 while the apex of the mandrel 18 will force the hammer member 102 and its striker arm 145 into operative position.

Affixed to the die carriage assembly 100 is the cup discharge receiving assembly 105 arranged to reciprocate with the former over a cup bearing mandrel 18 at discharge station E (Fig. 7). The discharge assembly includes a tube 106 having resilient cup gripping elements 107 formed with bead receiving members 108 that slide over the bead 109 previously rolled on the cup. At station E, the blank gripping element 35 of the mandrel is released by the pressure of the cam member 45 upon the button 44 (Fig. 6). At the same time tube 106 is slid inwardly over mandrel 18, the resilient members 107 grip the cup at the beaded portion, and, upon the return of the tube with the die carriage, the cup is stripped from the mandrel.

As cups are successively stripped from the mandrels by the cup discharge member they are received within the tube 106 in stacked nested relation. Resilient holding members in the form of resilient fingers 110 press against the conical side of cups stacked in the tube and hold them in nested molded relationship until the pressure of successive cups forces the yielding fingers 110 to flex, passing one or more cups into a delivery chute 111 mounted below the tube 106. By holding the cups within the tube 106 by the fingers 110, the cups act upon each other to mold and set successive cups into a proper shape and permit the glued portions to dry substantially while the cups are in this molded relationship before they are handled for packing or inspection.

In attaching the tube 106 to the die carriage 100 an annular collar 112 may be mounted around the tube 106 through the brackets 113 which in turn may be bolted to a bossed member 114 on the die carriage.

The frame member 115 of the carrier assembly may be attached to a supporting frame 116 (Fig. 5) and as seen in Fig. 4 is provided with guides 117 that interfit with the links of the chain members 25 and 26 to prevent undue lateral or longitudinal movement of the assembly while in operation.

Various modifications of structure will be apparent to those skilled in the art without departing from the spirit of the invention. All such modifications are intended to be included within the scope of the appended claims.

I claim:

1. In a cup-making machine, a cup-forming mandrel having gripping means associated therewith, feeding means arranged for feeding a blank to said gripping means to be formed into

a cup on said mandrel, said feeding means including a hinged blank supporting guide member for directing said blank to said gripping means, and means for swinging said guide members into and away from blank supporting position.

2. In a cup-making machine, a cup-forming mandrel having gripping means associated therewith, feeding means arranged for feeding a blank to said gripping means to be formed into a cup on said mandrel, said feeding means including upper and lower guide members between which said blank is supportingly directed to said gripping means, the lower guide member being reciprocable into and away from blank supporting position.

3. In a cup-making machine having a plurality of rotatable mandrels mounted for intermittent translatable movement with blank gripping means associated with each of said mandrels, a feeding means arranged to feed successive blanks to said mandrels at a point in the translatable path of said mandrels, said feeding means including a blank supporting guide member over which a blank may be fed to a mandrel gripping means and seized by said gripping means during a pause in the translatable movement, said guide member being mounted for movement into and away from blank supporting position, and means for moving said guide member away from blank supporting position during translatable movement of said mandrels.

4. In a cup-making machine having a cup-forming mandrel mounted for intermittent rotation with blank gripping means associated with said mandrel, feeding means arranged for feeding a blank to said gripping means, said feeding means including a blank supporting guide member normally operable for directing a blank to said gripping means, said guide member being movable away from blank supporting position during rotation of said mandrel.

5. In a cup-making machine having a cup-forming mandrel with blank gripping means associated therewith for seizing and holding a blank to be formed on said mandrel, feeding means arranged to feed a blank to said mandrel, said feeding means including a blank supporting guide member normally in operative position to feed a blank to said gripping means, said guide member being automatically movable from operative position after a blank has been seized by said gripping means.

6. In a conical cup-making machine, a rotatable conical cup-forming mandrel and a blank gripping and releasing means, said means including a gripper member formed within the apex of said mandrel and lying within the peripheral configuration of said conical mandrel while in operative gripping position, said gripper member being movable to a position without the peripheral configuration of said mandrel to release and force a finished cup therefrom, and means operatively connecting said gripper member to said machine for moving said gripper member into operative position and release positions at predetermined times.

7. In a conical cup-making machine, a rotatable cup-forming mandrel and a blank gripping and releasing means, said means including a gripper member mounted in the apex of said mandrel and conforming to the peripheral configuration of the same when in operative gripping position, said gripper member being movable to a position without the peripheral config-

uration of said mandrel to discharge a cup therefrom, and a gripper operating mechanism attached to said gripper member and extending through said mandrel to move said gripper member into operative and discharge positions at predetermined times.

8. In a cup-making machine having a plurality of operations for forming cups, means for translating said cups during their formation from one place to another in said machine for various operations thereon, said means including a pair of endless chain members operatively mounted in a desired path adjacent the necessary operations, and cup-forming mandrels mounted to said chain members.

9. In a cup-forming machine having a translatable path for cup-forming mandrels, including a rotatable wheel member, a flexible endless carrier member operatively mounted for advancing movement around said wheel member, a plurality of spaced cup-forming mandrels mounted on said carrier member, for successive translatable movement around said wheel member and a plurality of spaced forming members mounted on said wheel member for successive contact with successive mandrels as they pass therearound.

10. A cup-forming machine as defined in claim 9 wherein said mandrels are rotatably mounted on said carrier member, said forming members are idler rollers and wherein a rolling contact is established between said mandrels and said forming members.

11. A cup-forming machine as defined in claim 9 wherein said mandrels are conical in shape, said forming members are conically shaped roller members and wherein the contact between a mandrel and its forming member is throughout the length of the cup being formed therebetween.

12. A cup-making machine as defined in claim 9 wherein said forming members have a cup bottom forming projection mounted thereon.

13. In a cup-making machine having a rotatable conical cup-forming mandrel and a forming roller associated therewith, the combination of a cup bottom rounding projection mounted on said forming roller.

14. In a cup-making machine having a conical cup-forming mandrel and a conical forming roller associated therewith for rolling a cup blank around said mandrel, the combination of means for rolling a rounded bottom on said cup, said means including a projecting member mounted at the apex of said forming roller for contact with said blank adjacent the apex of said mandrel to roll over and seal portions of said blank extending therebeyond.

15. In a cup-making machine, a rotatable conical cup-forming mandrel having a rounded apex portion and a conical forming roller associated therewith for forming a cup blank around said mandrel, the combination of means for rolling a rounded bottom on said cup, said means including a projecting member mounted at the apex of said forming roller and extending adjacent the rounded apex of said mandrel to roll portions of said blank extending therebeyond against said rounded apex portion.

16. A cup-making machine as defined in claim 15 wherein said projecting member includes a wheel member mounted for rotation with said forming roller.

17. In a cup-making machine including a mandrel, means for smoothing and pressing a blank being formed on said mandrel, said means including a frame member and a resilient mem-

ber loosely suspended therefrom in spaced relation for yielding contact with said mandrel, means for loosely suspending said resilient member from said frame member and tension means for holding said resilient member under tension in relation to said frame member.

18. In a cup-making machine having a translatable path for mandrels usable to form blanks into cups, a pressing and smoothing mechanism, including a stationary frame member having stud securing openings therein, a resilient smoothing member spaced from said frame member for smoothing yielding contact with said mandrels, and stud members loosely mounted in said openings and secured to said smoothing member for spacing said smoothing member from said frame member.

19. In a cup-making machine having means for forming blanks into a cup-like shape and for discharging the same, a stacking tube for receiving discharged cups, said tube having forward resilient receiving fingers at one end of said tube for receiving and holding discharged cups in said tube, and holding fingers at the opposite end of said tube for holding the cups in stacked nested relation for molding and shaping each other, said holding fingers being resilient to permit cups to pass from said tube under pressure of additional cups advancing into said tube.

20. In a cup-making machine having a plurality of cup-forming mandrels arranged for intermittent translatable movement from one station to another, a stacking tube mounted adjacent a discharge station, said stacking tube being reciprocable over and away from said mandrels, resilient fingers on said tube for passing over the rim of a cup formed on said mandrel to strip a cup from a mandrel on reciprocation away therefrom, and resilient releasable means for holding stripped cups in said stacking tube to mold and shape each other.

21. In a conical cup-making machine, a carrier member having a plurality of successive rotatable mandrels mounted thereon for translatable movement along an endless path, a rotatable former head adjacent the path of said mandrels having a plurality of successive rotatable forming rollers mounted thereon for movement in an orbit around said head, the path of said mandrels being arranged to pass along the orbit of said rollers to form a successive rolling contact therebetween.

22. In a cup-making machine, a cup-forming mandrel having gripping means associated therewith, feeding means arranged for feeding a blank to said gripping means to be formed into a cup on said mandrel, said feeding means including upper and lower guide members between which said blank is supportingly directed to said gripping means, the lower guide member being hinged to swing up into and downwardly out of the blank supporting position, and means for imparting the swinging movement to said lower guide member.

23. In a conical cup-making machine, a rotatable conical cup-forming mandrel having blank gripping means associated therewith, said gripping means being located adjacent the apex of said mandrel, pressure means for cooperation with said mandrel for winding a blank into a cup thereon, and an annular friction element associated with said mandrel near the base thereof to prevent slippage of said blank with respect to said mandrel during the forming operation.

24. In a conical cup-making machine, a rotatable conical cup-forming mandrel and a blank gripping and releasing means, said means including a gripper jaw which comprises a segment formed in the apex of said mandrel and lying within the peripheral configuration of said conical mandrel while in operative gripping position, said gripper jaw being movable to a position without the peripheral configuration of said mandrel to release and strip the finished cup off said mandrel, and means operatively connecting said gripper jaw to said machine for moving said jaw into gripping and stripping positions at predetermined intervals in the operating cycle of the machine.

25. In a cup-making machine having a plurality of rotatable mandrels arranged for endless translatable movement therethrough from a blank-receiving station, through a cup-forming operation to a discharge station and return, a pressing mechanism, said pressing mechanism including a frame member adjacent and following the path of translatable movement of said mandrels, and a resilient member loosely suspended from said frame member for yielding contact with the blank-carrying mandrels at substantially the blank-receiving station and continuing said yielding contact through the cup-forming operation.

26. In a cup-making machine having a plurality of rotatable mandrels arranged for endless translatable movement therethrough from a blank-receiving station, through a cup-forming operation to a discharge station and return, a pressing mechanism, said pressing mechanism including a frame member adjacent and following the path of translatable movement of said mandrels, a resilient member loosely suspended from said frame member for yielding contact with the blank-carrying mandrels at substantially the blank-receiving station and continuing said yielding contact through the cup-forming operation, and means for tensioning said resilient member on said frame member.

27. In a cup-making machine having a plurality of conical cup-forming mandrels arranged for translatable intermittent movement of cup blanks from one station to another in said machine for various finishing operations thereon, a cylindrical portion on said mandrels, a reciprocable rim forming die means slidably mounted over said cylindrical portion, positioning means in the translatable path of said mandrels to positively retract said die member, die-operating means in the translatable path of said mandrels for yieldingly receiving said die member, and means for actuating said die-operating means.

28. A cup-making machine as defined in claim 27, wherein said die-operating means include spaced members mounted to receive the die means therebetween, said members being pivot-

ally mounted to permit the members to yield as the mandrels pass thereby in a translatable movement, and means to return said members to an operative die-actuating position.

29. In a cup-making machine, a translatable rotatable conical mandrel, a blank gripping means adjacent the apex of said mandrel, a pressing member in the translatable path of the mandrel to wind said blank into a cup while the mandrel rotates said blank thereagainst, and a friction element on said mandrel adjacent the base thereof to prevent slippage of said blank with respect to said mandrel and said gripping means while said blank is being formed into a cup.

30. In a cup-making machine having a plurality of operations for forming cups from blanks, means for translating said blanks during their formation into finished cups from one place to another in said machine for various operations thereon, said means including a plurality of spaced sprocket wheels mounted in predetermined positions in said machine, an endless chain member operatively mounted in a desired path around said wheels adjacent the necessary operations, a plurality of spaced cup-forming mandrels mounted on said chain member for successive translatable movement along said path and a lesser number of spaced forming members mounted on one of said wheels for successive contact with successive mandrels as they pass thereby.

31. In a cup-making machine, means for performing various desired operations on cups to be formed therein, said means including a carrier member having spaced chain members operatively connected to be driven at identical speeds and arranged in a desired endless path, means for advancing said carrier member, and a plurality of spaced cup forming mandrels mounted on said carrier member for advancement therewith, said mandrels being mounted for support from both chain members.

32. In a cup-making machine having a rotatable conical cup forming mandrel for receiving and winding a blank therearound and a forming roller associated therewith, the combination of a projecting member extending beyond said forming member to press the edge of the blank inwardly against the apex of said mandrel into a plurality of overlapped plies of material.

33. In a conical cup-making machine having means for winding a blank into cup form on a conical mandrel, the combination of a die mechanism for assisting in the formation of a bead on the rim of said cup while setting the bottom thereof including a reciprocating die carriage having a frusto-conical portion and a co-operating conical bottom setting portion slidably mounted with respect thereto.

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