Dec. 16, 1958 O. L. DELLINGER ET AL 2,864,612

PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 1

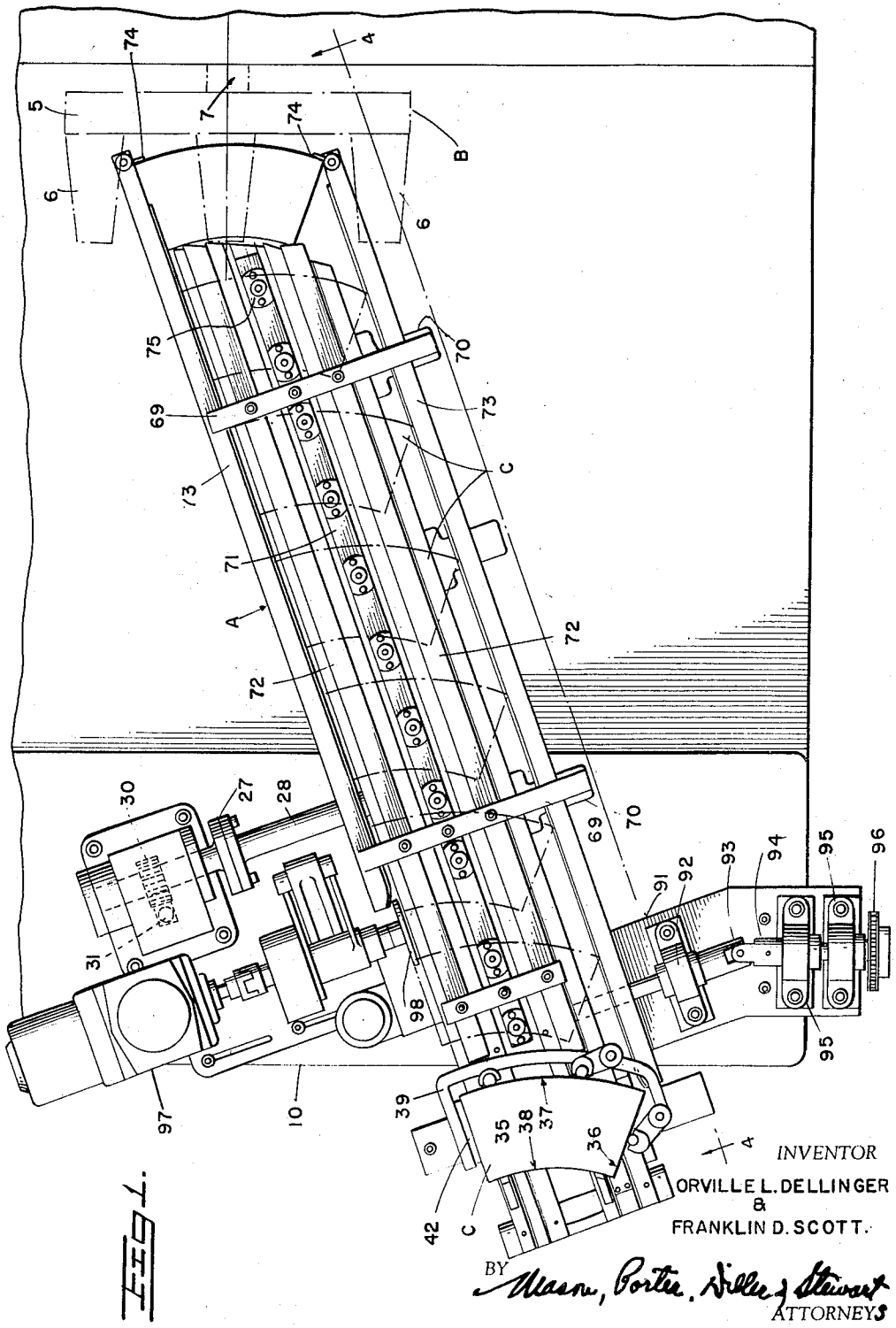


FIG. 7.

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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 2

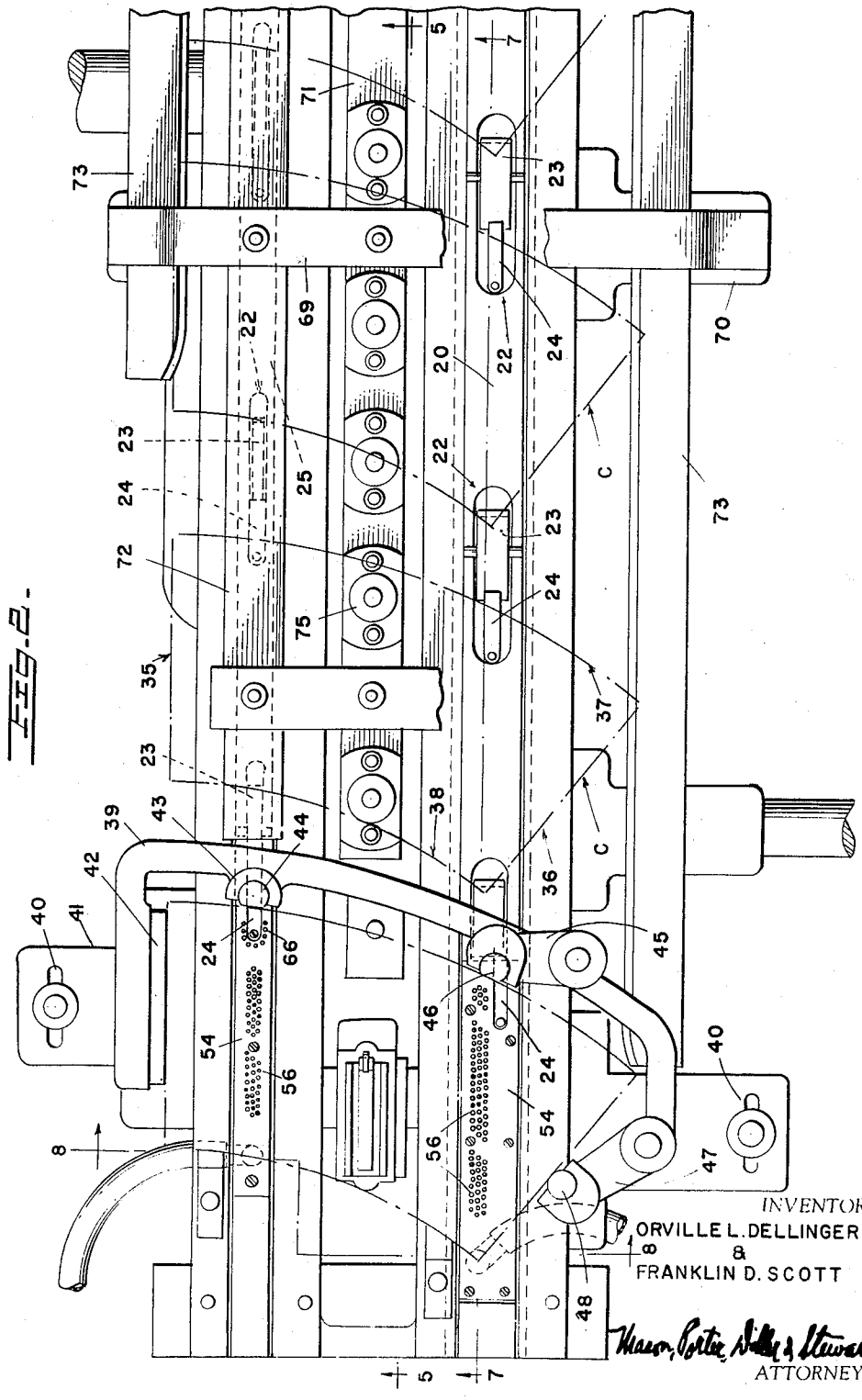


FIG. 2.

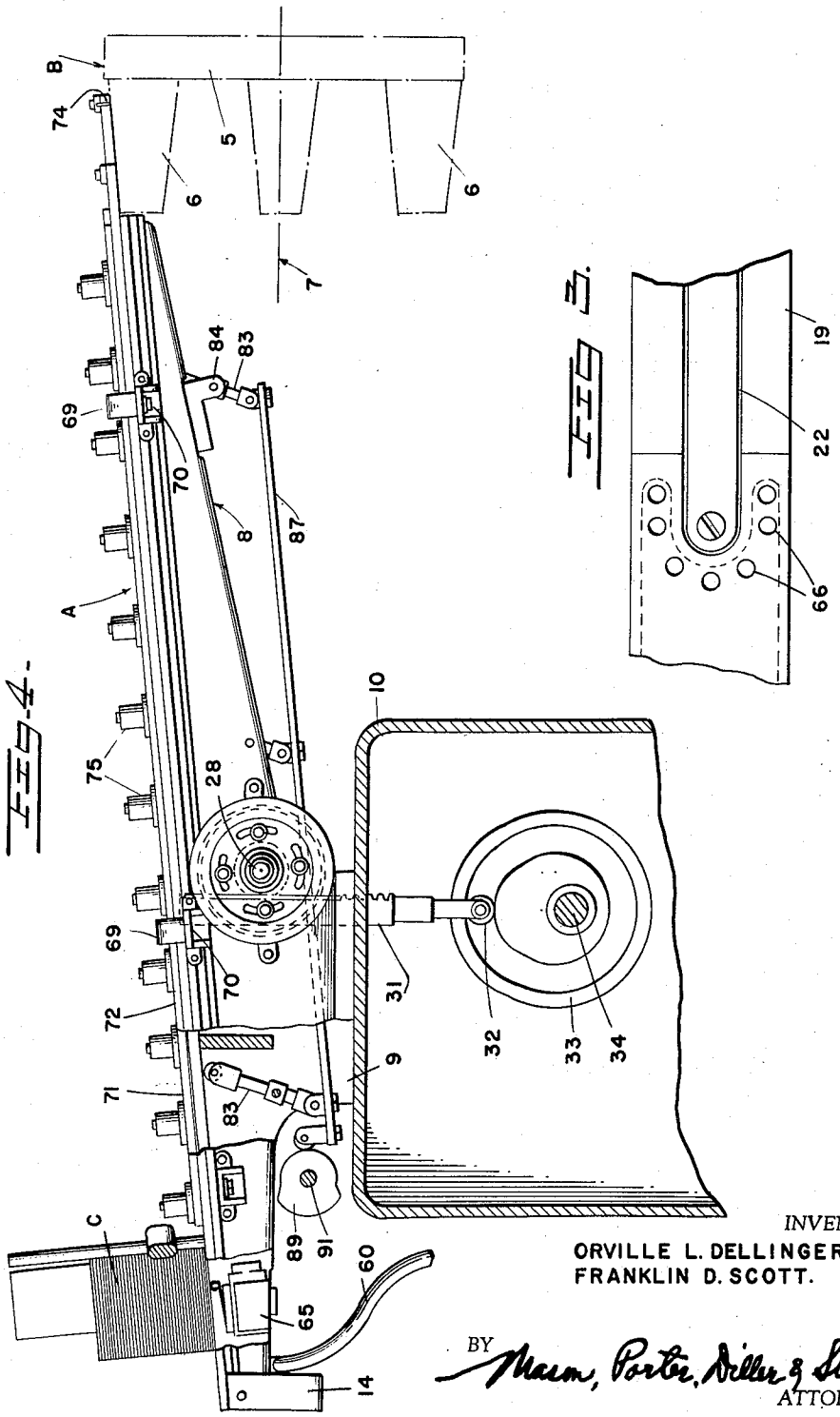
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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 3



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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 4

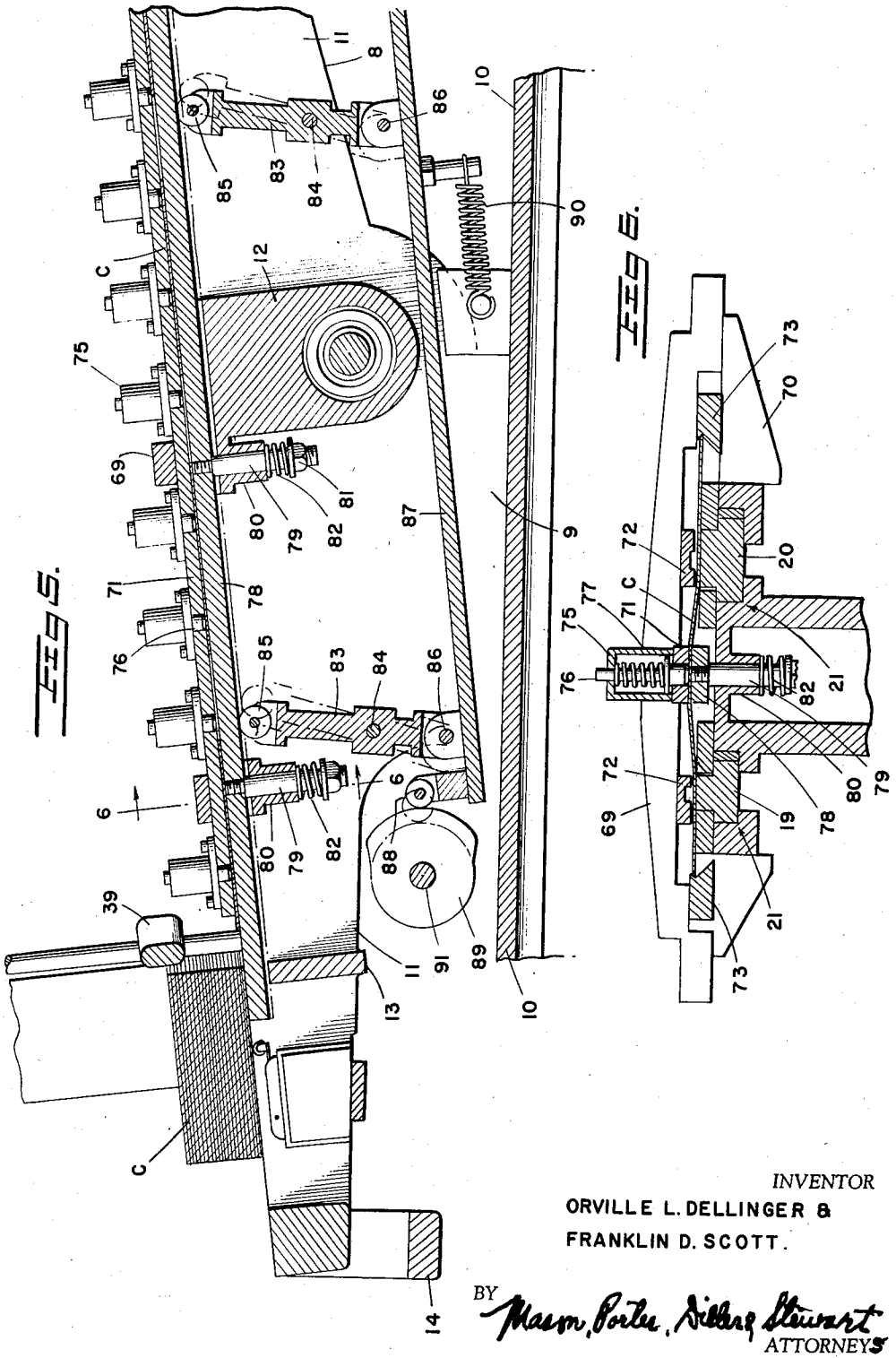


Fig 5.

Fig 6.

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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 5

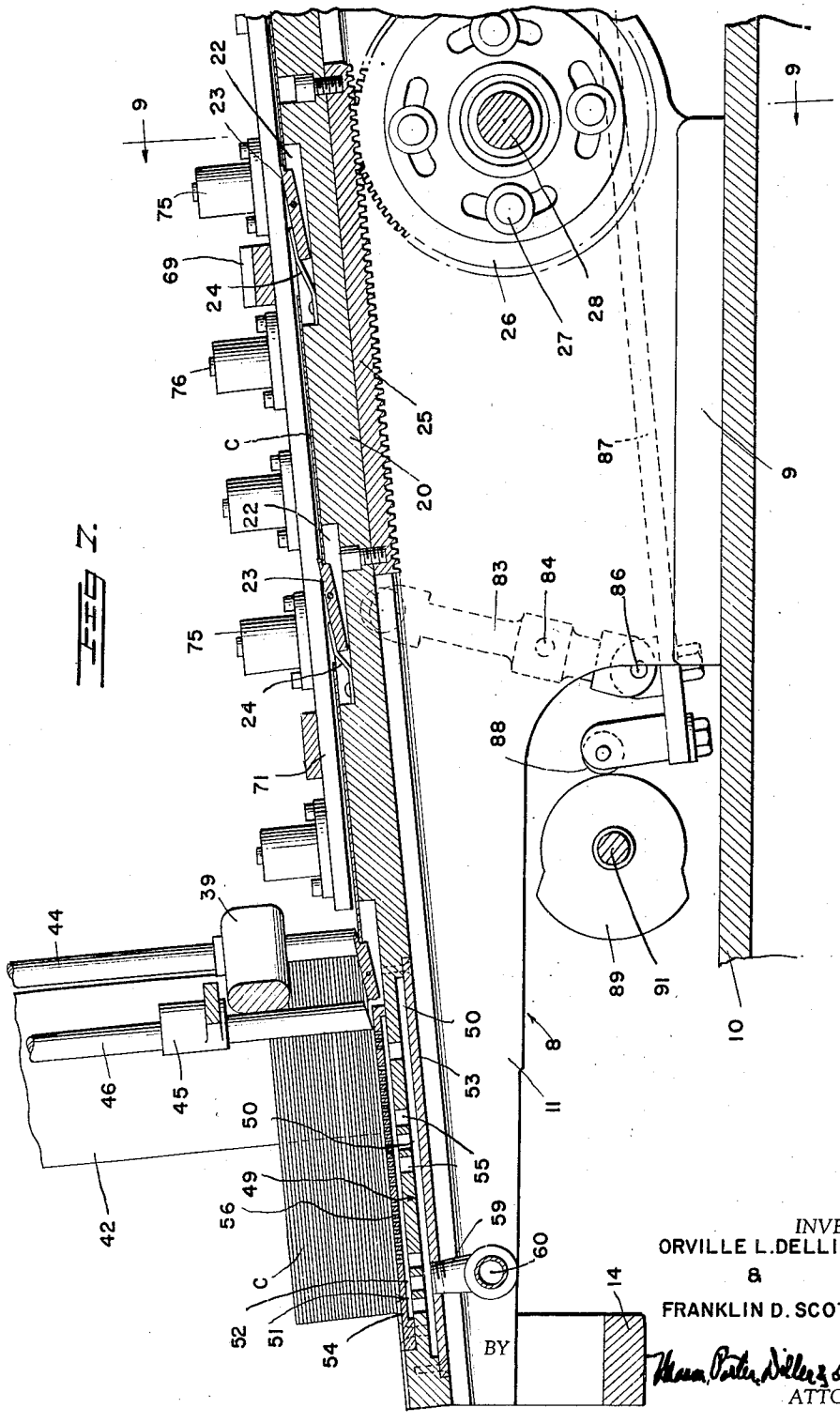


FIG. 7.

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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 6

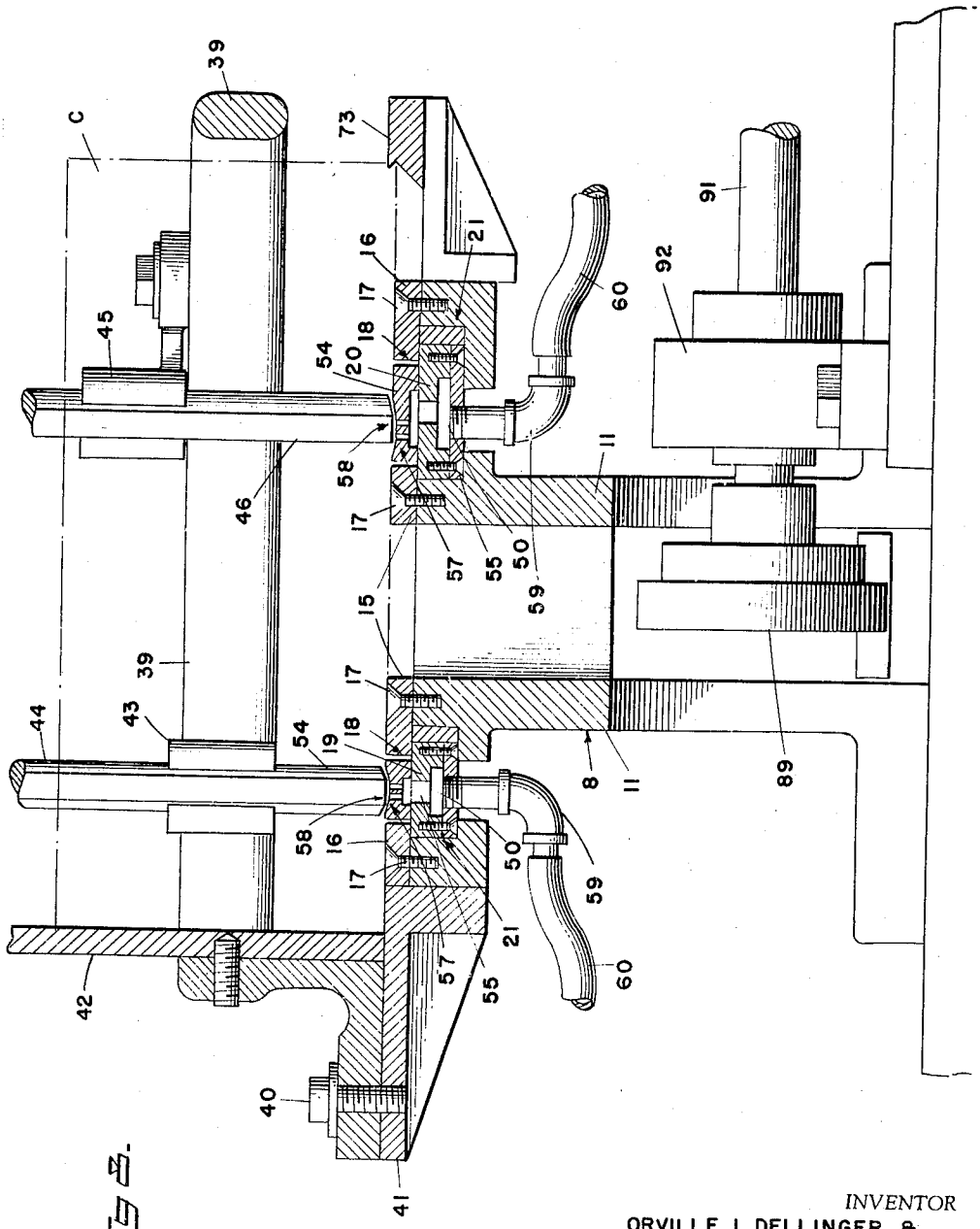


FIG. 2.

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PAPER CUP MACHINE BLANK FEEDING MECHANISM

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Fig 9.

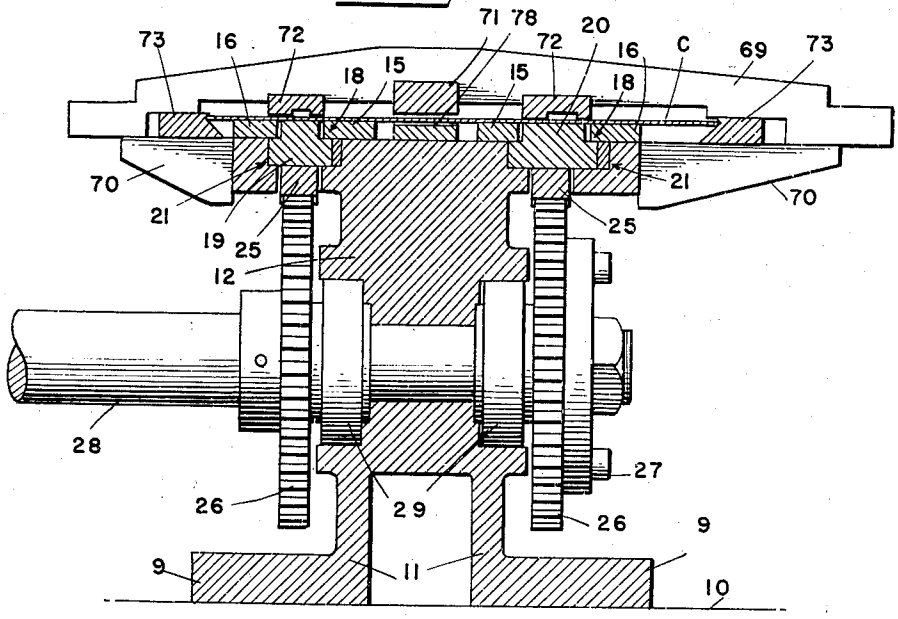
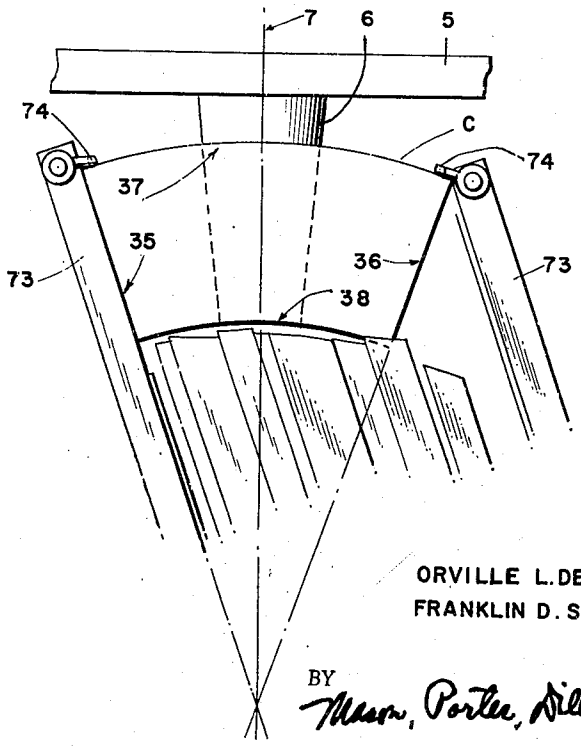


Fig 10.



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PAPER CUP MACHINE BLANK FEEDING MECHANISM

Filed May 22, 1953 8 Sheets-Sheet 8

Fig. 11.

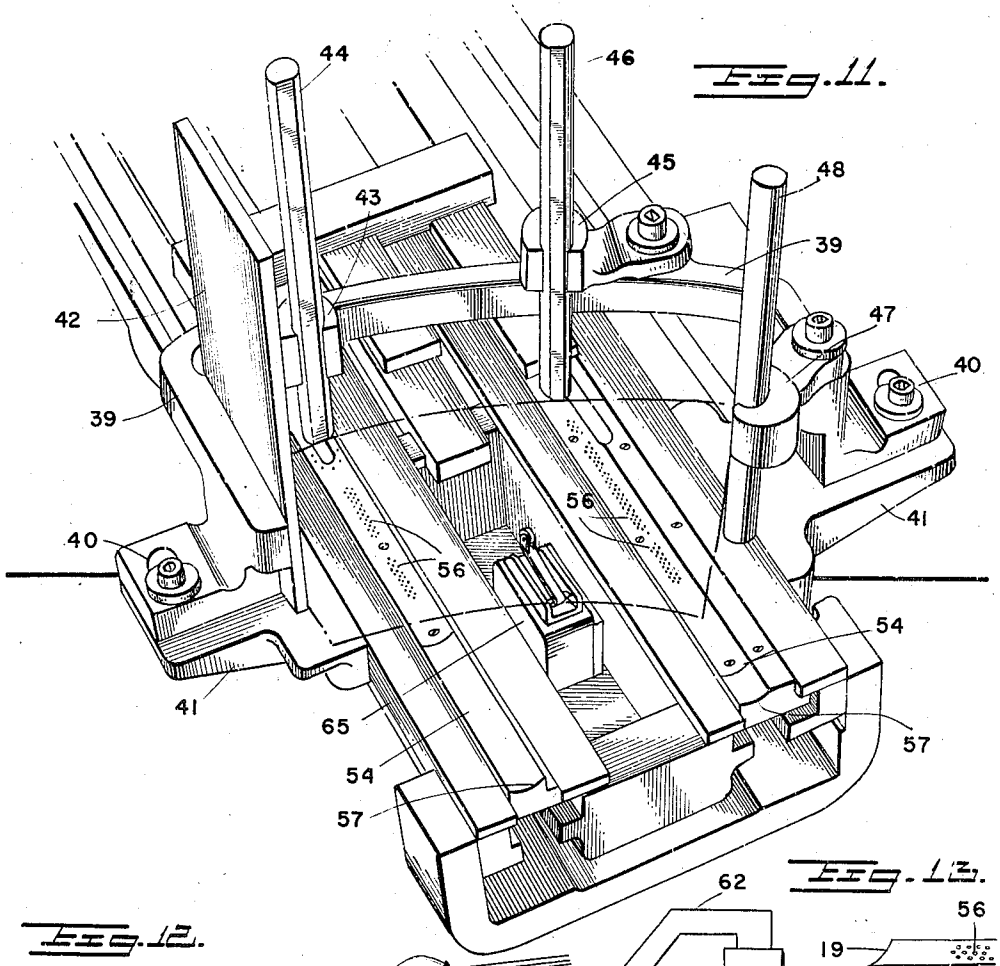


Fig. 12.

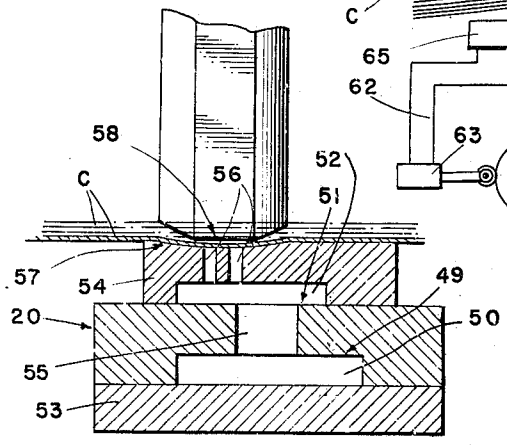
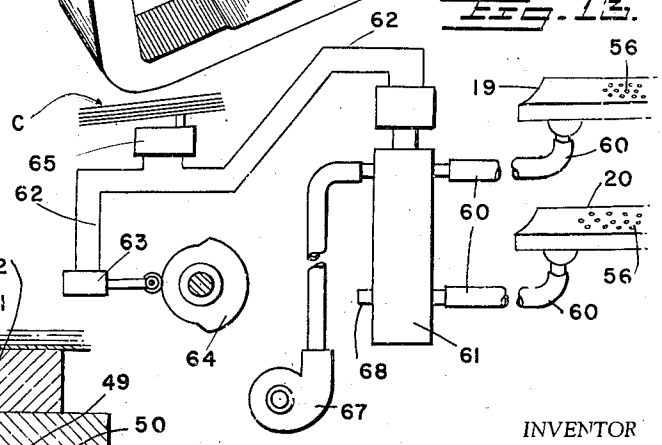


Fig. 13.



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United States Patent Office 2,864,612 Patented Dec. 16, 1958

2,864,612

PAPER CUP MACHINE BLANK FEEDING MECHANISM

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Application May 22, 1953, Serial No. 356,792

9 Claims. (Cl. 271—32)

The invention relates generally to the making of paper drinking cups and primarily seeks to provide novel means for feeding the paper blanks to the mandrels of the turret of a paper cup making machine whereon the cup bodies of frusto-conical shape are formed.

Paper cups are extensively manufactured today, and the present invention has reference to machine structures wherein paper cups of the frusto-conical body type are formed, such cups having a bottom insert or closure therein, and an edge smoothing and strengthening curl at the upper ends thereof. The bodies of these cups are formed by wrapping flat paper blanks about frusto-coniform shaping mandrels, said blanks having converging side edges, a convexly curved top edge and a concavely curved bottom edge so as to provide the desired frusto-coniform sleeve shape when the side edges are brought together and bonded in overlapping, side seam forming relation. In the machine structure of which the herein disclosed blank feeding mechanism forms a part, the body shaping mandrels are mounted in equidistantly spaced parallel axis relation on a turret which is indexed about a horizontal axis. In order to properly present the blanks one by one to the mandrels as the turret is moved about step-by-step, means must be provided for feeding the blanks very accurately in processional order, and for applying an adhesive along one side edge of each blank as it is moving toward the mandrel which is to receive it so that the side seam formed incidental to the shaping of the blank about the mandrel will be suitably bonded. It is a purpose of the present invention to provide such a feeding means.

In its more detailed nature the invention seeks to provide a blank feeding means of the character stated wherein is provided a body blank feedway disposed to deliver directly onto the top peripheral surface of a frusto-conical blank receiving mandrel, means for feeding blanks in processional order along the feedway with one side edge of all of said blanks longitudinally aligned, body blank stack supporting means for holding blanks in the feeding position, means for withdrawing the blanks one-by-one from the bottom of the stack to be fed along by the feeding means, and means for applying an adhesive along the longitudinally aligned side edges of the blanks as they are being fed along.

An object of the invention is to provide a blank feeding means of the character stated wherein the line of feed is disposed in such angular relation to the axis of the mandrel to which each of the successively presented body blanks is fed as to place the longitudinal center line of each blank directly over and along the axis of the mandrel with the side edges spaced approximately like distances at either side of said axis and converging toward intersection at a point directly over or along said axis.

Another object of the invention is to provide an apparatus of the character stated wherein the blank feeding means includes reciprocable feed bars extending under

the blank stack and having provision for directly attracting and holding individual blanks thereagainst by suction action, means being provided for applying the suction while the bars are beneath the stack and are about to move forwardly so that a blank will be advanced thereby, and for relieving the suction at the completion of each such step advancement of a blank to permit the bars to be returned to position under the stack for attracting and feeding another blank.

Another object of the invention is to provide an apparatus of the character stated wherein the feed bars include equidistantly spaced feeder fingers supplementing the means for attracting and holding the blanks by suction and which take over the feeding of the blanks from said suction feeding means, means also being included for holding the blanks against retrograde movement during each retraction of the feed bars.

Another object of the invention is to provide an apparatus of the character stated wherein the means for holding the blanks against retrograde movement includes upper and lower, opposed blank retainer bars, and means for moving at least one bar toward an opposing bar upon completion of each forward movement of the feed bars to clamp the blanks during retraction of the feed bars.

Another object of the invention is to provide an apparatus of the character stated wherein the means for holding the blanks against retrograde movement includes a lower bar opposed by an upper bar, means constantly tending to depress the lower bar out of contact with the blanks, and cam actuated means for moving the lower bar against the blanks to clamp them against the upper bar during retraction of the feed bars.

Another object of the invention is to provide an apparatus of the character stated wherein the clamp bar opposing upper bar is equipped with a plurality of spring plungers extending a limited distance below said bar.

Another object of the invention is to provide suction feed means of the character stated wherein each feeder bar includes a manifold extending longitudinally therein, and suction orifices opening through the top, blank stack opposing face of the bar.

Another object of the invention is to provide suction feed means of the character stated wherein each suction orifice equipped bar portion is arcuate in cross section transversely of the feed line so that blank portions attracted to the bar will assume a longitudinal rib formation extending in the direction of feed.

Another object of the invention is to provide suction feed means of the character stated wherein each suction orifice equipped bar not only includes the longitudinal manifold with which the orifices communicate, but also an underlying longitudinal manifold communicating with the overlying manifold through apertures.

Another object of the invention is to provide suction means of the character stated wherein are included a suction source communicating with the manifold means through an electrically controlled valve, a cam operated timing switch in a control circuit connected with the valve, and a switch connected in series with said timing switch and normally held in circuit closing condition by weight of the cup blank stack thereon so that when the stack is exhausted there can be no suction application to the feeder bars.

Another object of the invention is to provide an apparatus of the character stated wherein the blank stack supporting means includes upright rods for accurately confining the stack, one such rod being disposed over each concave feed bar portion with its lower end extremity so close to the bottom of the respective bar concavity as to obstruct forward movement of blanks lying straight

across the feed bars, the lowermost blank of the stack being freed to pass forwardly under the rods only when it is attracted by suction action against the bar concavities.

Another object of the invention is to provide an apparatus of the character stated wherein the feed bars have racks thereon engaged by gears, and cam and rack means serve to rotate the gears back and forth to impart reciprocation to the feed bars.

Another object of the invention is to provide an apparatus of the character stated wherein the clamp bar lifting means includes a longitudinally reciprocable bar, cam means for reciprocating the bar, and a plurality of upright rocker arms pivotally supported intermediately of the ends thereof and connected at their lower ends with the reciprocating bar and having rollers at their upper ends engaging under the clamp bar.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a plan view illustrating the improved blank feeding means.

Figure 2 is an enlarged fragmentary plan view at the blank stack supporting end of the mechanism.

Figure 3 is an enlarged fragmentary plan view illustrating the recess end parallelling suction orifice arrangement in one of the feed bars.

Figure 4 is a side elevation and part vertical longitudinal sectional view, the elevation being taken approximately along the line 4—4 of Figure 1.

Figure 5 is a vertical fragmentary longitudinal section taken approximately along the line 5—5 of Figure 2.

Figure 6 is a fragmentary vertical cross section taken on the line 6—6 of Figure 5.

Figure 7 is an enlarged fragmentary vertical longitudinal section taken on the line 7—7 of Figure 2.

Figure 8 is an enlarged vertical cross section taken approximately on the line 8—8 on Figure 2.

Figure 9 is a vertical cross section taken on the line 9—9 on Figure 7.

Figure 10 is a fragmentary plan view illustrating the position in which each blank is presented to the mandrel about which it is to be shaped.

Figure 11 is a fragmentary perspective view illustrating the body blank stack supporting means.

Figure 12 is an enlarged detail vertical cross section illustrating the relation of the free lower end portions of the upright stack supporting rods with the underlying concaved feeder bar surfaces.

Figure 13 is a diagrammatic view illustrating the control for the suction source communication and the means for assuring that the suction source communication will be terminated when a stack of body blanks to be fed is exhausted.

In the example of embodiment of the invention herein disclosed, the novel blank feeding mechanism is generally designated A, and B generally designates the indexed turret structure to the successively presented mandrels of which the body blanks C are fed in processional order in the manner indicated in Figures 1, 2 and 10 of the drawings.

The turret structure A is somewhat diagrammatically illustrated merely to show the general shape of the mandrels, the structural details of the turret and the manner of indexing the same and wrapping the body blanks about the mandrels disclosed and covered in U. S. Letters Patent 2,819,659 issued to Harry A. Scott and Lewis F. Fallows on January 14, 1958. The turret structure includes the rotor 5 which is indexed to serially present the frustoconical mandrels 6 about which the blanks are shaped, said rotor being indexed about a horizontal axis indicated at 7.

The improved blank feeding mechanism includes a frame casting generally designated 8 and which is mounted as at 9 upon a portion 10 of the main machine framing. The casting 8 has two laterally spaced parallel and upright side portions 11 joined and strengthened by an intermediate cross web 12 and end web means 13, a connecting and strengthening yoke 14 also being provided at the blank stack supporting end of the casting.

Two parallel inner bed pieces 15 are provided, and two parallel outer bed pieces 16 are provided, these being secured as at 17 upon the frame structure side portions 11 in the manner illustrated in Figures 1, 8 and 9. The bed pieces cooperate in pairs 15—16, and each pair forms along the respective side of the blank feedway a slideway 18 in which to receive a reciprocable feed bar. The feed bars are respectively designated 19 and 20, and it will be apparent by reference to the drawings that the feed bar 20 is wider than the cooperating feed bar 19. The feed bars are slidable in grooveways 21 provided therefor in the frame structure side portions 11, and along the main body portions of upward projections of said feed bars are provided longitudinal recesses 22 in each of which is rigidly supported a feeder finger 23 and a leaf spring 24 which engages the trailing end of the feeder finger and serves to constantly tend to lift the advance end of the finger in the manner well known in the art and as illustrated in Figure 7. It will be apparent by reference to Figures 2 and 7 that the feeder fingers are placed to properly engage behind the cup body blanks in the manner clearly illustrated so as to feed said blanks over the supporting feedway in processional order.

A rack 25 is secured to the bottom face of each said bar 19 and 20 and each said rack extends downwardly through and is operable in a grooveway formed in the respective side portion 11 of the frame structure. Each rack 25 is engaged by a spur gear 26 adjustably mounted as at 27 on a cross shaft 28 which is rotatable in bearings 29 provided therefor in the cross web 12. The shaft means 28 is equipped with a pinion 30 to which rotation is imparted by a vertically reciprocable rack 31 extending downwardly into the main machine housing and having a follower roller 32 thereon engaging in an actuator groove in the cam 33 secured on the cam shaft 34 which is to be understood to be driven in timed relation with the operating parts of the main machine structure, so as to impart the desired reciprocation to the feed bars. See Figures 1 and 4.

Each blank C includes converging straight side edges 35 and 36, a convexly curved top edge 37 which constitutes the advance edge portion as the blanks are being fed, and a concavely curved bottom or trailing edge portion 38. The blank stack supporting or confining means includes a somewhat U-shaped frame piece 39 which is adjustably secured as at 40 on side extension brackets 41. At the side in which the blank edges 35 are located an upright support wall 42 is secured to the frame piece 39 in the manner clearly illustrated in Figures 2 and 11 of the drawings. It will also be noted that the frame piece 39 includes a fixed support 43 in which is carried an upright support rod 44 disposed to be engaged by the advance edges 37 of the blanks adjacent the side edges 35 thereof. The frame piece 39 also carries a swingably adjustable support 45 in which an upright support rod 46 is mounted, each of the support rods 44 and 46 being disposed over one of the reciprocable feed bars 19 and 20. Another swingably adjustable support 47 is carried by the frame piece 39 and serves as a support for an upright rod 48 which is engaged by and serves to confine the end edges 36 of the stacked body blanks in the manner clearly illustrated in Figure 2.

At the end thereof operable beneath the body blank stack each said bar 19 and 20 is recessed at its bottom face at 49 to provide a lower manifold 50 and at its top face as at 51 to provide a top manifold 52, each lower manifold 50 being closed by a removably mounted recessed plate 53, and each top manifold 52 being covered

by a removably mounted recessed plate 54. Apertures 55 provide communication between the lower and upper manifolds 50 and 52, and suction orifice sets 56 are provided in each removably mounted top or cover plate 54 to provide communication between the upper manifolds 52 and the transversely arcuate, longitudinally extending clearances or depressions 57 provided in the top surface of each of the plates 54. See Figures 8 and 12. Reference to Figure 8 will make it apparent that the top surfaces of the plates 54 cooperate with the members 15, 16 in forming the floor of the blank stack, and hence said plates always are disposed at a level for contacting the bottom surface of the lowermost blank in the stack. It will be apparent by reference to these figures that the lower ends of the rods 44 and 46 engaged by the advance edges 37 of the body blanks terminate at 58 just short of contact in the longitudinal arcuate clearances 57 in the underlying feed bars. This clearance of the rod ends is best illustrated in Figure 12 from which it will be apparent that the lower end of the respective rod thus disposed projects down far enough to intercept and prevent advance movement of any body blank lying straight across the respective feed bar, but any blank which is attracted downwardly into surface contact with the underlying transversely arcuate feed bar surface in the manner illustrated in Figure 12 will clear the lower end extremity of the rod so that said body blank can move forwardly with the feed bar without interference by said rod end.

Each lower manifold closure plate 53 has a nipple 59 attached thereto, and each nipple is connected by a flexible duct 60 with a suction source. In the example diagrammatically illustrated in Figure 13 this suction source connection can be effected through an electrically operable valve 61 which is electrically connected through control conductors 62 with a control switch 63 actuated in properly timed relation by a rotary cam 64 driven in timed relation with the main machine parts from any suitable operating shaft of said machine. A stack weight closed switch 65 is connected in series with the control switch 63. This switch will normally be held closed by the weight of the cup body blank stack, but whenever the supply of body blanks becomes exhausted, the switch will spring to its open condition and break the control circuit through the conductors 62. In this manner, assurance is provided that there will be no vacuum control in the absence of body blanks to be fed by the feeding means. The valve 61 may be connected with a pump 67 as the vacuum source, and may include the usual atmospheric port 68 for releasing the applied suction. It is to be understood that the control is so timed that each time the feed bars complete their advance movement the connection with the suction source will be broken and will remain broken until the feed bars are fully retracted to place the orifice sets 56, 66 thereof under the blank stack in the manner illustrated in Figure 2, whereupon the suction source communication will again be effected so as to attract the lowermost body blank to the feeder bars in the manner illustrated in Figure 12. Thus upon the next advance movement of the feed bars said attracted body blank will be fed forwardly with the feed bars, passing freely under the rods 44 and 46. It wil be apparent that the attraction of the body blank portions into the longitudinal, transversely arcuate clearances in the feeder bars will provide a sort of depressed strengthening rib along each side of the body blank and thereby facilitate longitudinal feeding thereof.

Traversing supports 69 are mounted on side brackets 70 in the manner clearly illustrated in Figures 1, 2, 4, 6 and 9 of the drawings, and serve to support an upper center rail 71 and two side rails 72, each said side rail overlying one of the feed bars 19 or 20 and being grooved on its under-surface to clear the raised fingers of the respective underlying feed bar. The brackets 70 also serve to support parallel edge guides 73 which are engaged by and serve to confine and guide the body blanks. It will be noted by reference to Figures 1 and 2 that the stack support mounting and the arrangement of the feeder fingers is such that the blanks are fed in processional order with all of the edge portions 35 thereof disposed in longitudinal alignment. The edge guides 73 are equipped at their delivery ends with depending stop members 74 which serve to stop each body blank in the accurate position illustrated in Figure 10.

The center rail 71 supports a plurality of clamp plunger housings 75 in each of which is mounted a spring depressed plunger 76, and each plunger passes downwardly through an aperture in the rail and is urged downwardly by a compression spring, an abutment means 77 serving to limit downward movement of each plunger so that its lower end extremity is projectable only a short distance beneath the center rail 71.

A lower center rail 78 opposes the upper center rail 71 and is equipped with depending plungers 79 which are vertically slidable in frame guides 80. The plungers 79 have abutments 81 at their lower ends, and springs 82 engaging the abutments constantly tend to depress the lower rail to its lowered or dot and dash position indicated in Figure 5. A plurality of upright rocker members 83 are provided and these are pivoted intermediately of their ends as at 84 on the frame structure sides 11. A roller is carried at the upper end of each rocker member in position for engaging the undersurface of the bar 78, and the lower end of each rocker member is pivotally connected at 86 to a reciprocable bar 87. The bar 87 has a cam follower 88 at one end thereof and is held against a rotary cam 89 by an anchored spring 90. The cam 89 is mounted on a shaft 91 which is rotatable in bearings 92, and said shaft is universally coupled as at 93 to a driver shaft 94 which is rotatable in bearings 95 and is driven by chain and sprocket means from any suitable part of the main machine structure.

A separate motor drive means generally designated 97 serves to drive an adhesive applicator 98 which is disposed as illustrated in Figure 1 to engage and apply adhesive to the undersurfaces of the aligned side edges 35 of the body blanks as they are fed over said applicator.

It will be apparent by reference to Figure 4 that the feedway over which the body blanks C are fed in processional order is upwardly inclined, the degree of inclination being the same or approximately the same as the degree of inclination of the top surface of the mandrel as it is presented to receive a body blank. It will also be apparent by reference to Figure 1 that the feedway also is disposed in angular relation to the axis 7 of the mandrel carrying turret. This angle is selected so that when a blank is delivered over a receiving mandrel it will not only lie at the inclination of the top surface of said mandrel, but will be directly centered over the mandrel in the manner clearly illustrated in Figure 1 with its lateral edge portions spaced approximately like distances to either side of the mandrel axis and converging toward intersection at a point directly over or along said axis.

From the foregoing, it will be apparent that as the rack 31 of Figures 1 and 4 is vertically reciprocated, it will impart partial rotation back and forth to the gears 26, and this rotary motion of the gears will be transmitted in the form of reciprocatory movement to the feed bars 19 and 20. Each time the bars are retracted, the orifice sets 56 will be presented under the body blank stack as shown in Figures 2 and 7, and the vacuum source control will function to open communication with the vacuum source and attract the lowermost body blank to the feed bars in the manner clearly illustrated in Figure 12, thereby shaping longitudinal rib portions of the blank into the feed bar top plates 54 to form longitudinal ribs therein and clear said ribs beneath the lower end extremities of the rods 44 and 46. As the feed bars are advanced the lowermost body blank will be advanced to the position illustrated at the center in Figure 2, and at each such feed station the cam 89 will function to rock the mem-

bers 83 and cause the rollers 85 to lift the clamp bar 78 in the manner illustrated in Figure 6 to securely clamp the engaged body blanks against the overlying center bar 71. This clamping action will serve to retain the blanks against retrograde movement as the feed bars are retracted. When the feed bars are retracted to the position illustrated in Figure 2, the feed fingers 23 nearest the body blank stack will spring up behind the blank positioned at the center of Figure 2, and from this point on the body blank will be advanced by feed finger contact, the fingers being depressed and moving under each successively presented blank as the feed bars are retracted in the well known manner. This feeding of the body blanks in processional order will continue until all body blanks have been exhausted in the stack, and at this time the control switch 65 will function to break the suction source communicating control and the controlled suction source communication will be discontinued.

While an example structure has been disclosed herein, it is to be understood that the cooperating parts may be variously changed without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. In apparatus of the character described, blank feeding means comprising a blank stack supporting means, a feedway, and means for extracting the blanks one by one from the bottom of the stack and advancing them in processional order along the feedway, said advancing means including at least one reciprocable feed bar with a portion extending under the stack and having provision for directly contacting blanks and attracting and holding individual blanks thereagainst by suction action, and control means for applying the suction while the bar portion is beneath the stack and is about to be moved forwardly to advance blanks, and for relieving the suction at the completion of each step advancement of blanks to permit the bar portion to be returned to position under the stack for attracting and feeding another blank, said blank attracting and holding means including a manifold extending longitudinally in the feed bar portion and having provision for controlled connection with a suction source, and suction orifices opening through the top from said manifold, blank stack opposing face of the bar portion, said vacuum source communication being through an electrically controlled valve, and there being included a cam operated timing switch in a control circuit connected with the valve, and a switch connected in series with the timing switch and normally held in circuit closing condition by the weight of the blank stack thereon so that when the stack is exhausted there can be no suction communication between the suction source and the feed bar portion manifold.

2. In apparatus of the character described, blank feeding means comprising a blank stack supporting means, a feedway, and means for extracting the blanks one by one from the bottom of the stack and advancing them in processional order along the feedway, said advancing means including reciprocable feed bars having spring elevated feed fingers disposed in equidistantly spaced relation therealong, means for holding the blanks against retrograde movement as the feed bars are retracted, at least one said bar having a portion extending under the stack and having provision for directly contacting blanks and attracting and holding individual blanks thereagainst by suction action, and control means for applying the suction while the bar portion is beneath the stack and the bars are about to be moved forwardly to advance blanks, and for relieving the suction at the completion of each step advancement of blanks to permit the bar portion to be returned to position under the stack for attracting and feeding another blank, said means for holding the blanks against retrograde movement including a lower bar and an opposing upper bar, said bars extending along the feedway for a distance for simultaneously engaging a plurality of blanks being fed, means constantly tending to depress the lower bar out of contact with the blanks, and cam actuated means for moving the lower bar against the blanks to clamp them against the upper bar during retraction of the feed bars, said last named means comprising, a plurality of uprightly disposed rocker arms pivotally supported intermediately of their ends and having rollers at their upper ends engaging with the lower bar, an actuator bar, means pivotally connecting the lower end of each rocker arm to the actuator bar, and cam means for reciprocating the actuator bar.

3. In blank feeding means for a paper cup making machine, said blanks each having a top convexly curved edge to be fed as a leading edge, a bottom concavely curved edge and two straight side edges converging toward said bottom edge, blank stack supporting means including an upright flat wall engageable by the side edges at one side of the blanks in the stack, a frame bar conforming generally to the shape of the leading edges of the blanks, two parallel spaced upright rods carried by the frame bar and engaged by the top edges of the blanks of the stack, and an upright rod carried by the frame bar in position for engaging the side edges at the other side of the blanks in the stack, and means for withdrawing the blanks one by one from the bottom of the stack and feeding them away beneath the lower ends of the two rods engaged by the top edges of the blanks of the stack, one of the rods engaged by the top edges of the blanks in the stack, and the rod engaged by side edges of the blanks at one side in the stack being swingably mounted on the frame bar so as to be adjustable to the shape of the blanks with the edges at the other side of the blanks engaging over a major part of their length against the upright flat wall.

4. In blank feeding means for a paper cup making machine, said blanks each having a top convexly curved edge to be fed as a leading edge, a bottom concavely curved edge and two straight side edges converging toward said bottom edge, blank stack supporting means including an upright flat wall engageable by the side edges at one side of the blanks in the stack, a frame bar conforming generally to the shape of the leading edges of the blanks, two parallel spaced upright rods carried by the frame bar and engaged by the top edges of the blanks of the stack, and an upright rod carried by the frame bar in position for engaging the side edges at the other side of the blanks in the stack, and means for withdrawing the blanks one by one from the bottom of the stack and feeding them away beneath the lower ends of the two rods engaged by the top edges of the blanks of the stack, said blank withdrawing and feeding means including a bar portion extending under the blank stack at the position of each blank top edge engaging rod and having a longitudinal concavity therein into which the lower end extremity of the respective rod projects part way to the bottom so as to leave a clearance beneath the rod end sufficient for the passage of a blank, each said bar portion also having a manifold therein and suction orifices opening from the interior of the manifold through the overlying body of the bar portion into its concavity, there being included also means for reciprocating the bar portions and means for evacuating the manifolds therein in time with the reciprocations to attract and hold blanks against the bar portions in the concavities thereof to advance the blanks from the stack and then release them so that the bar portions can be retracted.

5. In blank feeding means for a paper cup making machine, said blanks each having a top convexly curved edge to be fed as a leading edge, a bottom concavely curved edge and two straight side edges converging toward said bottom edge, blank stack supporting means including an upright flat wall engageable by the side edges at one side of the blanks in the stack, a frame bar conforming generally to the shape of the leading edges of the blanks, two parallel spaced upright rods carried by the frame bar and engaged by the top edges of the blanks

of the stack, and an upright rod carried by the frame bar in position for engaging the side edges at the other side of the blanks in the stack, and means for withdrawing the blanks one by one from the bottom of the stack and feeding them away beneath the lower ends of the two rods engaged by the top edges of the blanks of the stack, said blank withdrawing and feeding means including a bar portion extending under the blank stack at the position of each blank top edge engaging rod and having a longitudinal concavity therein into which the lower end extremity of the respective rod projects part way to the bottom so as to leave a clearance beneath the rod end sufficient for the passage of a blank, each said bar portion also having a manifold therein and suction orifices opening from the interior of the manifold through the overlying body of the bar portion into its concavity, there being included also means for reciprocating the bar portions and means for evacuating the manifolds therein in time with the reciprocations to attract and hold blanks against the bar portions in the concavities thereof to advance the blanks from the stack and then release them so that the bar portions can be retracted, means for clamping the blanks against retrograde movement just prior to each retraction of the bar portions, and means for continuing the step by step feeding of the blanks initiated by said bar portions.

6. In blank feeding means for a paper cup making machine, said blanks each having a top convexly curved edge to be fed as a leading edge, a bottom concavely curved edge and two straight side edges converging toward said bottom edge, blank stack supporting means including an upright flat wall engageable by the side edges at one side of the blanks in the stack, a frame bar conforming generally to the shape of the leading edges of the blanks, two parallel spaced upright rods carried by the frame bar and engaged by the top edges of the blanks of the stack, and an upright rod carried by the frame bar in position for engaging the side edges at the other side of the blanks in the stack, and means for withdrawing the blanks one by one from the bottom of the stack and feeding them away beneath the lower ends of the two rods engaged by the top edges of the blanks of the stack, said blank withdrawing and feeding means including a bar portion extending under the blank stack at the position of each blank top edge engaging rod and having a longitudinal concavity therein into which the lower end extremity of the respective rod projects part way to the bottom so as to leave a clearance beneath the rod end sufficient for the passage of a blank, each said bar portion also having a manifold therein and suction orifices opening from the interior of the manifold through the overlying body of the bar portion into its concavity, there being included also means for reciprocating the bar portions and means for evacuating the manifolds therein in time with the reciprocations to attract and hold blanks against the bar portions in the concavities thereof to advance the blanks from the stack and then release them so that the bar portions can be retracted, means for clamping the blanks against retrograde movement just prior to each retraction of the bar portions, and spring pressed finger bar feeder extensions on said bar portions for continuing the step by step feeding of the blanks initiated by the bar portions, at least one bar portion including a recess extension accommodating one of the finger presser springs and disposed adjacent one of the upright rods when the bar portions are retracted, said recess having orifices partially bordering the same and communicating with the respective manifold.

7. In blank feeding means for a paper cup making machine, said blanks each having a top convexly curved edge to be fed as a leading edge, a bottom concavely curved edge and two straight side edges converging toward said bottom edge, blank stack supporting means including an upright flat wall engageable by the side edges at one side of the blanks in the stack, a frame bar conforming generally to the shape of the leading edges of the blanks, two parallel spaced upright rods carried by the frame bar and engaged by the top edges of the blanks of the stack, and an upright rod carried by the frame bar in position for engaging the side edges at the other side of the blanks in the stack, and means for withdrawing the blanks one by one from the bottom of the stack and feeding them away beneath the lower ends of the two rods engaged by the top edges of the blanks of the stack, said blank withdrawing and feeding means including a bar portion extending under the blank stack at the position of each blank top edge engaging rod and having a longitudinal concavity therein into which the lower end extremity of the respective rod projects part way to the bottom so as to leave a clearance beneath the rod end sufficient for the passage of a blank, each said bar portion also having a manifold therein and suction orifices opening from the interior of the manifold through the overlying body of the bar portion into its concavity, there being included also means for reciprocating the bar portions and means for evacuating the manifolds therein in time with the reciprocations to attract and hold blanks against the bar portions in the concavities thereof to advance the blanks from the stack and then release them so that the bar portions can be retracted, means for clamping the blanks against retrograde movement just prior to each retraction of the bar portions and including longitudinally extending upper and lower bars between which the blanks are fed and which extend along the feedway for a distance for simultaneously engaging a plurality of blanks being fed, and means for moving one said bar toward the other upon completion of each forward movement of the blanks to clamp the blanks between the bars during retraction of the feeder means.

8. In apparatus of the character described, blank feeding means comprising a blank stack supporting means providing a blank supporting floor, a feedway, and means for extracting the blanks one by one from the bottom of the stack and advancing them in processional order along the feedway, said advancing means including at least one reciprocable feed bar with a portion extending under the stack and having a suction face forming a part of the blank supporting floor and constantly disposed at a level for directly engaging the bottom face of the lowermost blank in the stack and effective for attracting and holding individual blanks thereagainst by suction action, and control means for applying the suction while the bar portion is beneath the stack and is about to be moved forwardly to advance blanks, and for relieving the suction at the completion of each step advancement of blanks to permit the bar portion to be returned to position under the stack for attracting and feeding another blank, said blank attracting and holding means including manifold means directly in and extending longitudinally of the feed bar and comprising an upper manifold and an underlying lower manifold communicating with the upper manifold through apertures, said manifolds having provision for controlled connection with a suction source, and suction orifices opening through the top from said upper manifold, blank stack opposing face of the bar portion, and said blank stack opposing face being arcuate in cross section transversely of the line of feed so that blank portions attracted and held against the bar portion will assume a longitudinal rib formation extending in the direction of feed, said vacuum source communication being through an electrically controlled valve, and there being included a cam operated timing switch in a control circuit connected with the valve, and a switch connected in series with the timing switch and normally held in circuit closing condition by the weight of the blank stack thereon so that when the stack is exhausted there can be no suction communication between the suction source and the feed bar portion manifold.

9. In apparatus of the character described, blank

feeding means comprising a blank stack supporting means providing a blank supporting floor, a feedway, and means for extracting the blanks one by one from the bottom of the stack and advancing them in processional order along the feedway, said advancing means including at least one reciprocable feed bar with a portion extending under the stack and having a suction face forming a part of the blank supporting floor and constantly disposed at a level for directly engaging the bottom face of the lowermost blank in the stack and effective for attracting and holding individual blanks thereagainst by suction action, and control means for applying the suction while the bar portion is beneath the stack and is about to be moved forwardly to advance blanks, and for relieving the suction at the completion of each step advancement of blanks to permit the bar portion to be returned to position under the stack for attracting and feeding another blank, said blank attracting and holding means including a manifold formed directly in and extending longitudinally of the feed bar portion and having provision for controlled connection with a suction source, and suction orifices opening through the top from said manifold blank stack opposing face of the bar portion, and said blank stack opposing face being arcuate in cross section transversely of the line of feed so that blank portions attracted and

held against the bar portion will assume a longitudinal rib formation extending in the direction of feed, and said blank stack supporting means including an edge confining rod disposed uprightly over each suction orifice equipped bar portion with its lower end extremity so close to the bottom of the transversely arcuate cross section as to obstruct forward movement of blanks except when the lowermost blank in the stack is suction attracted and held against the arcuate sectioned surface and is thereby freed to pass under the rod when the bar is moved forward to feed the same.

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