Aug. 12, 1941. H. S. LABOMBARDE 2,251,945

BLANK FEEDING MECHANISM

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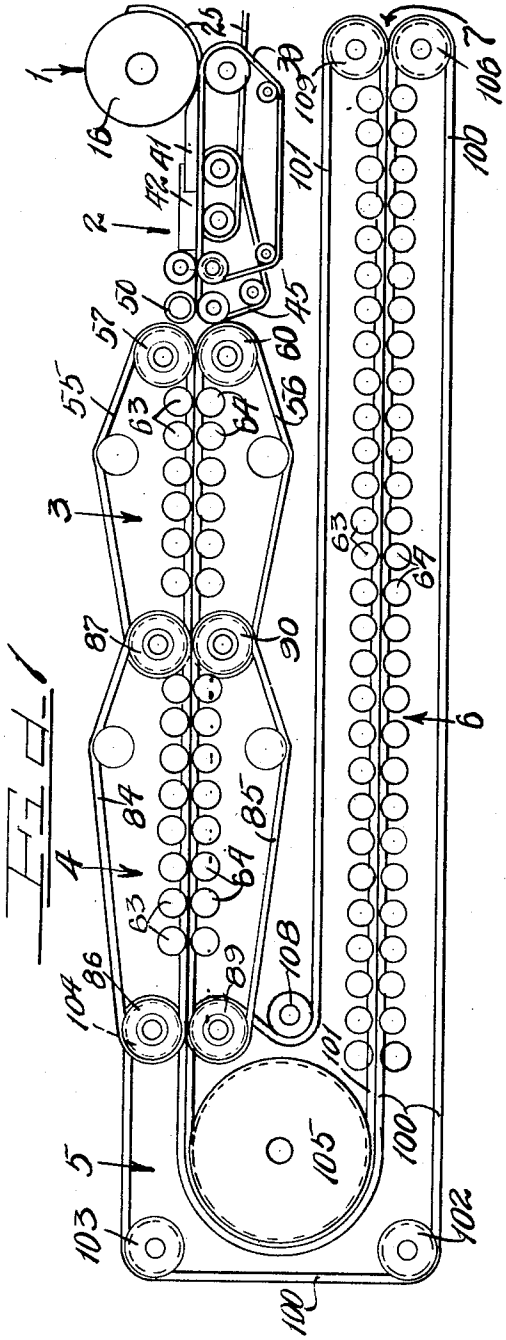


Fig. 1

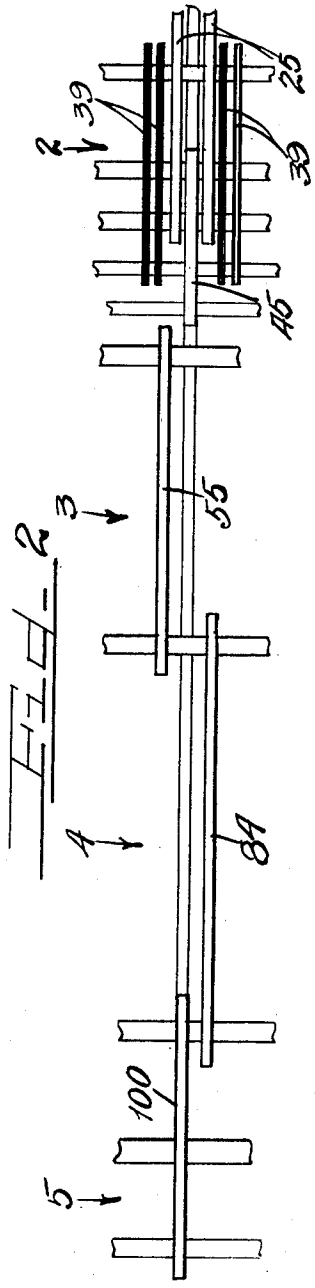


Fig. 2

INVENTOR
Harold S. Labombarde.
BY Charles O. Miller
ATTY.

Aug. 12, 1941. H. S. LABOMBARDE 2,251,945

BLANK FEEDING MECHANISM

Filed June 22, 1938 7 Sheets-Sheet 2

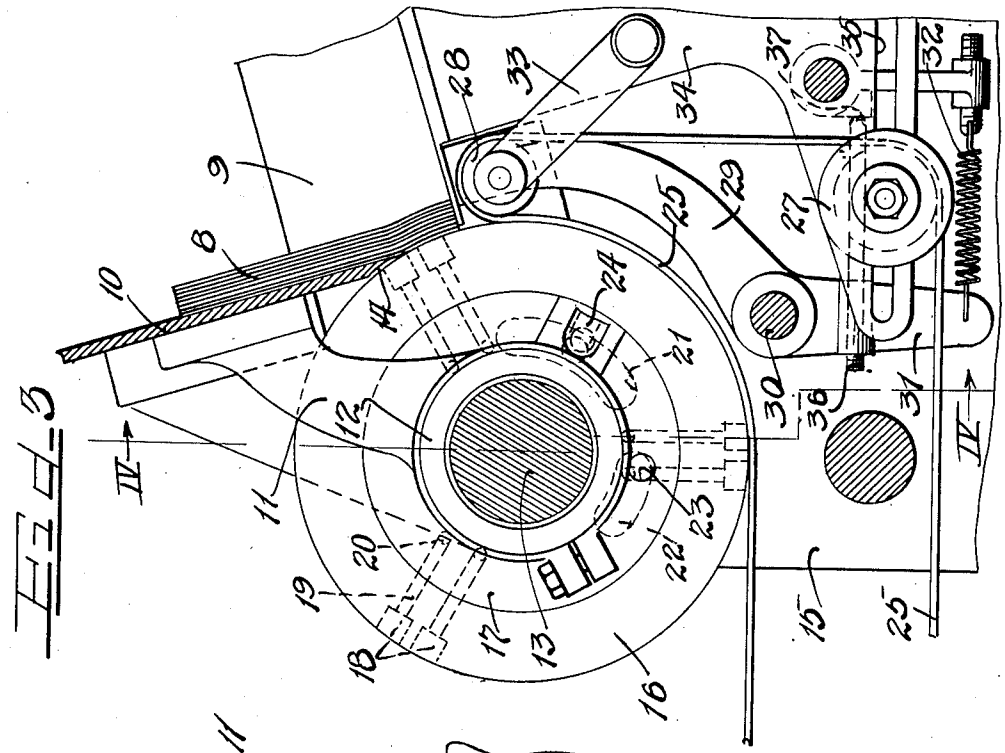


Fig. 3

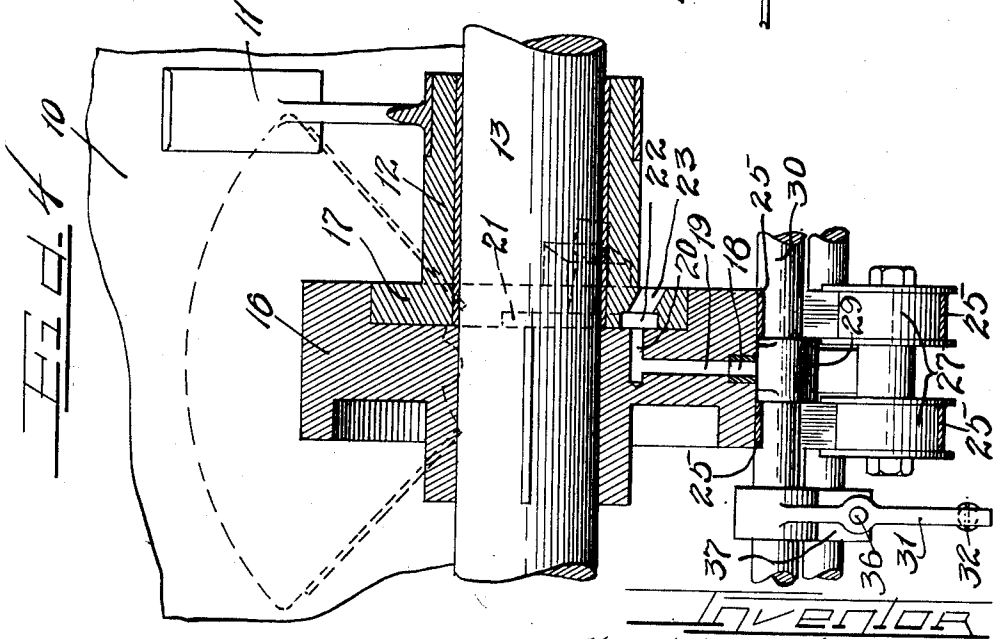


Fig. 4

Inventor
Harold S. Labombarde.
By Charles A. Gilbert
Atty.

Aug. 12, 1941. H. S. LABOMBARDE 2,251,945

BLANK FEEDING MECHANISM

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Fig. 5

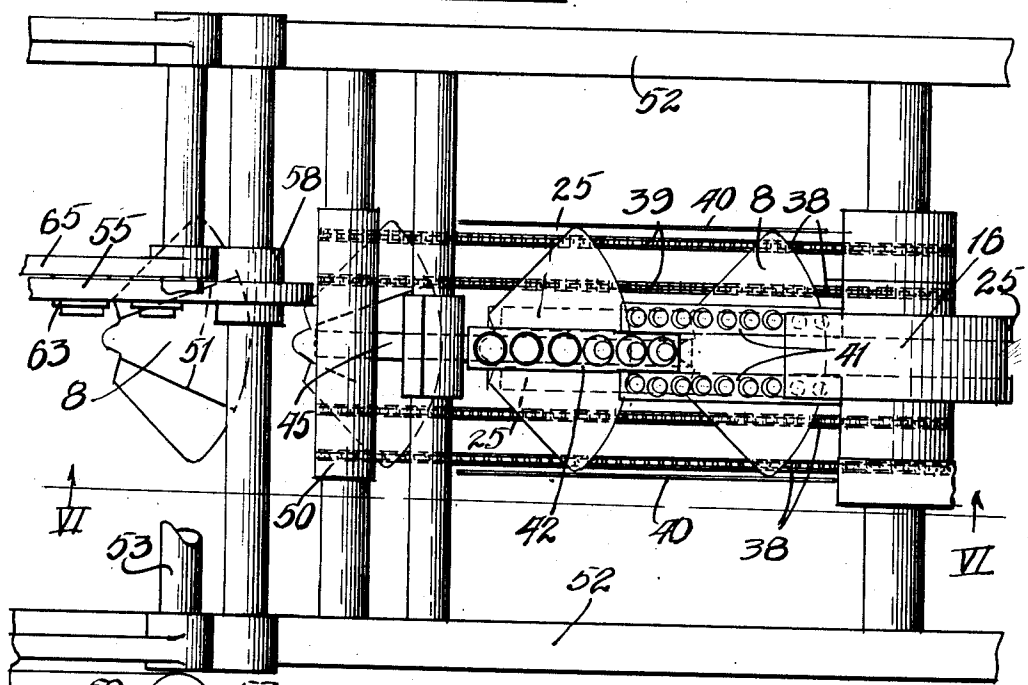
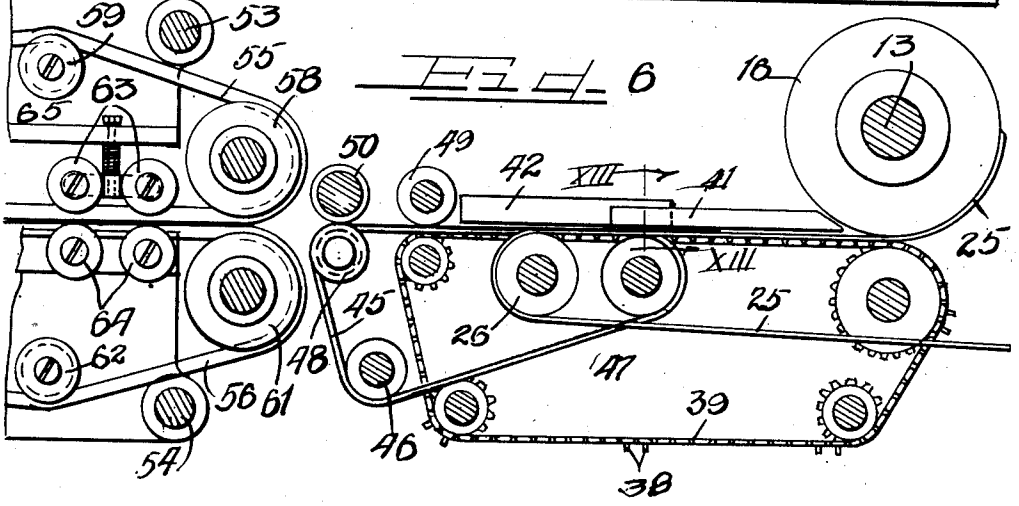


Fig. 6



Inventor
Harold S. Labombarde
by Charles O. Miller Attys.

Aug. 12, 1941. H. S. LABOMBARDE 2,251,945

BLANK FEEDING MECHANISM

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Fig. 7

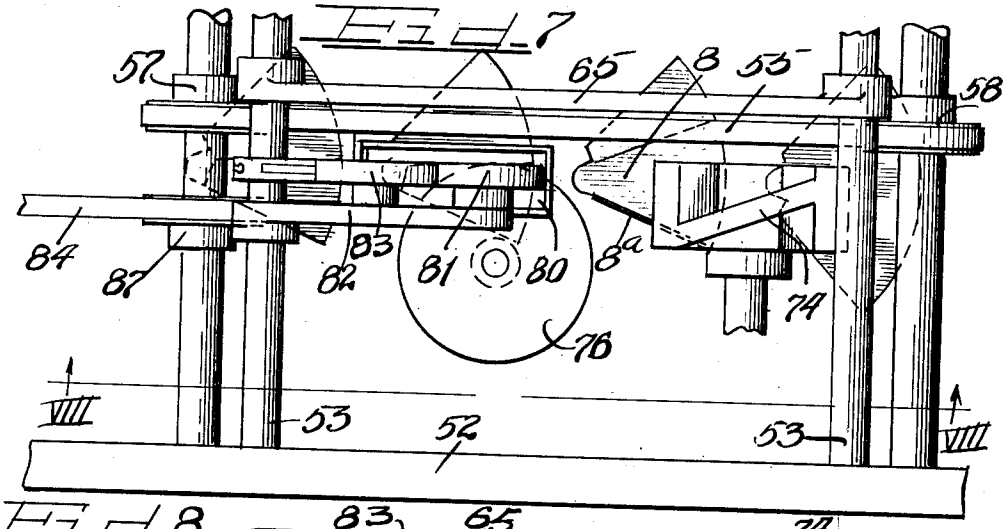
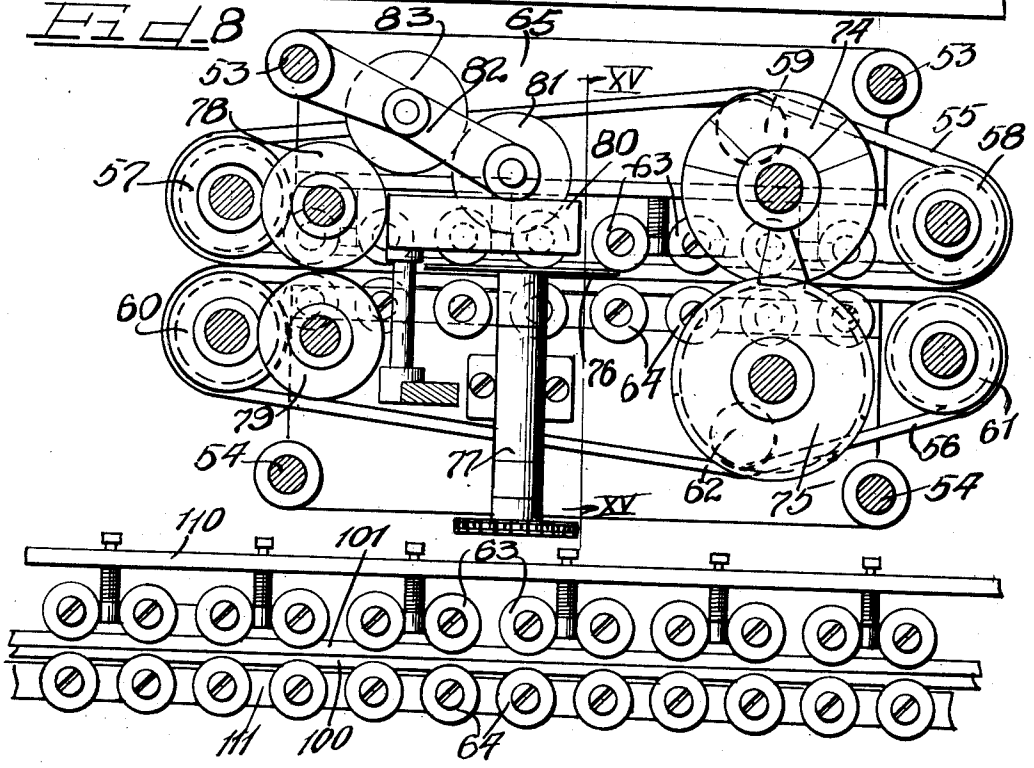


Fig. 8



Inventor
Harold S. Labombarde
By Charles O. Hill Attys

Aug. 12, 1941. H. S. LABOMBARDE 2,251.945

BLANK FEEDING MECHANISM

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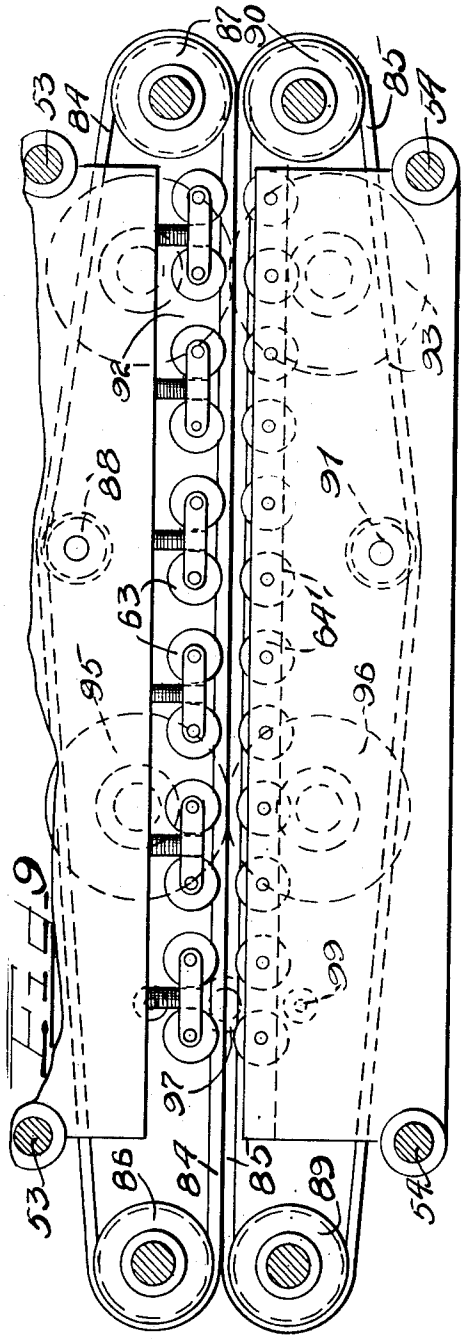


Fig. 9

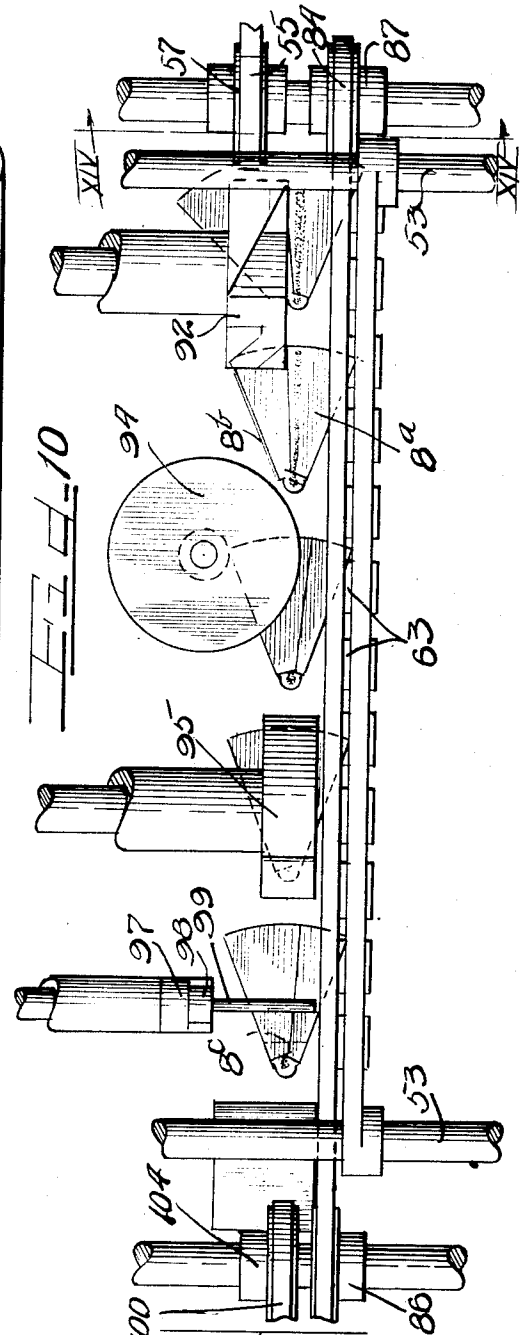


Fig. 10

Inventor
Harold S. Labombarde
by Charles O. Wilkins

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BLANK FEEDING MECHANISM

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Fig. 11

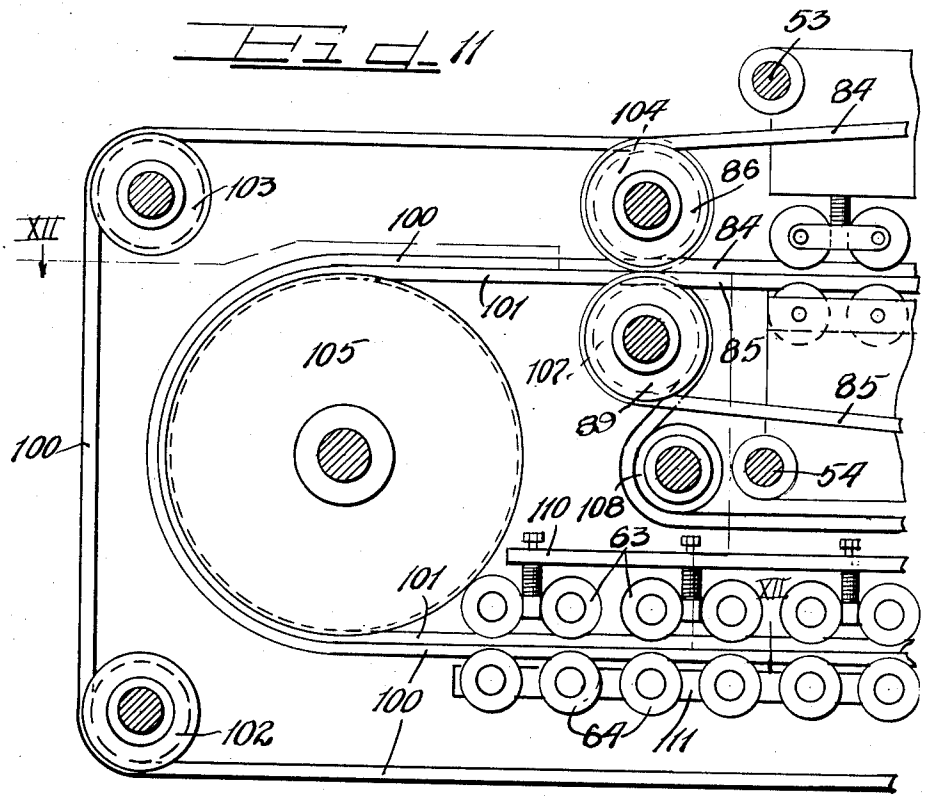
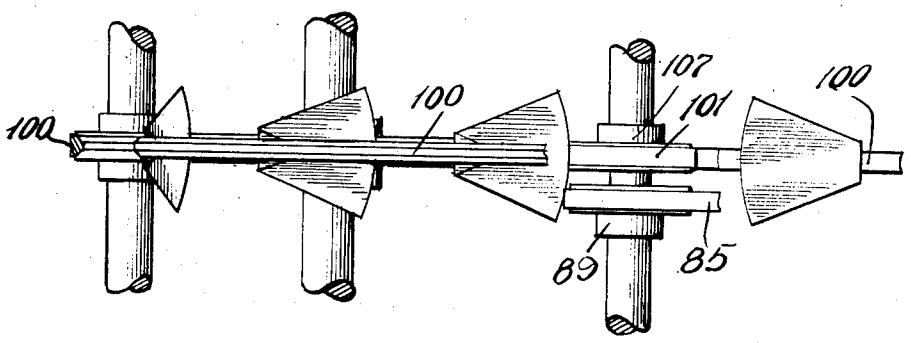


Fig. 12



Inventor
Harold S. Labombarde
By Charles A. Wilkinson
Attys.

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BLANK FEEDING MECHANISM

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Fig. 15

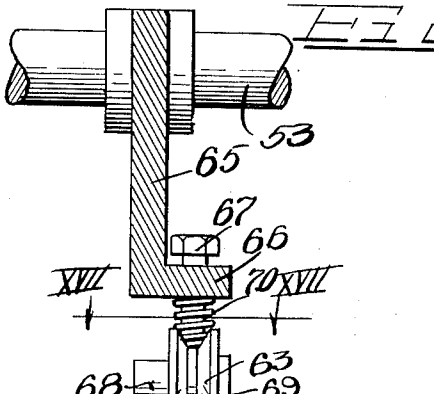


Fig. 13

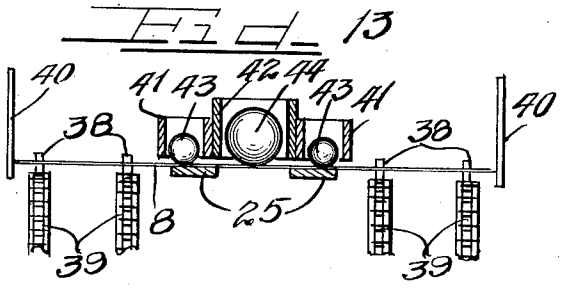


Fig. 14

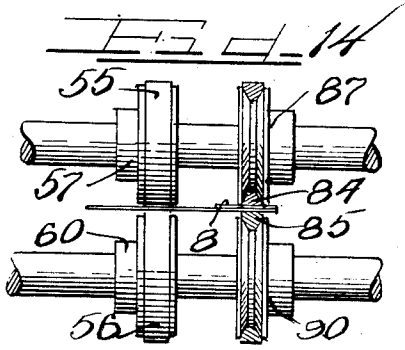


Fig. 17

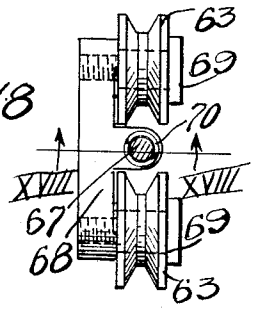


Fig. 16

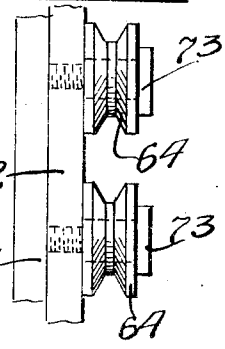
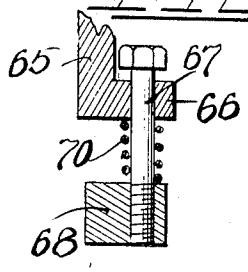


Fig. 18



Inventor
Harold S. Labombarde
By Charles A. Shell Atty.

Patented Aug. 12, 1941

2,251,945

UNITED STATES PATENT OFFICE

2,251,945

BLANK FEEDING MECHANISM

Harold S. Labombarde, Nashua, N. H., assignor to Dixie-Vortex Company, Chicago, Ill., a corporation of Delaware

Application June 22, 1938, Serial No. 215,124

15 Claims. (Cl. 271—12)

This invention relates to improvements in blank feeding means, and more particularly to a feeding mechanism wherein blanks may be removed from a hopper or the like and fed to a container receiving element, the blanks being formed into container shape while carried by the feeding mechanism, the invention being highly desirable for use in connection with the forming of wedge-shaped paper cups or similar paper cups initially formed substantially flat, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

The present invention embodies divisional subject matter from the invention set forth and described in my copending application for patent entitled "Method and machine for making tapered cups," filed June 27, 1936, Serial No. 87,628, and this application is a continuation in part of my aforesaid copending application.

In the manufacture of containers of the character of paper drinking and ice cream cups which are sufficiently economical to warrant their disposition after a single usage, economy of production is an essential. Such cups are usually made from a blank of paper stock, and the ease, rapidity and facility with which such a blank may be handled during the forming of the container from the blank, contributes in no mean way to the resultant economy of production. In the case of a wedge-shaped cup, for example, wherein one side portion is folded over and the other side portion folded over on top of the first side portion, and finally an end fold is made to close the bottom end of the cup, difficulty has been experienced in properly feeding the blank while the various folding operations were under way, and in many instances mandrels were employed around which the blank was shaped into container form, and the use of such mandrels materially slows production.

With the foregoing in mind, it is an important object of the present invention to provide feeding means for container blanks which keep the blank in constant motion from the time it is taken from a hopper until a finished container is delivered by the feeding means into a suitable receiver.

Another object of the invention is the provision of feeding means arranged to carry a container blank from which a paper cup may be shaped in flat form continuously from the time the blank is taken from a hopper until the cup is finished, without once losing a definite grip upon the cup.

A further object of the invention is the provision of feeding means arranged to continuously carry a paper cup blank along during the formation of the blank into container shape, with the feeding means shifting its hold upon the blank from one location to another during the travel of the blank to accommodate the various forming operations.

It is also an object of this invention to provide feeding means for a paper cup blank, which means are arranged to grip the blank and to transfer the gripping to different locations on the blank during the forming of the blank into container shape, without once releasing the blank.

Another feature of the invention is the provision of feeding mechanism for advancing a paper cup blank together with automatic centering means associated with the feeding mechanism, so that the blank assumes the proper initial position for subsequent carrying by the feeding mechanism.

A further feature of the invention is the provision of feeding mechanism for advancing a paper cup blank together with automatic retarding means tending to delay the movement of the blank until the blank assumes a predetermined position relative to the feeding means.

Another object of this invention resides in the provision of feeding means for advancing a paper cup blank which is formed into container shape by making a plurality of folds in the blank, the feeding mechanism being arranged to grip the blank and to transfer its gripping action from one location on the blank to another, so as to maintain the various folds against accidental release during forming of the blank.

Still another object of the invention resides in the provision of feeding means adapted to withdraw a blank from a hopper or other container of a plurality of blanks, the feeding means being arranged to withdraw each blank by suction and so remove only one blank at a time.

Also an object of this invention is the provision of feeding mechanism for paper cup blanks, which mechanism is capable of simultaneously carrying a plurality of blanks at spaced intervals therealong, so that a plurality of cups may be undergoing formation simultaneously.

Still another feature of the invention resides in the provision of feeding means for paper cup blanks which are adapted to successively remove blanks from a hopper, automatically position the blanks in a predetermined position relative to the feeding means, grip the blanks, and shift the

gripping action to different successive locations upon the blanks without releasing the blanks.

It is also a feature of the invention to provide feeding means capable of accomplishing the results just above mentioned, while continuously moving the blanks at high speeds.

While some of the more salient features, characteristics and advantages of the present invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a diagrammatic elevational view illustrating the location of salient parts of the feeding mechanism embodying principles of the present invention;

Figure 2 is a fragmentary diagrammatic plan view of the structure of Figure 1, with parts omitted;

Figure 3 is an enlarged fragmentary vertical sectional view illustrating the first or initial part of the feeding means at the time a blank is removed from a hopper;

Figure 4 is a fragmentary vertical sectional view taken substantially as indicated by the staggered section line IV—IV of Figure 3, with the parts shown in elevation;

Figure 5 is a fragmentary plan view of that portion of the feeding means immediately following the structure of Figures 3 and 4;

Figure 6 is a fragmentary vertical sectional view taken substantially as indicated by the line VI—VI of Figure 5;

Figure 7 is a fragmentary plan view of the next succeeding portion of the feeding mechanism, namely, that portion seen just right of center in Figure 1;

Figure 8 is a fragmentary vertical sectional view taken substantially as indicated by the section line VIII—VIII of Figure 7;

Figure 9 is a fragmentary vertical sectional view similar in location to Figures 6 and 8, but illustrating the next following portion of the feeding means, namely, that visible just left of center in Figure 1;

Figure 10 is a fragmentary plan view of the structure seen in Figure 9;

Figure 11 is a fragmentary vertical sectional view illustrating the feeding mechanism seen in the left-hand portion of Figure 1;

Figure 12 is a fragmentary plan sectional view taken substantially as indicated by the staggered line XII—XII of Figure 11, showing in the left-hand portion the upper feeding deck, and in the far-right-hand portion the lower feeding deck;

Figure 13 is an enlarged fragmentary detail sectional view taken substantially as indicated by the line XIII—XIII of Figure 6;

Figure 14 is also a fragmentary detail sectional view taken substantially as indicated by the line XIV—XIV of Figure 10;

Figure 15 is an enlarged fragmentary detail sectional view taken substantially as indicated by the line XV—XV of Figure 8;

Figure 16 is a fragmentary plan sectional view taken substantially as indicated by the line XVI—XVI of Figure 15;

Figure 17 is a fragmentary plan sectional view taken substantially as indicated by the line XVII—XVII of Figure 15; and

Figure 18 is a fragmentary vertical detail sectional view taken substantially as indicated by the line XVIII—XVIII of Figure 17.

As shown on the drawings:

The illustrated embodiment of the present invention is, for the purpose of clarity, shown as arranged to carry along a blank for the formation of a tapering or wedge-shaped paper drinking cup and keep this blank continuously in motion during the forming of the blank. The particular cup and the method of forming it are more fully set forth and described in my aforesaid copending application.

It suffices to say herein that each blank to be carried by the feeding means embodied in the present invention is of generally a sector shape. One side portion of the blank is folded over the central portion, and the opposite side portion also folded inwardly over the central portion so that the margins of the two side flaps overlap. These margins are held together by a suitable adhesive, and after the forming of the marginal portions, a transverse end fold is made, bringing up the end flap of the blank and folding it over the body portion to which it is held by adhesive, thus providing a bottom closure for the cup.

With reference to the diagrammatic showings in Figures 1 and 2, it will be seen that the illustrated embodiment of the feeding mechanism includes a mechanism generally indicated by numeral **1** for removing the blanks in successive order from a hopper or magazine, and immediately following this mechanism is an arrangement **2** for centering or properly positioning the blank relatively to the feeding means. The next section of the feeding mechanism, generally indicated by numeral **3**, is that portion in which the blank is held adjacent one side, while the opposite side flap is folded over the central portion of the blank, and it is during the time the blank is carried by this section of the feeding means that a stripe of glue or adhesive is applied to the blank. In the next section, generally indicated by numeral **4**, the grip of the feeding mechanism upon the blank is shifted to the opposite side to hold down the side flap already folded and permit the other side flap to be folded so that a marginal portion thereof overlaps the adhesive stripe on the previously folded portion. Also in this section of the feeding mechanism, the blank is scored to mark the bottom fold-up and this part is given an initial bend towards folded position. The following section **5** completes the folding of the bottom fold-up, and here the grip of the feeding means on the blank is transferred to the central portion of the blank so as to overlie the seam of the cup being formed and also overlie the portion of the bottom fold-up which is glued to the body of the cup. Still gripped by the feeding mechanism, the blank is next carried by the lower deck portion **6** back towards the direction from which the blank started, and during this course of travel through this part **6**, the adhesived portions of the blank are firmly held together while the glue or adhesive is setting. The finished container is discharged at the point **7** (Figure 1), at the same end of the machine in which the blank was received. The container may be discharged into any suitable receiving means, such as that set forth, described and claimed in my copending application for Letters Patent entitled "Container receiving mechanism," filed June 22, 1938, Serial No. 215,125, which is also a division of my aforesaid copending application Serial No. 87,628.

It will be appreciated that the various shafts supporting movable parts of the feeding mechanism are suitably journaled in side frame structures of the machine, and it is not necessary herein to completely set forth and describe such

frame structures, the details and disposition of which in general will be understood by one skilled in the art.

With reference now more particularly to Figures 3 and 4, it will be seen that a plurality of blanks 8 are disposed initially in a magazine 9 inclined so that the blanks rest against a front panel 10 supported by a bracket arm 11 carried on a non-rotating sleeve 12 fixed relatively to a rotatable shaft 13. As indicated at 14 in Figure 3, the front panel 10 terminates above the bottom of the magazine 9 so as to leave an opening through which the lower portion of the blank may be reached by the initial portion of the feeding mechanism now about to be described.

The shaft 13, which may be journaled in any suitable manner in a pair of side frames 15, carries thereon an initial feeding roller 16, which is provided with a hollow in one side to accommodate a flange 17 integral with the aforesaid non-rotatable sleeve 12, as best seen in Figure 4. The feed roll 16 carries a plurality of pairs of friction and suction cups 18, in this instance three, equally spaced apart, which are inset in the face of the roller and comprise tubular portions of any suitable material, such as rubber. Each of the suction cups connects through a radial passage 19 and a transverse passage 20 with the outer face of the wheel adjacent the flange 17, so that these passages are in successive communication with a pair of spaced hollows 21 and 22 in the flange 17. The hollow 22 is in communication with the atmosphere through a port 23. The hollow 21 is connected through a conduit 24 to any suitable source of suction.

It is therefore apparent that as the roller 16 rotates towards the magazine 9, each pair of circumferentially spaced suction cups may contact the first blank beneath the front panel 10, and after both the cups have come in contact with the blank, the respective horizontal passages 20 successively communicate with the aforesaid hollow 21 connected to the suction line, thus creating a suction through the cups 18 to hold the lower portion of the blank firmly attached to the roller. The roller pulls the blank downwardly out of the magazine between itself and a pair of adjacent belts 25. When the roller is rotated sufficiently for the passages 20 to coincide with the hollow 22, the suction is automatically broken and the blank released upon the belts 25 in position to be acted upon by another portion of the feeding mechanism, as will more fully later appear. In this manner, it will be seen that one blank only is removed at a time from the magazine and that, in this instance, three blanks are removed for each rotation of the roller 16.

The belts 25—25 are endless in character and are preferably kept in constant motion at the same speed as the roller 16.

The belts are carried by a pair of pulleys 26 (Figure 6), journaled in any suitable frame structure, omitted from the drawings for the purpose of clarity, a pair of adjustably positionable pulleys 27—27 and a pair of higher pulleys 28 positioned so that the belts will be in contact with the face of the roller 16 for a portion of its revolution. The upper pulleys 28 are carried on the free end of a crank arm 29 fixed on a shaft 30. Another crank 31 also fixed to this same shaft is pulled rearwardly by a tension spring 32 adjustably connected to a depending frame member. The pulleys 28, together with the belts, are thus constantly urged towards the roller 16, forming in effect a friction gauge to prevent the entry of more than one blank at a time between the roller and the belts, and any wear of any part is automatically compensated for. One or more links 33, suitably connected to a frame portion 34, aids in maintaining the pulleys 28 in proper position. The lower part of this frame portion is slotted, as indicated at 35, to permit adjustment of the pulleys 27—27, these pulleys being positionable in any desired point along the slot 35. An elongated set screw 36 is adjustably positioned in the crank 31, abuts a stop 37, and may be used, together with the adjustable attachment of the spring 32, to regulate the pressure of the belts 25 against the roller 16.

After the blank is free from the roller 16, it moves along the belts 25 in position to have its rear arcuate edge engaged by a plurality of pins 38 protruding from several similar chains 39. In this instance, there are four such chains illustrated, and the pins 38 on the outermost pair of chains are offset relatively to the pins on the inner pair of chains in keeping with the curvature of the rear edge of the blank. Each chain is suitably mounted in quadrilateral formation over a set of four sprockets, as is clearly seen in Figure 6. With reference to Figure 13, it will be seen that the chains 39 are disposed below the belts 25, so that the blank rides along on the belts 25 urged by the pins 38, the blank moving between a pair of suitable side guide rails 40—40. In order to expedite rapid production, the pins 38 are spaced along the chains 39 at various intervals so that more than one blank may be moved along by the pins at a time. It is, therefore, necessary to center or position a blank properly relatively to the pins 38.

In this instance, the centering or positioning means are in the form of retarding elements comprising a pair of outside channels 41 and an inside or central channel 42. Each of the channels is provided with a series of apertures in the bottom thereof, and in each aperture a metallic ball is disposed, each ball being of less size than its respective aperture so that it may ride freely on the blank 8 on the belts 25. With reference more particularly to Figure 13, it will be seen that the outer channels 41 carry smaller balls 43, and the inside channel 42 carries larger balls 44. The blank, moving along on the traveling belts 25, will be retarded by the balls 43 and 44 until it is positively engaged by the pins 38, and thereafter the blank will be advanced uniformly by the pins.

After being so centered, the blank is advanced over a centrally disposed traveling belt 45 carried on suitable pulleys 46, 47 and 48. The blank travels beneath a suitable roller 49 on the belt 45 and then beneath a scoring roller 50. With reference to Figure 6, it will be seen that the combination pulley and scoring roller 48 is recessed centrally to accommodate the belt 45 and leave the remainder of the roller in position to contact the blank 8 and thus form a backing for the scoring roller 50 which provides the blank with a pair of diverging score lines 51, as seen in Figure 5. The score lines define side flat portions of the blank which are to be folded over the central portion of the blank in the forming of the cup.

With reference now to Figures 5, 6, 7 and 8, it will be seen that the feeding mechanism in general is disposed between a pair of side frame members 52—52, and periodically these frame members are connected by an upper series of transverse fixed shafts 53 and by a lower series

of transverse fixed shafts 54. The major rotating shafts are, of course, journaled in the side frame members 52—52.

As the blank leaves the scoring rollers 48 and 50, it enters between a pair of relatively narrow superposed gripping belts 55 and 56. The upper belt 55 travels over a pulley 57 and a pulley 58 with the proper tension maintained by a rider roll 59. In like manner, the lower belt 56 travels over a pulley 60 and a pulley 61 and is equipped with a rider roll 62. The inside portions of these belts are in confronting relationship and are designed to grip the blank therebetween and carry it along therein.

The gripping action of the belts 55 and 56 is effected by a series of numerous small rollers 63 inside the belt 55 and bearing against the horizontal track of this belt, and a similar series of rollers 64 inside the belt 56 and bearing against the horizontal track of this belt. The mounting and construction of these rollers 63 and 64 and adjacent parts are best seen in Figures 15, 16 and 17. With reference to Figure 15, it will be seen that while the belts 55 and 56 present flat confronting faces, the rear portions of these belts are substantially V-shaped and the rollers are accordingly formed. Both the series of rollers 63 and 64 are freely mounted and rotate merely due to the frictional contact of the respective belts therewith.

The upper series of rollers 63 is carried on a frame member 65 depending from a pair of adjacent fixed cross-shafts 53. The inner portion of this frame member 65 is provided with an integral shelf 66, and the rollers are carried by a series of bolts 67 freely extending through the shelf 66. Each such bolt has its lower end threadedly engaged in a yoke member 68 which carries a pair of the wheels 63 upon suitable stub shafts 69, one wheel being disposed upon each side of the bolt 67. A suitable spring 70, disposed between the shelf 66 and the respective yoke 68, constantly urges the pair of wheels downwardly and forcefully against the belt 55.

A frame member 71 extending upwardly from a pair of adjacent lower fixed shafts 54 supports a bar 72 which in turn carries the lower series of wheels 64 on suitable stub shafts 73 engaged in the bar 72. The lower series of wheels 64 are not carried in pairs but are disposed at equal intervals along the bar 72, with each lower wheel 64 directly opposite an upper wheel 63. The lower belt 56 rides over the wheels 64, and there need not be any spring action from below against the belt 56, since the upper belt 55 is pressed downwardly thereagainst by the springs 70, as above explained. It is therefore apparent that a blank 8 will be positively gripped and firmly held between the belts 55 and 56.

It will be noted that the belts 55 and 56 are disposed to one side of the median line of the blank so as to leave ample freedom for the folding of one of the side flaps of the blank while still maintaining a firm grip upon the blank as a whole. The folding of the side flap is accomplished as the blank travels continuously along its path by a pair of folding rollers 74 and 75 (Figures 7 and 8), which operate continuously and are synchronized with the speed of the belts 55 and 56. As the side flap is elevated to the position 8*a* in Figure 7 by these folding rollers, it very shortly thereafter passes beneath a horizontally disposed and rotating plate 76 mounted upon a vertically disposed shaft 77 (Figure 8). This plate 76 presses down the flap 8*a* of the blank in its folded position, making a crease at the line of fold, which line of fold is at a definite angle to the line of travel of the blank. The blank next passes beneath a glue applying roller 78 backed by a similarly sized roller 79.

The roller 78 applies a stripe of glue along the upper margin of the folded flap 8*a* as well as on the projecting tip portion of the cup blank. The glue is carried in a glue pot 80 disposed adjacent the path of travel of the blank and a glue receiving roller 81, carried on the end of a link 82 supported by one of the fixed cross-shafts 53. rotates in the glue pot. The glue is transmitted from the circumference of the roller 81 to the circumference of an intermediate roller 83, also carried by the link 82, and the roller 83 transmits the glue to the circumference of the aforesaid applying roller 78.

After the application of the glue, the blank is fed through the next section of the feeding mechanism, generally indicated by numeral 4 in Figure 1. During its course of travel through this portion of the feeding mechanism, the other side flap of the blank must be folded over into position, and the transverse score line provided for the bottom fold-up, and the bottom portion of the blank picked up into position to be folded flat upon the body. In order to permit the adequate folding of the other side flap of the blank, it is necessary to transfer the gripping action of the feeding mechanism to the opposite side of the median line of the blank.

Before the belts 55 and 56 lose their grip upon the blank, another pair of similar belts 84 and 85 engage the blank. These belts 84 and 85 carry the blank through the portion 4 of the feeding mechanism, as best seen in Figures 9 and 10. The belt 84 is carried by a pair of suitable pulleys 86 and 87, and a rider 88 maintains proper tension in the belt. Likewise, the belt 85 is carried over a pair of pulleys 89 and 90, with a rider 91 disposed between the pulleys, all in the same manner as previously described in connection with the belts 55 and 56. At the time the partially folded blank is transferred from the belts 55 and 56 to the belts 84 and 85, there is a period when both sets of belts engage the blank, as seen in Figures 10 and 14, so that the blank has no opportunity to get out of its proper position.

It will be noted that the pulleys 57 and 87 are carried by the same shaft as are the pulleys 60 and 90, but the pulleys 87 and 90 are positioned so that the belts 84 and 85 engage the opposite side portion of the blank from that engaged by the belts 55 and 56. As seen in Figures 10 and 14, the belts 84 and 85 hold the flap 8*a* of the blank firmly in its folded position while advancing the blank. The belts 84 and 85 are pressed together over the blank by a series of upper pulley rollers 63 and a series of lower pulley rollers 64 of exactly the same character and arrangement as those previously described herein, and supported by upper and lower frame members carried by a pair of adjacent fixed cross-shafts 53 and 54, respectively.

As the blank travels along between the belts 84 and 85, a pair of folding rollers 92 and 93 elevate the other side flap of the blank, as indicated at 8*b* in Figure 10. These folding rollers are of the same nature as those previously described, and immediately after leaving the folding rollers, the blank passes beneath a horizontally disposed rotating plate 94 which presses down the flap 8*b*, so that a margin thereof over-

lies the stripe of glue upon the preceding folded flap 8a. After leaving the plate 94, the blank passes between a pair of scoring rollers 95 and 96, and a transverse score line 8c (Figure 10) is placed upon the blank to define the bottom fold-up. Disposed to one side of the path of the blank is a rotatable member 97 carrying a pair of diametrically opposed arms 98, from each of which a pin 99 extends laterally. This member 99 rotates constantly and the pins are disposed sufficiently far apart so that when one of them strikes the forward portion of the blank to turn it up along the score line 8c, the other pin misses the opposite or following edge of the blank. The fold-up portion of the blank is struck by one of the pins 99 and bent upwardly just before the blank enters between a pair of belts 100 and 101 positioned to press the blank along its median line over the glued seam, as well as over the glued portion uniting the bottom fold-up to the body of the blank.

The belts 100 and 101 are incorporated in both sections of the feeding mechanism generally indicated by numerals 5 and 6 in Figure 1, and are best illustrated in Figures 1, 8, 11 and 12. The belt 100 rides over a lower pulley 102, an upper pulley 103, an upper pulley 104 carried on the same shaft as the aforesaid pulley 86, and then rides the belt 101 around a large pulley 105 and travels the length of the feeding mechanism on a lower lever over a pulley 106 disposed beneath the blank magazine 9, as best seen in Figure 1. The belt 101 rides over the large pulley 105, a pulley 107 carried by the same shaft as the aforesaid pulley 89, over an intermediate pulley 108 with the flat face of the belt adjacent this pulley, and then over a pulley 109 at the opposite end of the machine in juxtaposed relationship to the aforesaid pulley 106.

With reference to Figures 11 and 12, it will be seen that the belts 100 and 101 grip the blank centrally therebetween right over all of the adhesived portions of the blank, carry the blank around the large pulley wheel 105, and then back on a lower level beneath the previously described portions of the feeding mechanism to the discharge point generally indicated by numeral 7 in Figure 1. During this lengthy travel of the blank, the adhesive has sufficient opportunity to set so that a finished cup may be discharged at the point 7 into any suitable receiving means. It will also be noted that the blank is reversed in position in passing over the large pulley 105, so that it is discharged closed end first. Along this lengthy travel at the lower level, the two belts 100 and 101 are pressed tightly towards each other by a series of upper pulley rollers 63 and a series of lower pulley rollers 64 of exactly the same character and arrangement as above described. The upper series of rollers are carried on a suitable frame bar 110 (Figures 8 and 11), and the lower series of rollers 64 are carried on a suitable frame bar 111.

It will be appreciated that any suitable drive means may be provided for the moving parts of the feeding mechanism, it not being necessary herein to illustrate such drive means. All of the parts of the mechanism are preferably operating continuously, each part in synchronism with the other constituent parts, so that the various operations upon the blank are properly timed and occur at exact predetermined points during the travel of the blank. The blank is carried by the feeding means continuously and preferably at high speed, from the time the blank is taken from the magazine 9 until a finished cup is delivered from between the belts 100 and 101 at the delivery point 7 indicated in Figure 1.

From the foregoing, the operation of the feeding mechanism is believed to be sufficiently apparent so that at this point only a brief summary of the operation is necessary. A blank is removed from the magazine 9 by the suction disks 18 on the wheel 16, and carried forward on the twin belts 25. While on these belts, movement of the blank is retarded by the balls 43 and 44 until the rear arcuate edge of the blank is engaged by the pins 38 and the chains 39. These chains then carry the blank forward over the centrally disposed belt 45 beneath the scoring wheel 50 and into positive firm engagement by the confronting belts 55 and 56 which are disposed to one side of the median line of the blank. While the blank is carried by these belts which are held tightly against the blank by the upper series of rollers 63 and the lower series of rollers 64, one side flap of the blank is folded over, creased in position, and a stripe of glue placed upon the marginal portion of the folded flap together with the projecting apex portion of the blank. The gripping action of the feed mechanism upon the blank is then shifted to the opposite side of the median line of the blank, when the blank is similarly firmly engaged between the belts 84 and 85. During the time the blank is carried along by the belts 84 and 85, the other side flap of the blank is folded over into position so that this marginal portion overlies the stripe of adhesive, a transverse score line is provided on the blank, and the bottom fold-up is picked upwardly into position by one of the pins 99. The fold-up is pressed into its proper folded position by the centrally located belts 100 and 101 which next take the blank and hold it firmly gripped therebetween directly over the adhesived parts until the blank is finally ejected in the form of a finished cup at the point 7 indicated in Figure 1.

Of course, while one blank is thus traveling through the machine, other blanks are following in consecutive order at spaced intervals behind the first blank, so that finished containers are being discharged at the point 7 in exceedingly rapid sequence.

From the foregoing, it is apparent that I have provided novel feeding mechanism arranged to carry a blank for a paper cup or similar container entirely through a complete series of forming operations, shifting the gripping action upon the blank in keeping with the successive forming operations to be performed, and without once releasing the blank until it is discharged in the form of a finished container by the feeding mechanism. The mechanism is exceedingly simple in construction, positive and efficient in operation, durable and may be very economically used.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than is necessitated by the prior art.

I claim as my invention:

1. Blank feeding mechanism, including a movable member, suction means carried by said member to contact and withdraw a blank from a magazine, elongated traveling conveying means adjacent the surface of said member and extend-

ing a material distance therebeyond and between which and the member the blank is withdrawn from the magazine, and means to break the suction to release the blank upon said conveying means which carry the blank along therewith.

2. Blank feeding mechanism, including a movable member carrying means to withdraw a blank from a magazine, and a flexible conveying element paralleling said member in contact therewith and between which and said member the blank is withdrawn, and resilient means maintaining tension on said element.

3. Blank feeding mechanism, including a movable member carrying means to withdraw a blank from a magazine, and a belt conveyor disposed against said member and extending therebeyond, said member withdrawing the blank between itself and said belt conveyor, the latter carrying the blank after it leaves said member.

4. A mechanism for feeding blanks comprising a roll, adjustable hollow friction plugs on said roll, means to apply suction through said plugs, a receptacle for a pile of blanks, the foremost blank of which pile rests against said roll, a conveyor engaging said roll in a manner to control the feed of the blanks from the receptacle so that only one blank may be fed at a time, and means to apply predetermined uniform and continuous pressure to said conveyor regardless of the wear on the respective parts.

5. Feeding mechanism for paper cup blanks, including three successive feeding units operating in synchronism and each arranged to grip the blank and carry it along therewith, one of said units gripping the blank on one side of the median line of the blank, another on the opposite side of the median line, and the other centrally of the blank.

6. Feeding mechanism for paper cup blanks, including three successive feeding units operating in synchronism and each arranged to grip the blank and carry it along therewith, one of said units gripping the blank on one side of the median line of the blank, another on the opposite side of the median line, and the other centrally of the blank, said units being arranged in overlapping order so the blank is never released during the course of travel defined by said units.

7. Feeding mechanism for a blank which is formed into a tapered paper cup by successively folding over a pair of side flaps and turning up the end portion to form a bottom closure and gluing the overlapping parts together, including a plurality of feeding units each arranged to grip the blank and carry it along therewith, one of said units being arranged to engage the blank at one side of its median line to permit a side flap to be folded along a line at an angle to the direction of travel, and another unit engaging the blank over the folded side flap to permit the other flap to be similarly folded.

8. Feeding mechanism for a blank which is formed into a tapered paper cup by successively folding over a pair of side flaps and turning up the end portion to form a bottom closure and gluing the overlapping parts together, including a plurality of feeding units each arranged to grip the blank and carry it along therewith, one of said units being arranged to engage the blank at one side of its median line to permit a side flap to be folded along a line oblique to the direction of travel, and another unit engaging the blank over the folded side flap to permit the other flap to be similarly folded, said units moving continuously and overlapping to an extent that one unit engages the blank before the preceding unit releases it.

9. Feeding mechanism for a blank which is formed into a tapered paper cup by successively folding over a pair of side flaps and turning up the end portion to form a bottom closure and gluing the overlapping parts together, including a plurality of feeding units each arranged to grip the blank and carry it along therewith, one of said units being arranged to engage the blank at one side of its median line to permit a side flap to be folded along an oblique line of fold, another unit engaging the blank over the folded side flap to permit the other flap to be folded along an oblique line opposite in slope to the first line, and another unit arranged to engage the blank after the bottom fold-up is made and directly over the adhesived parts of the blank.

10. Feeding mechanism for a blank which is formed into a tapered paper cup by successively folding over a pair of side flaps and turning up the end portion to form a bottom closure and gluing the overlapping parts together, including a plurality of feeding units each arranged to grip the blank and carry it along therewith, one of said units being arranged to engage the blank at one side of its median line to permit a side flap to be folded at an angle, another unit engaging the blank over the folded side flap to permit the other flap to be similarly folded, and another unit arranged to engage the blank after the bottom fold-up is made directly over the adhesived parts of the blank, said last unit holding the blank a greater length of time than the preceding units to allow the adhesive to set before the finished cup is released.

11. Blank feeding mechanism, including a movable feeding member, a plurality of suction elements on said member for simultaneous engagement with a blank to be fed, said suction elements being arranged for successive engagement and disengagement with the same blank, and suction control mechanism arranged to successively apply and break suction to said elements.

12. Feeding mechanism for a paper blank, including a traveling conveyor, and retarding means to act on a blank on said conveyor and tend to slow the movement of the blank against the urge of the conveyor to force the blank into proper registry, said retarding means including a plurality of channels in staggered and laterally spaced relationship, and a plurality of balls in each channel freely movable and arranged to bear upon a blank carried therebeneath by said conveyor.

13. A mechanism for feeding blanks, including a suction feeder roll with a cylindrical surface having a suction opening therein to withdraw a blank from a magazine when the suction opening is covered by the blank, and a flexible conveyor paralleling the cylindrical surface of said feeder roll adjacent the point of withdrawal of a blank so the blank may be withdrawn by the feeder roll between itself and said conveyor which carries the exposed blank along the blank leaves said roll.

14. A mechanism for feeding blanks, including a suction feeder roll with a cylindrical surface having a suction opening therein to withdraw a blank from a magazine when the suction opening is covered by the blank, and a flexible conveyor paralleling the cylindrical surface of said feeder roll adjacent the point of withdrawal of a blank so the blank may be withdrawn by the feeder roll between the same and said conveyor,

and pressure means arranged to maintain uniform pressure of the conveyor against said cylindrical surface regardless of wear to prevent the entry of more than one blank at a time between the feeder roll and the conveyor.

15. Blank feeding mechanism including a movable member carrying means to withdraw a blank from a magazine, and a flexible conveying element paralleling and in direct contact with said member, and pressure means urging the conveying element into forceful contact with said member sufficiently strong to prevent the introduction therebetween of more than a single blank at a time.

HAROLD S. LABOMBARDE.

CERTIFICATE OF CORRECTION.

Patent No. 2,251,945. August 12, 1941.

HAROLD S. LABOMBARDE.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the grant, line 6, title of invention, for "BLOCK FEEDING MECHANISM" read --BLANK FEEDING MECHANISM--; and in the printed specification, page 5, first column, line 31, for the word "lever" read --level--; page 6, second column, line 65, claim 13, for "along the blank" read --along after the blank--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of October, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)