This invention is a division of my application for patent for an “Automatic blank feeding apparatus for cup forming machines”, filed July 15, 1922, Serial Number 575,341. The present invention relates more particularly to an automatic cup blank elevating and feeding mechanism for a paper cup forming machine, and is provided for the purpose of elevating a stack of cup blanks and then feeding paper cup blanks singly from the top of the stack onto a table into the field of operation of a cup blank advancing mechanism to be advanced into the field of operation of rotating forming dies to permit the blanks to be formed into cups.

It is an object of this invention to provide an automatic table elevating mechanism for cup blanks.

It is also an object of this invention to provide an attachment for a cup forming machine whereby a stack of cup blanks is adapted to be automatically raised a predetermined amount each time a blank is removed from the stack and automatically delivered into the machine.

Another object of the invention is to provide a blank feed mechanism wherein a blank supporting carriage is adapted to be automatically elevated each time a blank is automatically removed therefrom and delivered upon a feed table by a suction means provided for the purpose.

It is a further object of this invention to provide a cup making machine blank feed attachment having a mechanism for elevating a blank carrying carriage, said carriage adapted to be elevated only when the level of the uppermost blank on the carriage is at or below a predetermined elevation.

It is an important object of this invention to provide an improved automatic blank feeding mechanism for a cup forming machine, said mechanism being operable from the machine and having a blank carrying carriage adapted when a blank is removed therefrom to be elevated by a feed device operable by a mechanism automatically governed by the level of the uppermost blank on the carriage.

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

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

On the drawings:

Figure 1 is a fragmentary front elevation of a cup forming machine showing the automatic cup blank elevating mechanism embodying the principles of this invention.

Figure 2 is an enlarged vertical detail view taken on line 2—2 of Figure 1.

Figure 3 is a fragmentary vertical view taken on line 3—3 of Figure 2.

Figure 4 is a vertical detail section of the feed mechanism taken on the line 4—4 of Figure 2 with parts shown in elevation.

Figure 5 is a detail view taken on line 5—5 of Fig. 2 with parts omitted.

Figure 6 is a detail view of the feed release mechanism taken on line 6—6 of Figure 2.

As shown on the drawings:

The reference numeral 1 indicates a machine frame having mounted thereon a stationary inclined table 2 which is rigidly supported upon a bracket 3 of the frame. Also mounted on the machine frame 1 is a slide table 4 which is mounted beneath the table 2 upon suitable guides, the ends of which are supported on the bracket 3. An arm or lever 5 is pivotally mounted on a shaft 6 supported on bearings secured to the machine frame. The free end of the lever 5 is connected by means of a link to one of the supporting brackets of the slide table 4 so that with each oscillation of the lever 5 will cause a corresponding longitudinal movement of the slide table 4 substantially in the plane of the meeting surfaces of the cup forming dies of the cup forming machine.

Any suitable means may be provided for oscillating the lever 5. In the form shown, a pivot shaft 6 with the free end of said arm 7 connected by a spring 8 to the lever 5. A boss 9 is provided on the lever 5 with an adjustable screw 10 extending therethrough and arranged to normally contact with an extension 11 formed on the arm 7. The spring 8 acts to resiliently maintain the screw 10 in contact with the extension 11 of the arm 7. The upper end of an operating bar or rod 12 is connected with a crank arm, not shown. The lower end of the rod 12 is piv-
totally connected intermediate the ends of a lever 13 to a support 14 adjustable by means of a screw 15. The lever 13 has the lower end thereof pivotally supported on a stub shaft 16 supported in a bearing 17 formed on a bracket 18 secured to the machine frame.

Mounted upon the stationary table 2 is a blank retaining spring 19 beneath which cup blanks slide when being advanced to the reciprocating table 4. Secured upon the upper surface of the movable table 4 is a blank guide block 20 and a blank guide flange 21. Secured to the bottom of the stationary table 2 and projecting out over the top of the shiftable table 4 is a blank stop 22. A guide bar 23 is secured to the shiftable table 4.

Attached to the shiftable table 4 is one end of a bar 24 having a rack 25 formed or secured thereon. Fixed on the machine frame 1 is one end of a horizontal beam or bar 26, the outer end of which is supported by means of parallel upright guide rails 27 having the lower ends supported on the bracket 18. Slidably engaged on the bar 24 is a block to which the upper end of the lever 13 is connected to permit the lever 13 when operating to slide the block back and forth on the rack bar extension 24. Fastened to the shiftable block is one arm of an angle member 28 which is disposed to slide on the stationary bar 26. The angle member 28 carries a cup blank gripper mechanism 29.

A toggle device 30 is connected with the gripper mechanism 29. Fixed on the stationary bar 26 is a boss 31 having a set screw 32 adjustable engaged therethrough and disposed in the path of the toggle device 30 to break the straight line toggle connection when the gripper mechanism 29 is at one end of its movement. Also fixed on the bar 26 is the boss 33 having an adjustable set screw 34 disposed in the path of the toggle device 30 to move the same into a straight line position when the gripper mechanism is at the other end of its movement. When the toggle device is moved into straight line position the gripper mechanism is actuated to grip a cup blank on the stationary table. When the toggle device straight line position is broken by contact with the set screw 32 the gripper mechanism releases the cup blank.

Bolted or otherwise secured upon the horizontal bar 26 is a plate 35 having a long arm 56 and a short arm 37 formed thereon. Also formed on the plate 35 is a bearing sleeve 58 through which the upper plain end of a feed screw 39 projects. The lower end of the feed screw 39 is journaled in a bearing sleeve 40 formed on the bracket 18. A handle 41 is secured on the upper end of the feed screw 39 for manual rotation of the feed screw when desired.

A vertically movable carriage 42 is provided having an inclined top plate for carrying a stack of cup blanks 43. Mounted on the carriage 42 are rollers 44 and 45 which are positioned to track on opposite sides of the guide rails 27 to hold the carriage in a predetermined path. Formed on the carriage 42 is an arm 46 having an opening therein through which the feed screw 39 projects. Pivotally mounted on the carriage arm 46 by means of a pin 47 is a pair of gripping handles 48 formed thereon for engagement with the feed screw 39. The handles 48 are separated by means of a coiled spring 50 which acts to hold the two half nuts 49 engaged against opposite sides of the carriage feed screw to permit the carriage to be raised or lowered when the feed screw 39 is rotated.

The mechanism for automatically rotating the feed screw to move the carriage comprises a ratchet 51 which is fixed on the feed screw 39. A pawl 52 co-acts with the ratchet 51 and is supported on a pin 53 which projects downwardly through an opening provided in one arm of a bell-crank 54. The bell-crank 54 is pivotally engaged on the upper portion of the feed screw 39 between the ratchet 51 and the bearing 38. Attached to the bell-crank 54 is one end of a spring 55 which is formed to engage against a flattened surface on the lower projecting end of the pin 53 to hold the pawl in resilient contact with the ratchet 51. Connected to the long arm of the bell-crank 54 is one end of a coiled spring 56 the other end of which is attached to the arm 36 of the plate 35. The spring 56 acts to normally hold the long arm of the bell-crank 54 against the end of a stop pin or rod 57 which is fastened to one side of the arm 36 to limit the throw of the bell-crank by the spring 56.

Projecting through the upright arm 36 is an upper horizontal stationary rod or shaft 58 provided with a longitudinal slot 59 (Fig. 1). An arm 60 is rigidly secured near the slotted end of said shaft 58. A short rod 61 is secured to the outer end of the arm 60 and is disposed parallel to the upper shaft 58. Also supported on the arm 60 is a lower horizontal stationary rod or shaft 62 parallel and disposed below the upper shaft 58. Slidably engaged on both of the shafts 58 and 62 to the outside of the arm 36 is a sliding yoke or bracket 63 having an arm 64 integrally formed thereon. Fastened to the yoke arm 64 is a member 65 to which one end of a bar 66 is secured. The bar 66 is positioned to slide on a shoulder 67 provided on the stationary arm 36 to permit said bar 66 to co-act with the bell-crank 54 to cause rotation of the feed screw 39 by the pawl 52 acting on the ratchet 51. Pivotally connected to one end of the member 65 is one end of a link 68 the
other end of which is pivotally connected to one end of a beam 69 fulcrumed on a pin 70 on the slidable yoke 63. A roller 71 is rotatably mounted on the second end of the fulcrumed beam 69 and is positioned to track upon the uppermost cup blank 43 when the upper level of the stack of cup blanks reaches or passes a predetermined level. In case the cup blank carrying carriage has been fed upwardly to position the level of the uppermost cup blank above a proper feeding position, the roller 71 riding on the uppermost cup blank will cause the beam 69 to be tilted so that the bar 66 will be tipped upwardly above the level of the bell-crank 54 to prevent the bar 66 from operating said bell-crank, thus temporarily discontinuing the upward feed of the carriage 42 by the feed screw 39.

Rotatably supported on the short upright arm 37 of the plate 35 is a gear 72 which is in mesh with the lower rack 26 and with an upper rack 73. The upper rack 73 is horizontally disposed and is secured to the lower end of an intermediate bracket or yoke 74 which is slidably mounted on both of the stationary shafts 58 and 62. The rack 73 is provided with a shoulder 75 adapted to coact with the yoke 63 to slide the same in one direction on the shafts 58 and 62. A cylindrical extension rod 76 is integrally formed on the rack 73 and slidably projects through an opening provided in the lower portion of the yoke 63. A head 77 is formed on the end of the rack extension rod 76 to slide the yoke 63 in the opposite direction on the shafts 58 and 62.

Integrally formed on the arm 36 is a boss 78 (Figure 3) in which one end of a stationary stub shaft 79 is rigidly secured. Fastened to the stub shaft 79 is a bracket 80 which projects outwardly and downwardly and has a stop arm 81 secured thereto in position to serve as a stop against which the uppermost cup blanks 43 are adapted to engage to hold the cup blanks properly stacked on the carriage 42.

Rigidly secured on the end of the stub shaft 79, is a casting or block 82 having an opening therein through which a rod or shaft 83 slidesably projects. A head 84 is fixed on the outer end of the shaft 83 to limit the inward movement of said shaft when said head 84 contacts the block 82. Secured on the inner end of the shaft 83 is a plate 85 having a cam edge 86. A projection or stop is formed on the cam plate 85. Wound around the shaft 83 is a coiled spring 87 one end of which bears against the block 82 while the other end engages against the cam plate 85. The cam plate 85 is positioned to slidably project through a guide block 88 integrally formed on the yoke 74 and against which the projection on the cam plate 85 is adapted to be engaged. Slidably projecting through an opening in the block 88 is a rod 89 having stop collars 90 secured on one end thereof. A coiled spring 91 is engaged around the rod 89 between the block 88 and the stop collars 90. Rigidly secured or integrally formed on the other end of the slidable rod 89 is a guide cam 92 having a cam edge 93 which together with the cam edge 86 of the plate 85 affords a guide passage for a roller 94. The roller 94 is adapted to roll on the cam edge 86 of the cam plate 85.

A cup blank buckling mechanism is provided and comprises a bracket 95 which is supported on the shaft 79 and has pivotally supported in the bifurcated end thereof a bar 96. A counterweight 97 is adjustably engaged on a reduced end of the bar 96. A spring controlled cup blank pusher 98 is pivotally supported on one end of the bar 96. A spring controlled cup blank pusher 98 is pivotally supported on one end of the bar 96. Secured to the bar 96 is an arm 99 having a tapered finger 100 formed thereon. An arm 101 is positioned to co-act with the tapered finger 100. A set screw 102 is set to co-act with the handle of the pusher 98 at a predetermined time.

Slidably engaged on the shafts 58 and 62 is a block or yoke 103 connected to the slidable yoke 74 by a spring 104. The yoke 103 is provided with a key which slides in the groove 59 of the shaft 58. A valve mechanism 105 is mounted on the yoke 103 and has an exhaust pipe 106 connected in an outlet thereof. A flexible hose or pipe 107 has one end connected in an intake passage of the valve mechanism 105 and the other end connected to a suction block or nozzle 108. The suction block 108 is pivotally between a pair of arms 109 which are supported on a bracket 110 secured to the slidable yoke 103. A lever or arm 111 is connected to the valve stem of the valve mechanism 105 for co-action with the rod 61 (Figure 1) and a rod 112 secured to the stationary arm 36.

Mounted on the machine frame is an air nozzle 113 (Figure 3) connected with an air supply pipe 114 having a control valve 115 therein. The air nozzle 113 is provided to blow air between the upper cup blank 43 on the feed carriage 42 to separate said blanks to permit proper automatic feeding of the same into the machine. Guide bars 115 are supported on the machine frame and are positioned to serve as guides for the stack of cup blanks 43 on the carriage 42.

The operation is as follows:

When the machine is operating a reciprocating motion is given to the slide table 4 by means of the lever 5 which receives a drive from the machine through the shaft 6. Before the machine is started the handles 48 are gripped manually and forced together thereby compressing the spring 50 and moving the half nut members 49 out of engagement with the carriage feed screw 59. The carriage 42 is thus released and is permitted
to slide downwardly with the guide rollers 44 and 45 tracking on opposite sides of the guide rails 27. The carriage 42 is thus lowered to the lower end of the feed screw or to any desired elevation. The handles 48 and the further tooling are so designed as to force said handles apart thereby again moving the half nuts 49 into threaded engagement with the feed screw 39. A stack of cup blanks of the required shape are now placed upon the inclined top plate of the carriage 42 and against the guide bars 116 and the guide 81 which act to hold the cup blanks properly stacked upon the feed carriage.

When the machine is started, the table 4 is reciprocated as already described. As shown in Figure 5 the spring 56 acts to hold the long arm of the bell-crank 54 against the end of the stop pin 57 and the spring 55 holds the pawl 52 in engagement with the ratchet 51 to prevent reverse rotation of the ratchet and the feed screw 39. As the table 4 is moved from its innermost position (Figure 1) outwardly beneath the stationary table 2, the rack 25 attached to the sidetable table 4 is moved outwardly thereby rotating the gear 72 which being in mesh with the rack 73 pulls said rack inwardly thereby sliding the yoke 74 and at the same time pulling the rack extension 76 through the yoke 63 until the head 77 contacts said yoke 63 and forces the same inwardly on the shafts 58 and 62 toward the stationary arm 36. As the yoke 63 slides inwardly, the bar 66 connected with said yoke slides inwardly over the shoulder 67 of the arm 36 and is forced against the bell-crank 54 operating the same and thereby causing the pawl 52 to rotate the ratchet 51 and the feed screw 39. It will thus be noted that as the table 4 continues to be reciprocated, the feed screw 39 is rotated, thereby causing the carriage 42 to be gradually elevated to raise the stack of cup blanks a predetermined amount with each reciprocation of the slide table.

It is desired to keep the level of the uppermost blank of the stack at a certain height to permit proper feeding of the cup blanks into the machine. Should the blank carrying carriage 42 be elevated too high, the roller 71 is adapted to track over the top of the stack of cup blanks and causes the beam 69 to pivot thereby forcing the link 68 downwardly to cause the bar 66 to swing upwardly out of the plane of the bell-crank 54. The bar will thus pass over the bell-crank 54 and will not actuate the same so that the further feed movement of the carriage will take place until the level of the stack of cup blanks has been reduced to the required level.

It will thus be noted that the feed carriage 42 is adapted to be automatically fed upwardly as cup blanks are taken therefrom and that the feeding of the carriage is automatically stopped when the cup blanks are elevated above a predetermined level.

When the machine is in operation, the air valve 111 is brought into contact with the cup blanks so that the cup blanks can be pushed from the stack by the moving carriage 42 upwardly as cup blanks are taken therefrom and that the feeding of the carriage is automatically stopped when the cup blanks are elevated above a predetermined level. This is done to separate the flat cup blanks so that only one blank at a time will be removed from the stack.

The suction mechanism 108 is next brought into operation to produce a suction to automatically draw the uppermost cup blank 43 upwardly against the bottom of the suction block. As this operation takes place, the yoke 74 moving on the shafts 58 and 62 approaches the stationary arm 36 thereby carrying the block 88 toward the pusher mechanism. The arm 101 is thus moved into engagement with the tapered finger 100 thereby causing the fulcrumed bar 96 to swing downwardly raising the counterweight 97. As this operation occurs, the screw 102 is brought into contact with the upper end of the pusher handle to swing the same causing the pusher head 98 to push the uppermost cup blank and buckle the same as illustrated in Figure 3, to separate the uppermost blank from the blank immediately therebelow. The uppermost blank is thus attracted to the suction device 108 and then buckled by the pusher head ready to be lifted from the stack and transferred onto one end of the stationary table 2.

The gripper mechanism is now brought into position to clamp one margin of the raised cup blank as the suction device is operated to cause automatic release of said cup blank. The gripper mechanism now acts to draw or advance the cup blank over the stationary table and beneath the retaining spring 19 and onto the table 4 against the stop flange 21 and in front of the stops 20 and 22. When the cup blank has been sufficiently advanced upon the slide table 4 the toggle mechanism 30 contacting the screw 32 causes automatic release of said cup blank. With the cup blank advanced onto the table 4 a portion of the cup blank projects beyond the advance edge of said table and is disposed substantially in the plane of the meeting surfaces of the cup forming dies of the cup forming machine ready to be formed into a cup and then discharged.

The cycle of operations may be repeated as often as desired to permit the cup blanks 43 on the carriage 42 to be automatically elevated and the blank carrying carriage 42 will take place until the level of the stack of cup blanks has been reduced to the required level.

It will thus be noted that the feed carriage 42 is adapted to be automatically fed.
into the field of operation of the cup forming dies to be formed into cups.

The feed screw 39 may be operated manually, by means of the handle 41, if desired to cause raising or lowering of the blank carrying carriage 42.

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 purport limiting the patent granted hereon, otherwise than necessitated by the prior art.

I claim as my invention:

1. A cup blank feeding attachment comprising a feed screw, a cup blank supporting carriage, gripping means thereon for engaging the feed screw, a pawl and ratchet mechanism connected with said feed screw, a blank feeding table, means for reciprocating the same, a rack mechanism operated by said blank feeding table, and means actuated by said rack mechanism for operating the pawl and ratchet mechanism to cause rotation of the feed screw and elevation of the carriage.

2. In a blank feeding attachment, the combination with a feed screw, a cup blank supporting carriage, longitudinally movable with respect thereto, means on said carriage for releasably engaging the feed screw, a pawl and ratchet mechanism connected with the feed screw, reciprocating rack means for actuating the pawl and ratchet mechanism to cause rotation of the feed screw to elevate the carriage, and means connected with the reciprocating means and adapted to track on the cup blanks on said carriage to cause the reciprocating means to miss operating the pawl and ratchet mechanism when the level of the cup blanks on the carriage had been raised above a predetermined height.

3. The combination with a cup forming machine, of a bracket thereon, a bar supported on the machine, guides rails connecting said bracket with said bar, a feed screw supported by the bracket and bar, a carriage adapted to support a stack of cup blanks, guides for retaining the cup blanks properly stacked, rollers on said carriage engaged to roll on said guide rails, an apertured projection on said carriage through which the feed screw projects, handles pivoted on said projection, nut members on said handles, a spring between said handles for normally holding the nut members engaged with said feed screw, means for actuating the feed screw to cause the carriage to be elevated, a reciprocating member for actuating said means, a rack operated device for operating the reciprocating member, and a control mechanism supported on the rack operated device and connected with said reciprocating member adapted to have rolling contact with the cup blanks on said carriage to cause the reciprocating member to be moved to miss operating said means when the blanks on the carriage have been raised too high.

4. The combination with a cup forming machine, of a blank carrying carriage supported thereon, rack and gear means operated from the machine for elevating the carriage, and a control mechanism connected with the rack and gear means and governed by the height of the upper level of the blanks on said carriage to cause said means to fail to elevate the carriage when the level of the blanks on said carriage is above a predetermined height.

5. The combination with a cup forming machine, of a support mounted thereon, an adjustable cup blank carrying carriage on said support, means for elevating the carriage, a gear and double rack mechanism operable from the machine, and a device actuated thereby for operating said elevating means to cause said carriage to advance the cup blanks.

6. The combination with a cup forming machine, of a support mounted thereon, an adjustable cup blank carrying carriage on said support, means for elevating the carriage, a gear and double rack mechanisms operable from the machine, a yoke member slidably supported on the support, an actuating mechanism carried thereby, and stops on one of said double rack mechanisms for reciprocating the yoke member and said actuating mechanism to cause the actuating mechanism to operate the elevating means to raise the carriage.

7. The combination with a cup forming machine of a reciprocating table operated thereby, a carriage for carrying a stack of cup blanks, means operated from the reciprocating table for elevating the carriage, a device for separating the upper cup blanks of said stack, and means for automatically causing said elevating means not to elevate the carriage when said stack of blanks has been raised above a predetermined level.

8. A cup blank feeding attachment comprising a feed screw, a support for holding the same against longitudinal movement, a cup blank carrying carriage, an apertured arm formed thereon through which the feed screw projects, handles pivoted on said arm, nut members on said handles, a spring between said handles for holding the nut members engaged with said feed screw, means for actuating the feed screw to cause the carriage to be elevated, a reciprocating member for actuating said means, the reciprocating member, and a control mechanism supported on the rack operated device and connected with said reciprocating member.