June 9, 1931. T. STENHOUSE ET AL 1,809,793

GLASS FORMING MACHINE

Filed May 11, 1926 3 Sheets-Sheet 1

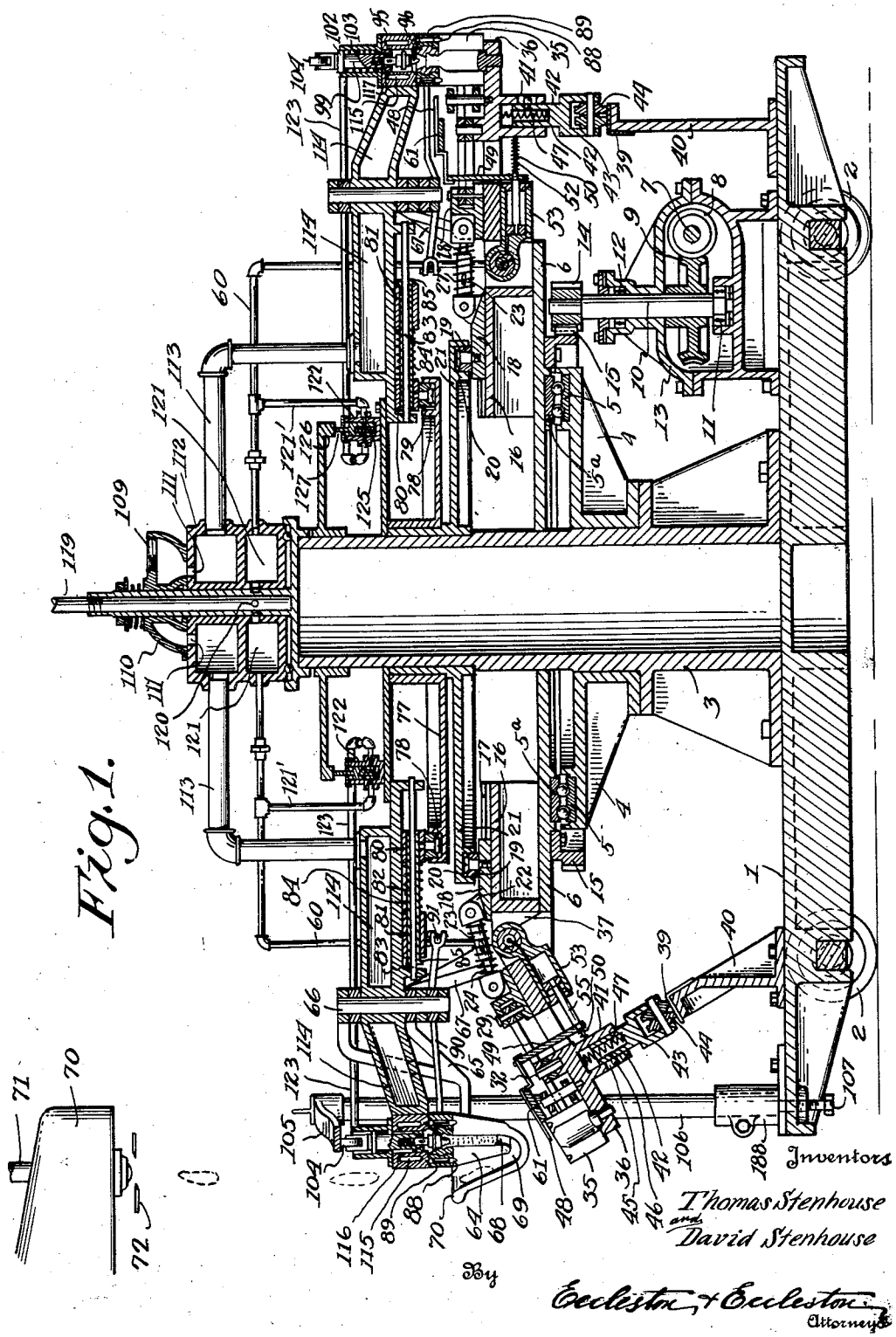


Fig. 1.

Inventors
Thomas Stenhouse
and
David Stenhouse

By
Eccleston & Eccleston
Attorneys

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Filed May 11, 1926 3 Sheets-Sheet 2

Fig. 2

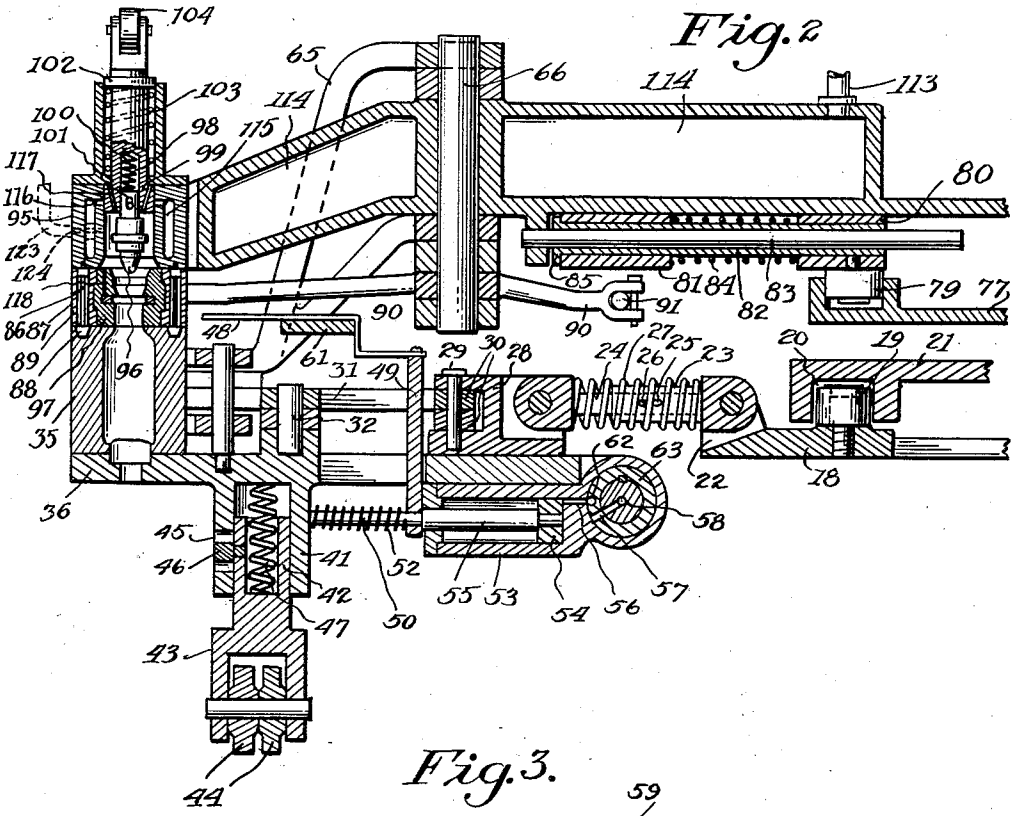
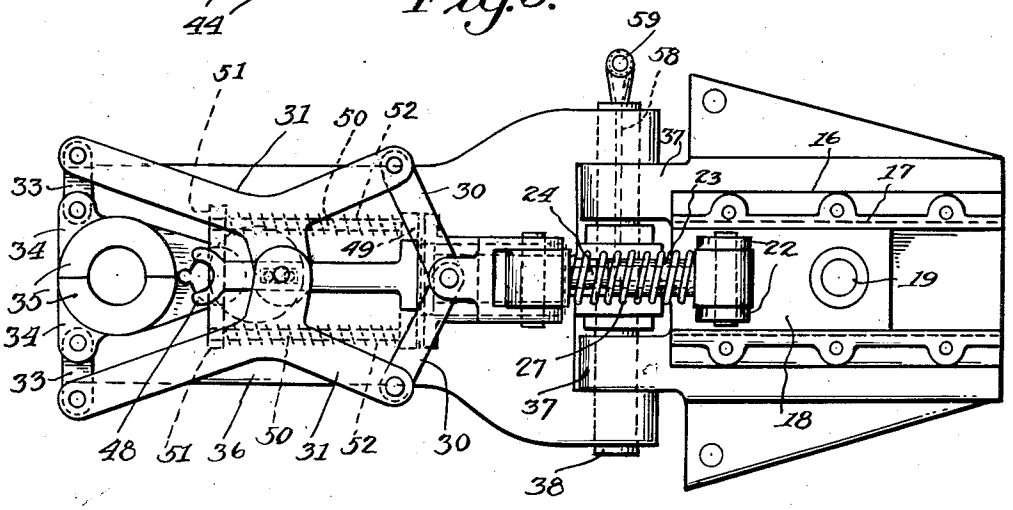


Fig. 3.



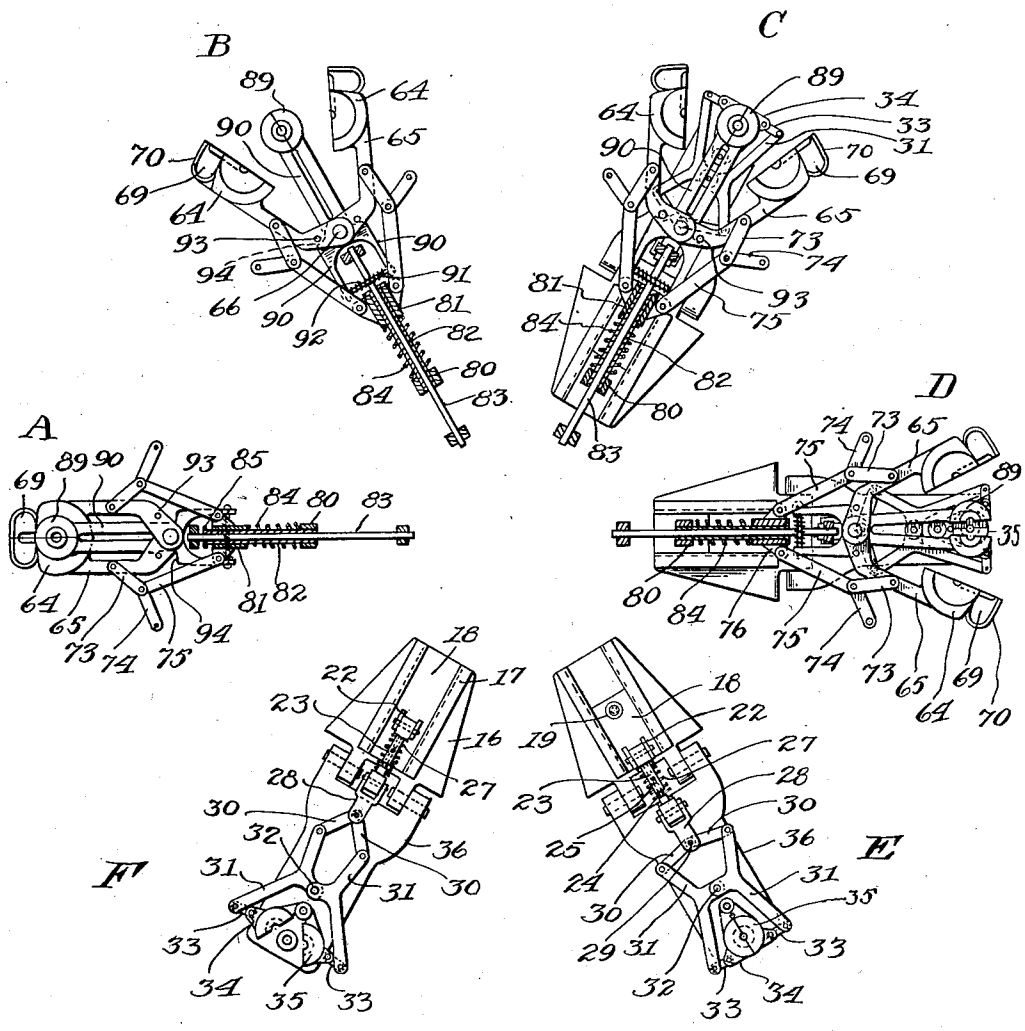
INVENTORS
Thomas Stenhouse
BY and David Stenhouse
Eccleston & Eccleston
ATTORNEYS

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GLASS FORMING MACHINE

Filed May 11, 1926 3 Sheets-Sheet 3

Fig. 4.



Inventors
Thomas Stenhouse
and David Stenhouse
Eccleston & Eccleston,
Attorneys

Patented June 9, 1931 1,809,793

UNITED STATES PATENT OFFICE

THOMAS STENHOUSE AND DAVID STENHOUSE, OF WASHINGTON, PENNSYLVANIA, ASSIGNORS TO HAZEL-ATLAS GLASS COMPANY, OF WHEELING, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA

GLASS FORMING MACHINE

Application filed May 11, 1926. Serial No. 108,326.

The invention relates to forming machines for bottles or the like, and particularly to bottle forming machines of the continuously revolving type; though it may also be operated as an intermittently rotated machine. In its general arrangement the present machine resembles the well known Owens type of machine. One of the most serious disadvantages of the Owens type of machine is that it requires the use of the expensive revolving pot feeding method; and one of the principal objects of the present invention is to entirely eliminate the use of this method of feeding, and substitute therefor the method of feeding formed gobs to the parison molds, by the well known reciprocating plug feeder, or any other feeder for delivering formed charges; this feeding operation being accomplished while the mold table continues to rotate.

Any type of gob feeder may be used in connection with this forming machine, though we preferably employ the well known reciprocating plug feeder. In order that the feeder may be made to synchronize in time and phase relation with the operation of the forming machine, we preferably employ the time and phase distributing valve disclosed in the application of David Stenhouse, Serial No. 28,750, filed May 7, 1925. By the use of this valve mechanism the feeder may be so adjusted as to deliver the glass charges at the proper instants, so that the charges are received by the molds as they successively pass under the feeding mechanism. If the parts are out of phase they may be adjusted into phase while the complete apparatus continues its operation. The valve mechanism above referred to, is also capable of a time or dwell adjustment to accurately regulate the weight of the charges, and this adjustment may also be made while the complete apparatus continues its operation.

A further object of the invention is to provide a simple and efficient means to prevent the ware from sticking to either side of the mold, while the mold is being opened, and to positively eject the finished articles at exactly uniform intervals, and in an exactly uniform manner, thus facilitating the adaptation of receiving mechanisms, which depend for their successful use on uniformity of delivery both as to time and manner.

While the invention disclosed herein presents numerous novel constructions, the advantages of which will be apparent to those skilled in the art, yet it will be understood that the broad idea involved resides in feeding formed charges through the lower ends of molds during the continued rotation of the molds. It is old to draw glass up through the lower ends of molds, from a glass pot, while the molds continue to rotate; and it is believed to be old to feed formed charges through the lower ends of molds while the molds are stationary; but it is believed to be broadly new to provide means capable of feeding formed charges through the lower ends of molds while the molds continue to rotate.

The preferred form of the construction will now be described; reference being had to the accompanying drawings, in which:

Figure 1 is a vertical sectional view of the apparatus; a glass feeder being diagrammatically illustrated in connection therewith.

Figure 2 is an enlarged vertical sectional view of one of the units of the forming machine, showing the finishing mold in closed position.

Figure 3 is a detail plan view showing the blow mold and its operating mechanism, and also showing the ejector mechanism; and,

Figure 4 is a diagrammatic view illustrating positions assumed by the neck rings, parison molds and finishing molds, during a complete rotation of the forming machine.

Referring to the drawings, more in detail, numeral 1 indicates the base plate of the machine, which is preferably mounted on wheels 2. A hollow central column 3 is fixed to the base plate, and carries a stationary bracket 4 for the reception of a ball race 5. A rotary table member is indicated by numeral 6, and this table is provided on its under side with a ball race 5^a cooperating with the ball race 5. The table 6 is preferably continuously rotated by means of an electric motor (not shown) geared to the shaft 7 of the worm 8 meshing with the worm wheel 9 keyed to the

vertical shaft 10, suitably fitted with ball bearings 11 and 12 within the gear casing 13. A pinion 14 is keyed to the upper end of the shaft 10 and meshes with a ring gear 15 which is attached to the under side of the revolving table 6.

The table 6 may be continuously rotated by the particular mechanism described above, or it may be continuously rotated by any other appropriate mechanism, or means may be provided for intermittently rotating the table.

The apparatus for operating the blow or finishing molds will first be described; and as the units are all the same, the description of one of them will suffice. Of course the forming machine will be provided with any desired number of units, but the present machine comprises twelve units.

A guide member 16 is provided for each blow mold unit, and the guide members are fixed to the rotating table 6 and are provided on their upper side with guides 17, between which guides a slide member 18 is mounted. The slide 18 is moved radially back and forth at the proper times, by means of a roller 19 which is mounted on the upper side of the slide and engages in a cam groove 20 provided in the plate 21 which is fixed to the column 3.

Lugs 22 are provided adjacent the outer end of the slide 18 and a compressible link has one end thereof attached to these lugs. The compressible link consists of two telescoping members 23 and 24; the member 24 being received within the member 23, and the member 23 being pivotally attached to the lugs 22. The member 23 is provided with a slot 25, and the member 24 is provided with a retaining pin 26; the pin and slot limiting the relative movement between the two members 23 and 24. A compression spring 27 surrounds the telescoping members, and is held under compression between the shoulders formed by the end hinge parts.

The link member 24 is pivotally attached to a slide 28, and pivotally attached to the slide, by means of a vertical pin 29, are two links 30. These links are pivotally connected at their outer ends to levers 31 which are pivotally mounted on the pin 32; and the outer ends of the levers are pivotally connected to links 33, which links are pivotally attached to the usual lugs 34 provided on the blow molds 35.

In operation, the cam groove 20 will advance and retract the slide 18; and the connections between the slide 18 and the levers 31, will cause the blow mold to be opened when the slide is advanced, and to be closed when the slide is retracted. The telescoping link 23, 24, and spring 27, provide a safety feature, by which breakage of parts will be avoided if for any reason it is impossible to entirely close the blow mold.

The blow mold plate is indicated by numeral 36, and it is hinged to the member 16 by means of lugs 37 and pin 38. Thus the plate may be raised and lowered to bring the blow mold 35 into and out of contact with the neck ring. This raising and lowering of the blow mold plate is accomplished by means of an inclined track 39 which is supported by suitable brackets 40 secured to the base plate 1. The under side of the blow mold plate is provided with a hollow sleeve 41 which receives the hollow stem 42 of the fork 43, carrying the rollers 44 which engage the track 39. The sleeve 41 is provided with a slot 45 in which operates a pin 46 carried by the hollow stem 42, and a compression spring 47 is arranged within the hollow sleeve and hollow stem.

In operation, the rollers 44 follow the inclined track 39 as the table revolves, so that the blow mold is raised, at the proper time, into cooperating relation with the neck ring; and at the proper time is lowered away from the neck ring. By means of the pin 46, slot 45 and spring 47, the various parts are held under tension, and an intimate contact between the neck mold and blow mold is maintained, irrespective of any variation in the length of the molds or inequalities in the track 39; and further, the pin, slot and spring also provide a safety feature, by which the straining or breakage of parts will be avoided if for any reason it is impossible to elevate the blow mold into its usual intimate contact with the neck ring.

The means for raising and lowering and opening and closing the blow molds has been described above. In connection with each blow mold we provide means for steadying the bottles and preventing them from sticking to either mold section; and as such means is associated with the blow mold, it may appropriately be described at this point.

In the specific form illustrated herein we employ a fork shaped member 48 for effecting the functions mentioned above. This fork is attached to the upper end of a cross bar 49, and the crossbar is slidably mounted on a pair of rods 50 which are fixed in lugs 51 projecting downwardly from the under side of the blow mold plate 36. A spring 52 is mounted on each of the rods 50, and one end of these springs bear against the fixed lugs 51, and at their opposite ends the springs bear against the cross-bar 49; whereby the cross-bar and the fork are forced to retracted position during the time that the blow mold and neck ring mold are in contact. For the purpose of moving the cross-bar and fork in the opposite direction, we provide a cylinder 53 which is arranged below the blow mold plate 36 and which is hingedly mounted on the pin 38. This cylinder is provided with a piston 54 and piston rod 55; the latter being attached to the cross-bar 49. Thus

when compressed air or other operating fluid is admitted to the inner end of the cylinder 53 the piston and piston rod will be moved outwardly, whereby the fork 48 will be advanced.

When the blow mold plate 36 is lowered to remove the blow mold from contact with the neck ring mold, the operating fluid should be admitted to the cylinder to advance the fork. To effect this function we provide the cylinder with an inlet port 56, and when the plate 36 and cylinder 53 are lowered, this port is brought into communication with the passage 57 which leads to a longitudinal hole 58 bored through the hinge pin 38. This longitudinal passage communicates with a supply inlet 59, which is connected to a compressed air pipe 60. Thus when the blow mold plate 36 is lowered compressed air or other operating fluid will be admitted through the port 56 to the inner end of the cylinder 53, thereby advancing the fork 48 to a position where it is around the neck of the bottle. The fork is held in this position while the blow mold is being partially opened, by means of a narrow lug or abutment 61 secured to the under side of the fork stem, and which is adapted to contact with the edge of the unopened or partially opened blow mold 35, at the joint thereof. The bottle will thus be steadied and prevented from sticking while the mold is being opened. However, when the mold has been opened sufficiently to permit the free ejection of the bottle, the lug 61 will be freed from its engagement with the mold, thereby permitting further advancing movement of the fork to positively tip forward the finished article into a suitable receiver.

At the proper time the blow mold plate is again elevated to bring the blow mold into position to contact with the neck ring mold, and when this takes place the cylinder 53 is also raised, thereby breaking the communication between port 56 and passage 57, and opening communication between port 56 and a passage 62 in the sleeve 63, which passage communicates with the atmosphere and permits the cylinder 53 to exhaust. When the cylinder is thus opened to exhaust, the springs 52 force the fork 48 to its retracted position, where it remains until the blow mold is again lowered out of contact with the neck ring.

By the use of the above described mechanism the ware is not only steadied and prevented from sticking to the mold, but also the ware is positively ejected at exactly uniform intervals and in an exactly uniform manner, thus facilitating the adaptation of receiving or transferring mechanisms. It is understood, of course, that each unit is equipped with an individual steadier and ejector.

We shall now describe the blank or parison mold, and its peculiar novel function and operation.

The blank mold is indicated by numeral 64, and as usual, this mold is formed of two half sections, which are carried by arms 65 hingedly mounted on the pin 66 carried by the bracket 67 extending upwardly and outwardly from the table 6. The blank mold is also provided with the usual mold cavity 68. In the well known Owens machine the glass is drawn up into the blank mold from a glass pot; and in other types of forming machines the blank molds are inverted to receive formed charges; but one of the objects of the present invention is to eliminate the glass pot of the Owens machine, and also to avoid the necessity of inverting the blank mold which is necessary in other types of machines; and in place of such structures to provide means whereby formed charges may be fed to the blank molds through the bottom thereof, and while the molds continue to rotate. The novel construction of the blank mold, by which this is accomplished, consists in providing the mold with an additional cavity, indicated by numeral 69, which communicates with the lower end of cavity 68 and extends upwardly terminating in an upwardly presented flared mouth 70, which is preferably oval shaped. Each parison mold is, of course, provided with this upwardly presented passage, and as the molds pass successively under the feeder, a formed charge is dropped into the passage and is immediately drawn upwardly by vacuum into the usual parison mold cavity 68 and into the neck ring, by means to be hereinafter described. In Figure 1 we have illustrated diagrammatically a portion of a conventional reciprocating plug feeder, comprising the flow spout 70', reciprocating plug 71, shears 72, etc. The gobs are formed in the usual manner by this type of feeder, or any other feeder which produces formed charges, are severed in the ordinary manner, and drop into the flared receiving passage, where the application of a vacuum draws the gob into the desired position in the parison mold cavity and neck ring; all of which is accomplished during the continued rotation of the molds. We thus wholly eliminate the objectionable revolving pot of the Owens machine, and also avoid the necessity of inverting the parison mold, which is necessary in other types of intermittently or continuously rotating machines. It will be understood that the upwardly presented mouth 70 of the passage 69 may be of any desired size or shape to facilitate the introduction of the glass charges, though we prefer the oval shape. It might also be mentioned that, if desired, air pressure may be applied to the mouth 70, after the charge has been introduced, for the purpose of assisting the vacuum in com-

pressing the charge in the parison mold cavity and neck ring.

The specific mechanism for opening and closing the parison mold sections, will now be described.

As stated above, the parison mold sections are carried by arms 65, which are hingedly mounted on the pin 66. Links 73 are pivotally attached to the arms 65, and at their opposite ends the links 73 are pivotally connected to links 74 which have their opposite ends pivotally attached to the frame, whereby toggles are formed, as clearly shown in Figure 4. Pivotally attached to the joint of each toggle is a link 75, and at their opposite ends these links 75 are pivotally attached to wing lugs 76 which are carried by a slide member which will now be described. Numeral 77 indicates a plate which is bolted or otherwise fixed to the column 3, and which is provided with a cam groove 78. A roller 79 rides in the cam groove and is attached to the part 80 of the two part slide comprising parts 80 and 81. The part 80 of the slide is fixed to a sleeve 82 which is slidably mounted on the slide rod 83. The other part 81 of the slide is slidably mounted on the sleeve 82, and a spring 84 mounted on the sleeve and extending between the two parts 80, 81, normally holds the part 81 in its forward position against the head 85 of the sleeve. The above mentioned wing lugs 76, to which the links 75 are pivotally attached, are carried by the part 81 of the slide.

In operation, as the machine rotates the cam groove will, at the proper moment cause the slide part 80 to be retracted, and the head 85 will cause the slide part 81 to be retracted, whereby the links 75 will pull inwardly on the toggle joints and cause the parison mold to be opened. Also at the proper moment the cam groove will advance the slide part 80, and the spring 84 will cause the slide part 81 to be advanced, whereby the links 75 will exert an outward pressure on the toggles and cause the parison mold to be closed. This particular operating mechanism possesses two advantages. First, the spring connection between the two slide parts causes the molds to be held tightly closed under compression independently of any irregularity of the cam groove, or normal wear of the pins, connecting parts, or other parts; and second, a safety factor is provided, for in the event that any obstruction prevents the mold from entirely closing, the further advancing movement of the slide part 80 would merely increase the pressure on the spring 84, and without causing the straining or breaking of any parts.

It is essential, of course, that the mold cavity in the parison mold align with the cavity in the neck ring mold, and to insure such alignment a plurality of pins 86 are attached to the suction and blowing head, and extend downwardly through passages 87 in the neck ring mold. The lower ends of these pins project slightly below the neck ring mold and are provided with knobs 88 which are adapted to be received in cooperating half notches provided in the contacting faces of the parison mold half sections. Thus when the parison mold is closed each half notch will embrace a half of a knob 88, thus assuring proper alignment between the neck ring mold and the parison mold. It is also essential, of course, that the neck ring mold and blow mold be properly aligned, and accordingly the contacting faces of the blow mold half sections are also provided with cooperating half grooves; so that after the parison mold has been moved away, and the blow mold has been moved into place, each half notch will embrace a half of a knob 88, thus assuring the proper aligned relation between the neck ring mold and the blow mold.

From the above description it will be seen that the pins 87, which are carried by the suction and blowing head, cause the proper alignment to be maintained between the neck ring mold and the parison mold, and also between the neck ring mold and the blow mold; and it will be understood that these pins also assure proper alignment between the neck ring mold and the suction and blowing head.

The neck ring mold, and the means for opening and closing the same, will now be described.

The neck ring mold is indicated by numeral 89, and as usual it is formed of half sections. The neck ring mold sections are mounted on arms 90 which are hingedly mounted on the pin 66; and these arms extend on inwardly beyond the pivot pin, in spaced parallel relation. A transverse pin 91 is arranged between the inner ends of these arms and a coil spring 92 is mounted on the pin so that the ends of the spring normally force the inner ends of the arms outwardly, thereby forcing inwardly the outer ends of the arms which carry the neck mold sections, thus forcing the neck mold sections tightly together.

For the purpose of opening the neck ring mold, we provide the arms 65, which carry the parison mold, with lugs or pins 93; and when the parison mold is opened wide enough these pins are arranged to strike against shulders 94 on the neck ring mold arms 90, and force the inner ends of these arms toward each other against the pressure of the spring 92, and thereby open the neck mold. It will be understood, of course, that the cam groove 78 which causes the opening and closing of the parison mold, is so designed that when it first opens the parison mold the neck ring mold remains closed; but after the blowing of the article is completed and it is desired to release the neck of the bottle, the cam groove 78 causes the parison mold to be further opened, whereupon the pins or lugs 93 strike the shoulders 94 of the arms 90 and

thereby cause the neck ring mold to be opened to release the article, which is still retained in the blow mold.

The construction of the suction and blow head, the means for applying the suction, the means for forming the initial blow opening, and the means for blowing the article, will now be described.

The suction and blow head is indicated generally by numeral 95. Just before the suction draws the glass charge up into the parison mold cavity 68 and into the finish of the neck ring, the core or plunger 96 for forming the initial blow opening, is lowered to seat on the neck ring 97 which is carried in the neck ring mold 89 in the usual manner. The core or plunger 96 is mounted in a recess 98 provided in a reciprocable plunger holder 99, and a spring 100, mounted in the recess, forces the core downwardly; there being a pin and slot connection 101 between the plunger and the reciprocable plunger holder, to limit the relative movement between these two elements. The upper end of the reciprocable plunger holder is provided with a collar 102, and a coil spring 103 surrounds the reciprocable member and presses against the collar 102 to elevate the reciprocable member and the core 96 carried thereby.

The upper end of the plunger holder 99 is provided with a roller 104 which is adapted to engage a cam track 105 supported by columns 106 carried by the frame 1. The column 106 is located at a corner of the square frame 1, so that it will be out of the path of the moving parts. The track 105 has an inclined approach, and the roller 104 contacts therewith and forces the plunger holder downwardly against the spring 103, and thereby forces the plunger or core 96 downwardly into contact with the neck ring. The track 105 normally occupies a fixed position, but it may be vertically adjusted by means of an adjusting screw 107 mounted in the frame beneath the column 106; and a clamp 108 maintains the column in adjusted position. However, any variation in the track or in the various members forming the combination, is taken care of by means of the spring 103 and the pin and slot connection 101, described hereinbefore.

At the instant when the plunger or core 96 is seated on the neck ring vacuum is applied by the means now to be described. The opening 109 in the cover plate 110 is connected by a pipe (not shown) with a central vacuum station (not shown); and the interior of the stationary hollow cover plate communicates by spaced ports 111 with the interior of the revolving chamber 112. Pipes 113 communicates with the interior of the revolving chamber, and lead to the vacuum chambers 114 which communicate by a passage (not shown) with the annular passage 115 in the suction and blow head 95. This annular passage 115 is provided with a plurality of ports 116 which are uncovered when the plunger holder 99 is lowered to engage the neck ring. When these ports 116 are uncovered the vacuum is applied through the passages 117 in the plunger holder, to suck the glass up into the parison mold cavity and the finish of the neck ring, whereby the neck of the article is formed and whereby the core member 96 forms the initial blow opening. The specific construction of the neck ring does not form any part of the present invention, for obviously any desired type of neck ring may be employed; but preferably we employ the neck ring of the type shown in the patent to Lloyd #1,519,586, granted December 16, 1924. In accordance with that construction, the neck molds disclosed herein are provided with one or more vertical passages 118 which communicate by means of annular passages (not shown) with the recesses of the neck ring, so that no air will be entrapped in the recesses and the glass will make close contact with the mold at all points.

The manner in which the vacuum is applied when the core is lowered will be understood from the foregoing description; and it will also be understood that when the core is elevated the core holder will close the ports 116, thereby shutting off communication with the vacuum source.

The neck of the parison having been formed, and the initial blow opening made in the parison, the parison mold is opened and the blow mold is raised into contact with the neck ring mold and closed. The article is now ready to be blown; and the means for blowing the articles will now be described.

A pipe 119 leads to the machine from a common or central source of compressed air, and by means of ports 120 this compressed air is introduced into the chamber 121. Pipes 121′ lead from this chamber to the valves 122, and pipes 123 lead from the valves 122 to the blow head and thence through ports 124 to the interior of the blow head and to the initial blow opening left by the retraction of the core 96. In this manner the glass parison is expanded to the form of the finished ware. It will be noted that in Figure 2 the pipe 123 and port 124 are shown in broken lines. The reason for this is that the true position of the pipe and port is in back of the suction and blow head (Fig. 2), and in order that these elements be shown in Figure 2, and yet not be considered as in their true position, we have indicated them in dotted lines at the side of the suction and blow head.

As described above, the compressed air for blowing the articles is supplied to the valves

122 by the pipes 121', and is carried from the valves to the blow heads by means of pipes 123; and these valves control the admission of fluid pressure to the blow heads. The valves are provided with oppositely disposed ports which are so positioned that when the valves are down these ports will open communication between the pipes 121' and 123, to supply compressed air to the blow heads; and when the valves are raised the ports are closed to shut off communication between the pipes 121' and 123. Springs 125 normally force the valves 122 upwardly to shut off the supply of compressed air to the blow heads, and they are successively lowered at the proper time, by means of the fixed cam track 126 which is carried by the column 3; the cam track being engaged by the valve stems 127. The valve 122 at the left of Figure 1 is shown in closed position, while the valve 122 at the right of Figure 1 is shown in open position.

It is believed that the construction and operation of the complete apparatus will be clearly understood from the foregoing description, however a brief résumé of the operation as a whole, will be given below. In the following description of the operation, particular attention is to be had to Figure 4; and in connection with this figure, it is to be remembered that it is merely a diagrammatic illustration of various positions which the molds and associated parts assume during the complete rotation of the mold table. Of course, any desired number of molds may be employed, though in the particular form illustrated here we employ twelve of the mold units. The mold table is continuously rotating, and the apparatus may be adjusted so that different operations may occur at varying stages of the complete rotation; and consequently no effort has been made in Figure 4 to show the various stages of the opening and closing of the molds, etc., in their true circular position. Figure 4 may be considered as illustrating six stages of the operation of a single unit, but without particular regard to the actual position of the unit in the cycle of rotation.

In operation we preferably employ the ordinary reciprocating plug feeder for supplying the formed charges or gobs to the forming machine; though, of course, any other type of suspended gob feeder may be used. The charges are formed, severed and dropped in timed relation with the operation of the forming machine, and for the purpose of securing an accurate time and phase relation we preferably employ the time and phase distributing valve disclosed in the patent to David Stenhouse, No. 1,590,558, granted June 29, 1926, though the present invention is not limited to any particular means for securing the proper time and phase adjustment.

Each severed gob falls by gravity into the open flared mouths 70 of the receivers 69 which are successively brought under the feeder in the continued rotation of the forming machine. The following description will relate to only one of the mold units, for it will be understood that all of the units operate successively in exactly the same manner.

When a unit has reached a position under the feeder the neck ring will be closed and the blank mold will be closed and in contact with the neck ring as illustrated at the left of Figure 1 and at the position marked A in Figure 4. Just as the unit reaches this position cam 105 causes the plunger holder 99 to be lowered, thereby forcing the core 96 downwardly into engagement with the neck ring, and, at the same time, opening the ports 117 into communication with the vacuum chamber 114, so that the instant the gob is received in the receiver 69 it will be sucked up into the mold cavity 68 and into the finish of the neck ring so that the bottle neck will be formed and also the initial blow opening will be made by the core or plunger 96.

The machine is, of course, continuing its rotation while these operations are being performed, and after it has rotated the desired distance, about 60° from position A, the blank mold is opened leaving the parison mold suspended by the neck ring, as illustrated at position B in Figure 4. In the meantime, spring 103 has lifted the core 96 clear of the neck ring. The blank mold is opened by means of the cam groove 78 and roller 79 which has a compressible connection with the blank mold sections, by the means hereinbefore described.

In the continued rotation of the forming machine the cam track 39 causes the blow mold plate 36 to be swung upwardly to bring the blow mold into contact with the neck ring, and the blow mold is then closed about the suspended glass parison by means of the cam groove 20 and roller 19 which has a resilient connection with the blow mold sections. With the parts in this position the valve 122 is depressed by the fixed cam track 126 to permit the entrance of compressed air into the blow mold to distend the glass parison to conform with the interior of the blow mold. All of the above operations take place while the unit is rotating to a position about 120° from the feeding position A, which position is indicated by the letter C on Figure 4. While the glass parison has been distended to its final form when the unit reaches about 120° from the feeding position, yet the compressed air is retained within the mold until the unit has reached approximately 180° from the feeding position, to insure the permanent setting of the article. The position of the parts during the blowing operation is illustrated in Figure 2, and at the right of Figure 1.

In the continued rotation of the forming

machine the neck ring is opened to free the neck of the bottle, which is still retained in the closed blow mold, as indicated by letter D in Figure 4.

In the continued rotation of the forming machine the cam track 39 permits the closed blow mold to be lowered the parts being as shown in position E in Figure 4. In the diagrammatic illustration at position E, all of the elements have been omitted except the blow mold and its operating parts.

When the blow mold 35 is lowered compressed air is automatically admitted to the cylinder 53 by the means hereinbefore described, whereby the steadier and ejector 48 is moved forward to a position to partly embrace the neck of the bottle to steady it and prevent it from sticking to the mold during the opening operation. In the continued rotation of the forming machine the blow mold is completely opened, by means of the cam groove 20, whereby the finished bottle is released, and also whereby the lug 61 is released to permit the further outward movement of the ejector 48, which positively ejects the article in the uniform manner and at uniform intervals thereby facilitating the adaptation of receiving mechanisms, which depend for their successful use on uniformity of delivery both as to time and manner.

The open blow mold and its operating elements are illustrated at position F in Figure 4 but it is to be understood that the complete opening of the blow mold and ejection of the finished article does not actually occur until the unit has reached a position from 60° to 90° beyond the feeding position, and the blow mold is then ready to be raised and closed again about a glass parison at about 120° beyond the feeding position. In the meantime, of course, the neck ring has been closed and the blank mold has been closed so that the parts are ready to receive another charge as the unit again passes under the feeder.

In the description of the construction of this machine and in the description of the operation of the machine, we have described the forming of the initial blow opening by the core 96, and the blowing of the glass parison after the initial opening has been made by the core; however, we have not mentioned that if desired, a momentary puff of air may be admitted to the glass parison after the initial opening has been formed and prior to the final blowing of the parison. It is quite common to admit a momentary puff of air to the parison, prior to the final blowing thereof, and obviously this preliminary puff may be provided in the present machine merely by changing the design of the cam which controls the admission of the compressed air to the parison.

The continuously rotating forming machine disclosed herein is relatively simple in construction; it eliminates the necessity of the undesirable and expensive revolving pot of the Owens machine; it eliminates the necessity of inverting the parison mold; it prevents the finished articles from sticking to the blow mold; it positively ejects the finished articles at uniform intervals and in a uniform manner; and it possesses numerous other advantages which will be apparent to those skilled in the art.

In accordance with the patent statutes we have described what we now believe to be the best embodiment of the invention, but we do not wish to be understood thereby as limiting ourselves or the scope of the invention, as many changes and modifications may be made without departing from the spirit of the invention; all such we aim to include in the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a glass forming machine, a continuously rotating table, a parison mold carried by the table, and a charge receiver in fixed relation with the mold, said receiver communicating with the lower end of the mold cavity and having an upwardly presented mouth.

2. In a glass forming machine, a continuously rotating mold table, a plurality of parison molds carried by said table, and a charge receiver individual to and in fixed relation with each mold, said individual receivers communicating with the lower ends of the mold cavities and having upwardly presented mouths.

3. In a glass forming machine, a plurality of parison molds, having their neck ends uppermost, a receiver individual to each mold and having an upwardly presented mouth, means fixedly connecting said mouth with the lower end of the mold cavity, and means for continuously moving said molds.

4. In a glass forming machine, a continuously rotating table, a plurality of parison molds carried by the table, a charge receiver individual to and integral with each mold, each of said receivers communicating with the lower end of the mold cavity and having an upwardly presented mouth, the glass charges being caused to travel from the mouth to the mold cavity by a difference in air pressure between that at the mouth and that in the mold cavity.

5. In a glass forming machine, a continuously rotating table, a plurality of parison molds carried by the table, a charge receiver individual to and integral with each mold, each of said receivers communicating with the lower end of the mold cavity and having an upwardly presented mouth, and means for forcing the glass charge from the charge receiver into the mold cavity.

6. In a glass forming machine, a continuously rotating table, a plurality of parison molds carried by the table and having their neck ends uppermost, a charge receiver in-

dividual to each mold, each of said receivers being in fixed relation to and communicating with the lower end of the mold cavity and having an upwardly presented mouth, and means for applying a vacuum through the neck end of said molds, whereby the glass is drawn from the receiver, through the lower ends of the molds, and upwardly into the mold cavity.

7. In a glass forming machine, a table carrying a plurality of parison molds, a receiver individual to and in fixed relation with the molds for receiving formed charges of glass during the continued rotation of the table, said receiver having an upwardly presented mouth, and means for applying a vacuum to the upper end of the molds to draw the glass charges downwardly through the receiver and upwardly into the mold cavity.

8. In a glass forming machine, a parison mold, a receiver integral with the mold and communicating with the lower end of the parison mold cavity, said receiver having an open upwardly presented mouth to receive formed charges, and vacuum means for sucking the glass through the receiver and upwardly into the parison mold cavity.

9. In a glass forming machine, a continuously rotating table, a plurality of parison molds carried by said table, a receiver individual to and integral with each mold and communicating with the lower end of the parison mold cavity, each of said receivers having an open upwardly presented mouth, and vacuum means for sucking the glass through the receiver and upwardly into the parison mold cavity.

10. In a glass forming machine, a continuously revolving table, a plurality of parison molds carried by the table, an upwardly presented receiver individual to and integral with each parison mold and communicating with the lower end of the parison mold, a glass feeder for feeding formed charges successively to the upwardly presented receivers, and means for conveying the charge from the receiver into the parison mold cavity through the lower end thereof.

11. In a glass forming machine, a parison mold formed of half sections, each of said sections having a half of the parison mold cavity, and each of said sections having a half of a charge receiving cavity, the two cavities communicating at their lower ends, and the charge receiving cavity having an upwardly presented mouth.

12. In a glass forming machine, a parison mold formed of half sections, each of said sections having a half of the parison mold cavity, and each of said sections having a half of a charge receiving cavity, the two cavities communicating at their lower ends, the charge receiving cavity having an upwardly presented mouth, and means for forcing the glass charge from the charge receiving cavity into the parison mold cavity.

13. In a glass forming machine, a continuously rotating table, a series of forming units carried by said table, each of said units including a neck ring mold, a parison mold adapted to be operatively associated with the neck ring mold, a charge receiver in fixed relation with the parison mold for feeding a formed charge of glass through the lower end of the parison mold while the table continues to rotate, a blow mold, and means for closing the blow mold about the glass parison after the parison mold has been removed.

14. In a glass forming machine, a continuously rotating table, a series of forming units carried by said table, each of said units including a suction head, a neck ring mold adapted to cooperate with the suction head, a parison mold adapted to cooperate with the neck ring mold, a charge receiver integral with the parison mold for feeding a formed charge of glass through the lower end of the mold during the continued rotation of the table, a blow mold, and means for closing the blow mold about the glass parison after the parison mold has been opened.

15. In a glass forming machine, a continuously rotating table, a series of forming units carried by said table, each of said units including a combined suction and blowing head, a neck ring mold adapted to cooperate with said head, a parison mold adapted to cooperate with the neck ring mold, a charge receiver fixedly associated with the parison mold and communicating with the lower end of the parison mold cavity, said charge receiver having an upwardly presented mouth, means for applying a suction to the upper end of the parison mold cavity to suck the glass from the receiver into the parison mold cavity and neck ring mold, a blow mold, means for closing the blow mold about the glass parison after the parison mold has been opened, and means for blowing the glass parison to finished form.

16. In a glass forming machine, a mold, and a single means movable to position to steady an article while the mold is being opened, and being further movable in substantially the same direction and in the same plane to eject an article after the mold is opened.

17. In a glass forming machine, a blow mold, a reciprocable fork shaped member, and means for moving said fork shaped member to embrace an article while the mold is being opened, said means further moving said fork shaped member in the same direction and in the same plane to eject an article after the mold is opened.

18. In a glass forming machine, a mold, means for raising and lowering the mold, an article steadying implement associated with the mold, and means for operating said im-

plement, said last-mentioned means being controlled by the movement of said mold.

19. In a glass forming machine, a mold, means for raising and lowering the mold, an article ejecting implement associated with the mold, and means for operating said implement, said last-mentioned means being controlled by the movement of said mold.

20. In a glass forming machine, a mold, a fork shaped implement associated with said mold, means for moving said implement in a right line to position to prevent an article from sticking while said mold is being opened, and for further moving said implement in a right line and in the same plane to eject the article after the mold has been opened.

21. In a glass forming machine, a mold, an article steadying and ejecting implement associated with said mold, means for moving said implement in a right line to position to steady an article during the opening of the mold, and for further moving said implement in a right line in the same plane to eject the article after the mold has been opened.

22. In a glass forming machine, a continuously rotating table, a plurality of molds carried by said table, an article steadying and ejecting implement individual to each mold, and means for successively moving each of said implements in a right line to position to steady the articles during the opening of the molds, and for further moving each of said implements in a right line and in the same plane to eject the articles after the molds have been opened.

23. In a glass forming machine, a mold, means for raising and lowering said mold, a fork shaped implement associated with the mold, a cylinder and piston for operating said implement, and means whereby fluid pressure is admitted to said cylinder when the mold is lowered.

24. In a glass forming machine, a mold, means for raising and lowering said mold, a fork shaped implement associated with the mold, a cylinder and piston for operating said implement, and means whereby fluid pressure is exhausted from said cylinder when the mold is raised.

25. In a glass forming machine, a mold, means for raising and lowering said mold, an article ejector associated with the mold, a cylinder and piston for moving the ejector in one direction, and a spring for moving the ejector in the opposite direction, and means controlled by the position of the mold for admitting fluid pressure to said cylinder.

THOMAS STENHOUSE.
DAVID STENHOUSE.