June 6, 1939. G. E. HOWARD 2,161,255

METHOD OF AND MACHINE FOR FORMING GLASSWARE

Filed Oct. 9, 1936 5 Sheets-Sheet 1

Fig.1.

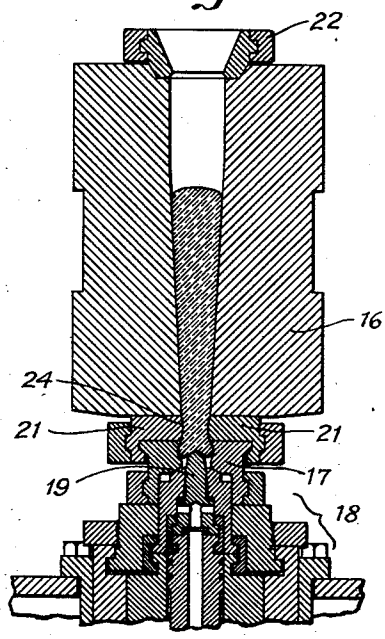


Fig.2.

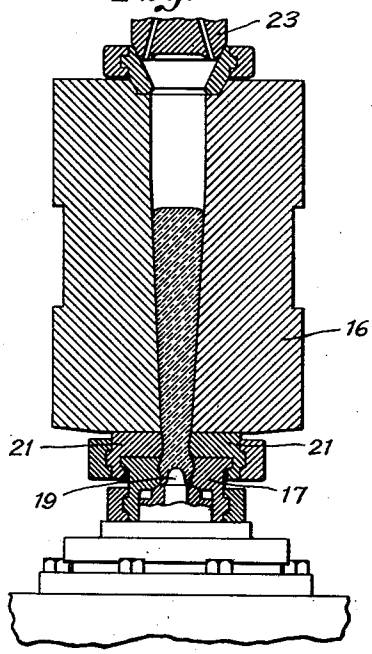


Fig.3.

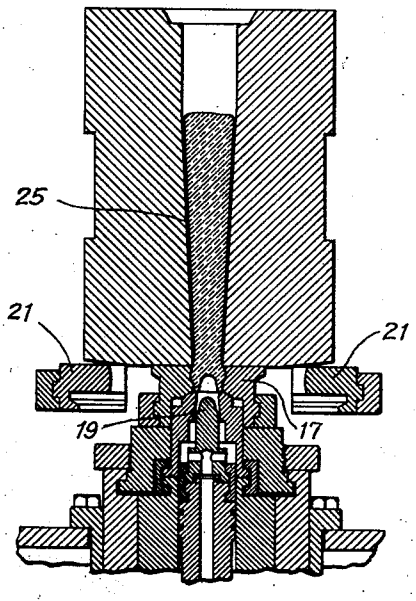
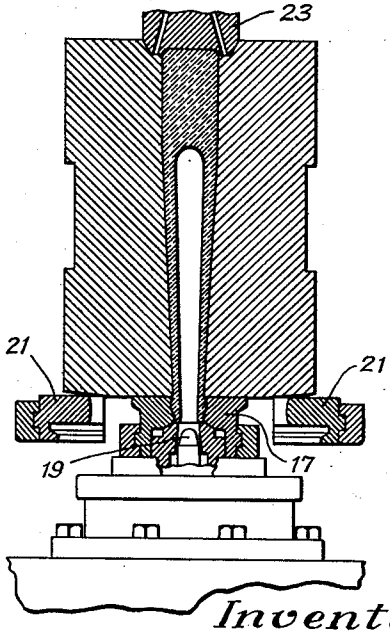


Fig.4.



Witness:
A. A. Horn

Inventor:
George E. Howard
by Brown & Parkam
Attorneys.

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METHOD OF AND MACHINE FOR FORMING GLASSWARE

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Fig.5.

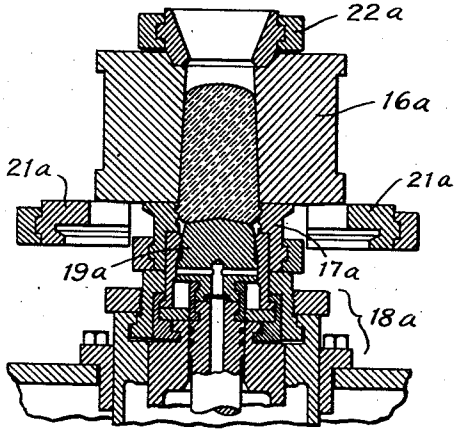


Fig.6.

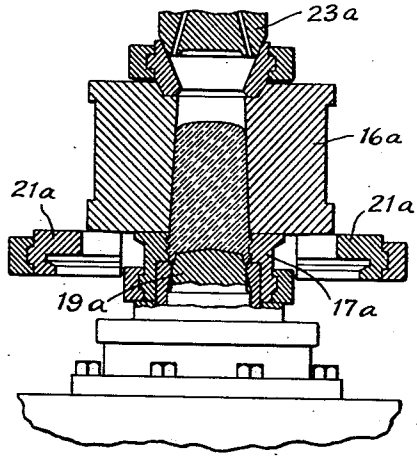


Fig.7.

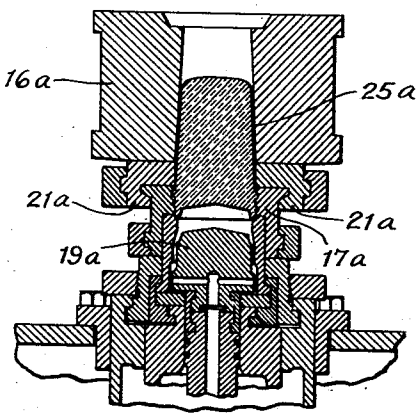
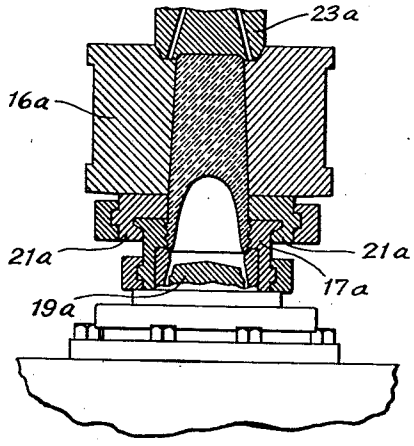


Fig.8.



Witness:
A. A. Horn

Inventor:
George E. Howard
by Brown & Parham
Attorneys.

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METHOD OF AND MACHINE FOR FORMING GLASSWARE

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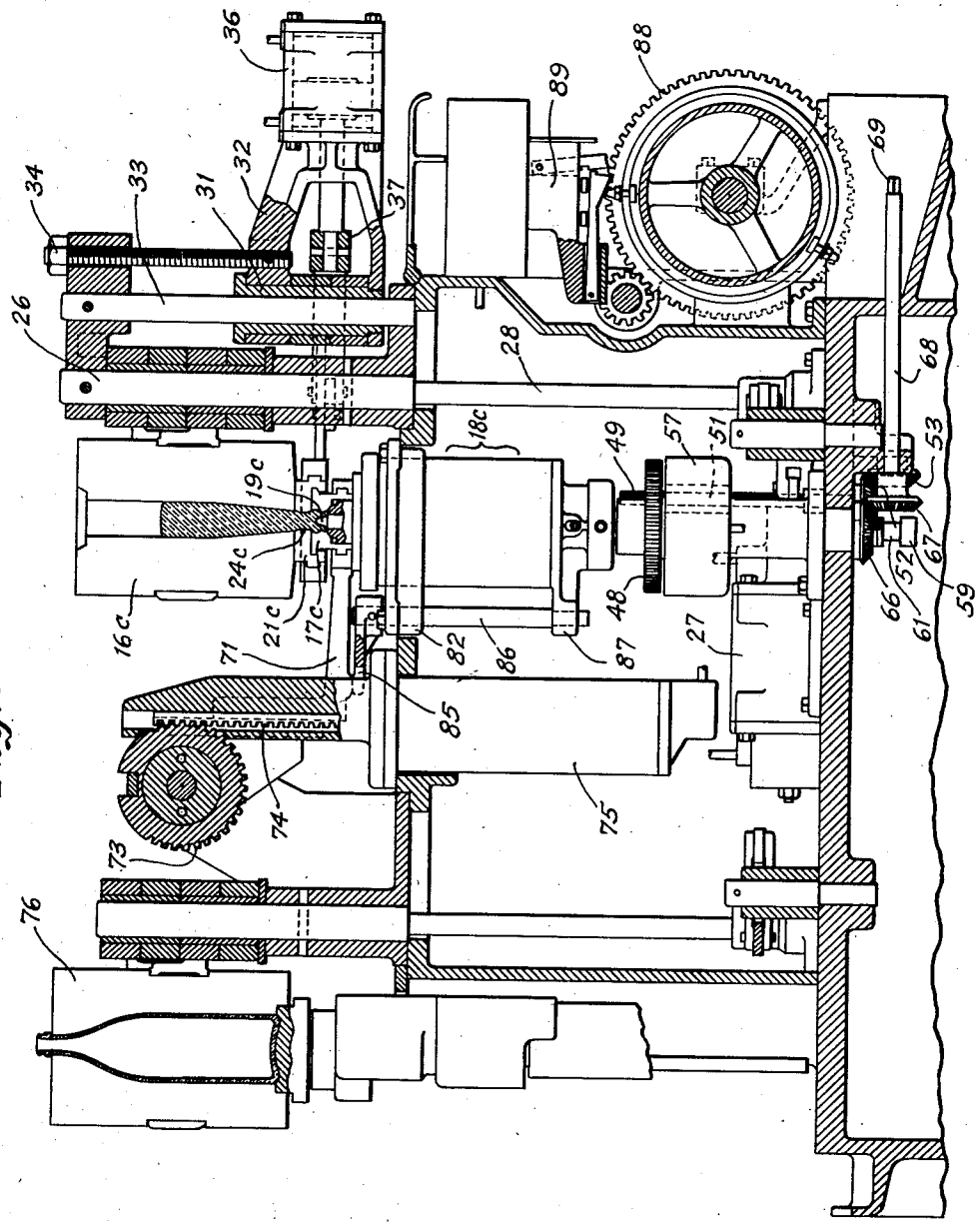

Fig. 9.

Witness:
A. A. Horn

Inventor:
George E. Howard
by Brown & Parkam
Attorneys.

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METHOD OF AND MACHINE FOR FORMING GLASSWARE

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Fig.10.

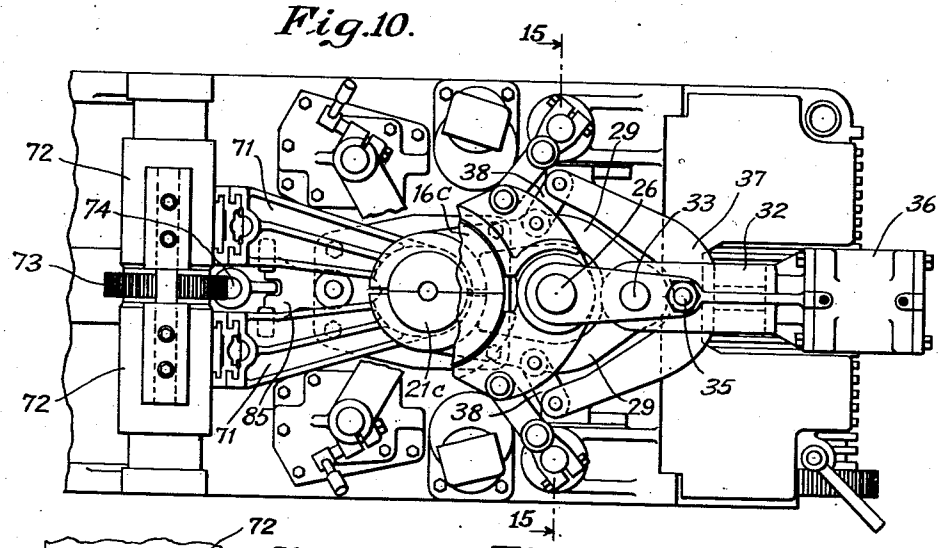


Fig.11.

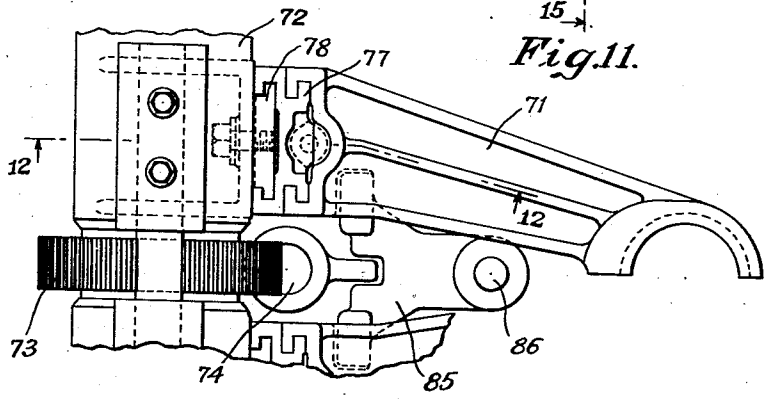
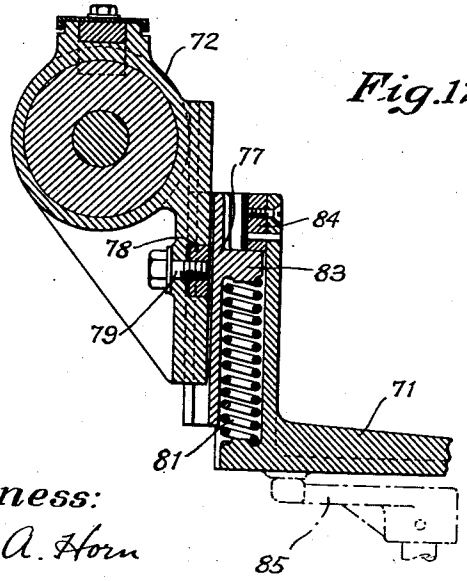


Fig.12.



Witness:
A. A. Horn

Inventor:
George E. Howard
by Brown & Parham
Attorneys.

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METHOD OF AND MACHINE FOR FORMING GLASSWARE

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Fig.13.

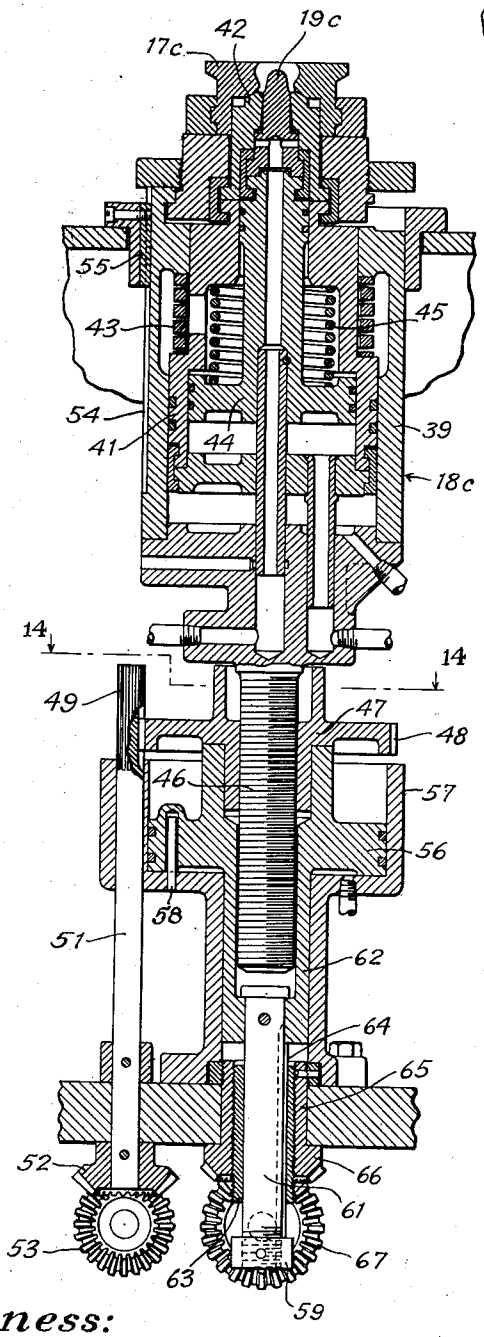


Fig.14.

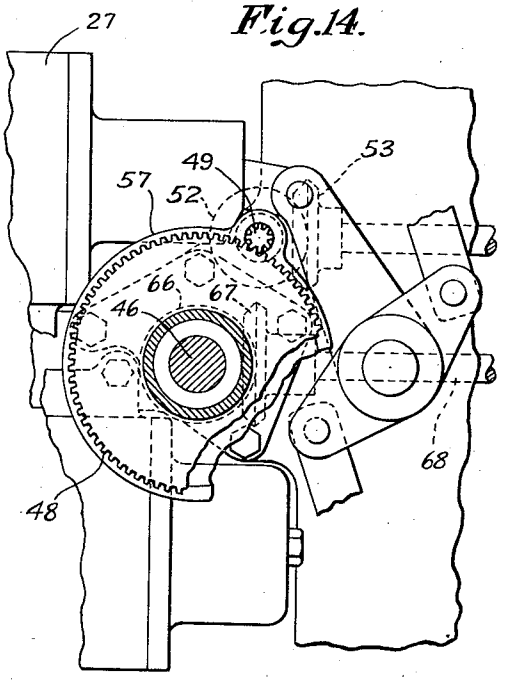
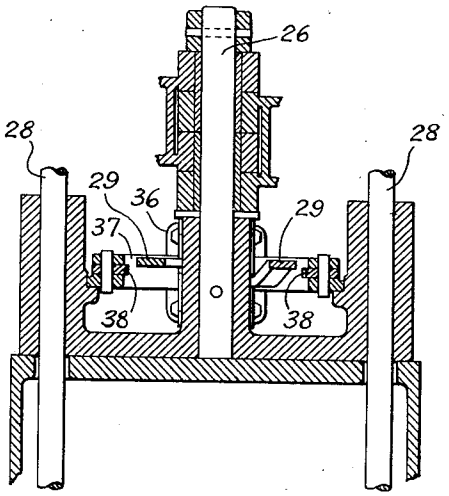


Fig.15.



Witness:
A. A. Horn

Inventor:
George E. Howard
by Brown & Parham
Attorneys.

Patented June 6, 1939 2,161,255

UNITED STATES PATENT OFFICE

2,161,255

METHOD OF AND MACHINE FOR FORMING GLASSWARE

George E. Howard, Butler, Pa., assignor to Hartford-Empire Company, Hartford, Conn., a corporation of Delaware

Application October 9, 1936, Serial No. 104,820

8 Claims. (Cl. 49—9)

This invention relates to methods of and machines for forming glassware according to the well known narrow neck method and the invention has particular relation to the method of and means for forming the blanks or parisons in the manufacture of bottles and other containers.

The blanks referred to usually are formed by delivering a charge of glass from a feeder to a blank mold unit, compacting or settling the charge and then counterblowing the compacted charge to produce a hollow blank. In the patent to George E. Rowe, No. 2,043,065, granted June 2, 1936, a method of forming blanks is described and claimed which involves reheating the blank between the settle blowing and counterblowing operations by cracking the blank mold in the interval between those operations to permit the heat in the glass to equalize. The purpose of this is to make more homogeneous the skin previously formed on the settled blank by the chilling effect of the mold, with the result that the expansion in counterblowing is substantially uniform and the settle wave produced in prior methods is reduced or eliminated.

The general object of the present invention is to provide an improvement upon the method of the Rowe patent and also to provide mechanism of novel character for performing the improved method.

A more specific object of the invention is to provide a novel method and novel means by the employment of which the settled blank is reheated by cracking the blank mold while pinching of the blank is prevented. When the settled blank reheats, it may happen that the glass settles or slumps beyond the confines of the blank mold to such an extent that it may be pinched in the joints of the blank mold as it is closed in preparation for counterblowing. This pinching of the glass causes fins or seams to be formed on the blank which remain as defects in the finished article. The purpose of my invention is to prevent or guard against such defects.

Accordingly it is an object of this invention to provide a novel method and novel means wherein the settled blank is caused to occupy a larger space in the mold after it is reheated than it does when it has just been compacted. This insures clearance of the reheated settled blank by the blank mold as it is closed and thus avoids pinching of the glass in the mold joints.

Other objects of the invention will be pointed out hereinafter or will become apparent from the following description or from the drawings wherein:

Figures 1 to 4 inclusive depict successive stages in one mode of practicing the novel method;

Figs. 5 to 8 depict another mode of carrying out the novel method;

Fig. 9 is a view in longitudinal vertical sectional elevation of a narrow neck machine embodying the invention;

Fig. 10 is a view in top plan of a portion of the machine shown in Fig. 9, parts being broken away for clarity in illustration;

Fig. 11 is an enlarged view in top plan showing in detail a portion of the transfer mechanism;

Fig. 12 is a view in longitudinal vertical section on line 12—12 of Fig. 11;

Fig. 13 is a view in vertical transverse section of the neck pin and neck mold elevating mechanism;

Fig. 14 is a horizontal sectional plan view on the line 14—14 of Fig. 13; and

Fig. 15 is a view in vertical section on the line 15—15 of Fig. 10.

In Figs. 1 to 8 inclusive, the use of my invention in the narrow neck process is illustrated in two ways, Figs. 1 to 4 inclusive showing the employment of the novel method in the production of typical narrow neck glassware and Figs. 5 to 8 inclusive the application of the novel method to the manufacture of semi-wide mouth or wide mouth glassware by the narrow neck method.

Considering the first mode, the inverted blank mold 16 of the sectional type is shown closed in cooperative relation with the usual sectional neck mold 17 and having neck pin mechanism 18 associated therewith. This mechanism 18 includes neck pin 19 and other parts which need not be described here but which serve to raise and lower the neck pin 19 for neck forming and the admission of counterblowing air to the neck mold.

Interposed between the neck mold 17 and blank mold 18 is an intermediate mold 21 which, like the blank and neck molds, is made sectional for opening and closing in the usual way. As will be apparent from Fig. 1, which shows the mold assembly containing a charge of glass delivered from a feeder (not shown) through funnel 22, the intermediate mold 21 serves to form the neck of the blank immediately adjoining the neck finish. This also is shown in Fig. 2 which depicts the blank after it has been compacted by the application of air through blowhead 23. The mold 21 preferably is rounded as indicated at

24 to constrict the blank for a purpose which is described below.

It will be observed that the blank mold cavity is tapered downwardly toward the neck finish and thus forms a blank, the body of which has an inverted frusto-conical shape. This is in accordance with the usual practice in the art in the manufacture of typical narrow neck ware. Consequently, relative movement can be effected between the settled lank and the blank mold and my invention utilizes this shape of the blank, as will now be explained, to avoid pinching the blank between the joints of the blank mold.

After the blank is compacted as shown in Fig. 2, the blank mold may be cracked and the mold 21 opened wide to reheat the glass for the purposes and with the advantages described above.

Under certain conditions the blank may settle or slump to such an extent that it will be pinched by the blank mold when the mold is reclosed. This shaping is likely to produce a bulge immediately adjacent the neck mold because the full weight of the blank is above this point or because it is the lowest point down to which the reheated glass may flow by gravity. The formation of such a bulge and other deformation of the settled blank is very likely to result in pinching the blank.

To prevent pinching under such conditions, the intermediate mold 21 serves to form a constriction near the neck mold when the glass is settled or compacted by air pressure delivered through blowhead 22. The constriction fills out more or less during reheating and under proper conditions and control, and with the proper design of the mold 21 the filling out of the constriction will leave an uninterrupted surface, that is, there will be neither a constriction nor a bulge of sufficient size to cause pinching.

However, other bulging or distortion of the reheated glass may occur and to insure that there will be no pinching of this glass my invention includes the step of effecting a change in the position of the blank within the blank mold before the blank mold is closed. In the form illustrated in Figs. 1 to 4 inclusive, this change in position is inwardly or upwardly of the blank mold cavity and may be accomplished either by lowering the blank mold or raising the neck mold and the blank supported thereby or by a combination of such movements. It is preferred, however, simply to elevate the entire neck forming mechanism and neck mold for this purpose. This change in position of the blank moves the blank farther into the blank mold and leaves a clearance as indicated at 25, Fig. 3, due to the downward taper of the blank mold cavity. The amount of clearance will depend upon the thickness of mold 21 because the neck mold and blank mold must be engaged for the counterblowing operation.

The reheated blank is now ready for the counterblowing operation which is carried out by removing funnel 22, engaging the blowhead 23 with the mold and then admitting air around the neck pin and through the neck mold. It will be understood that when the blank is counterblown, the clearance and any vestige of the constriction formed by mold 21 will be eliminated as shown in Fig. 4.

Considering the form of the method shown in Figs. 5 to 8 inclusive, these figures illustrate blank forming devices for shaping a blank for a screw threaded semi-wide mouth container. This requires a relatively short blank mold 16a and the cavity in this mold may be tapered upwardly to form an upwardly tapered blank. The neck mold is shown at 17a, the neck pin mechanism at 18a, the neck pin at 19a. An intermediate mold 21a, funnel 22a and combined settle blowhead and bottom closure 23a also are provided.

As distinguished from the procedure in Figs. 1 to 4, the blank mold 16a and neck mold 17a are engaged and the intermediate mold 21a held open for the delivery of a charge of glass as illustrated in Fig. 5, and the settling of the charge as shown in Fig. 6. When the settle blowing or compacting operation is completed and while the blank mold is cracked for reheating the blank, the blank mold and neck mold are separated to move the blank out of the blank mold sufficiently to permit the intermediate mold 21a to be closed in assembled relation with said blank and neck molds, as shown in Fig. 7. As a result, a clearance space is provided as indicated at 25a. The blank mold may be raised or the neck mold and associated parts lowered, or these operations combined to effect the above mentioned separation of neck mold and blank mold.

With the use of an intermediate mold of the proper thickness in relation to the design of the blank mold, the clearance provided will be sufficient to avoid pinching a relatively short and upwardly tapered blank.

With the parts in assembled relation as shown in Fig. 8, the blank is counterblown, the intermediate mold 21 serving in this instance to form a portion of the finished blank.

My novel method may be carried out by any well-known type of narrow neck machine suitably modified to perform automatically the steps of the method. By way of illustration, and not in limitation of the invention, there has been shown in Figs. 9 to 15 inclusive the Hartford individual section machine and attachments and modifications therein to adapt such machine to the automatic performance of the form of the method illustrated in Figs. 1 to 4 inclusive.

This machine is widely used in the art and is disclosed in United States Patent No. 1,911,119, granted May 23, 1933 to Henry W. Ingle, and hence only so much of said machine is illustrated in the drawings as is necessary to enable one skilled in the art readily to understand the embodiment of the present invention therein.

Referring to Fig. 9, the blank mold is shown at 16c, the neck mold at 17c, the neck pin mechanism at 18c and the neck pin at 19c. At 21c is found the intermediate mold which is constricted as indicated at 24c. The funnel and settle blowhead are omitted, being fully shown in the patent to Ingle.

The sections of the blank mold are carried by vertical post 26 about which they swing in opening and closing. An air cylinder 27 contains a piston (not shown) which operates through suitable connections, including vertical rock shafts 28, the respective mold sections of mold 16c.

The intermediate mold 21c is divided like the other molds and the sections are held in holders 29 (Figs. 9 and 10) pivoted on a sleeve 31 in a slide 32. Sleeve 31 has a sliding fit on the guide rod 33 so that by turning a nut 34 on a screw 35 which supports the slide, the position of the mold holders 29—29 may be adjusted to accommodate molds of different heights.

Slide 32 also carries air cylinder 36 which, through yoke 37 and links 38 (Figs. 9, 10 and

15), opens and closes the intermediate mold 21c.

To provide for changing the position of the blank in the blank mold after reheating to avoid pinching, the blank mold being cracked and the intermediate mold opened wide, means are provided whereby the neck mold and the settled blank and the neck pin mechanism are elevated until the neck mold touches the bottom of the blank mold.

Referring first to Fig. 13, it will be observed that the neck pin mechanism comprises a cylinder 39 which contains piston 41 for raising the thimble 42 and which is forced downwardly by a spring 43. Within piston 41 is another piston 44 urged downwardly by spring 45 and adapted to operate neck pin 19c. The cylinder 39 contains air passages for the admission and exhaust of air pressure to operate pistons 41 and 44 and for the admission of air in counterblowing the blanks, all as clearly shown in Fig. 13.

To adapt the neck pin mechanism to molds of different heights and to support the neck mold at the desired level, the neck pin mechanism 18c is made bodily adjustable up or down by the threaded stud 46 on the bottom of cylinder 39. Stud 46 is carried in nut 47 having gear 48 formed thereon with which pinion 49 is slidably in mesh. Pinion 49 is formed on shaft 51 which is adapted to be rotated by the bevel gears 52, 53, which in turn are operated by means (not shown) to effect the desired rotation of nut 47. The neck pin mechanism is held against rotation by a feather 54 which engages a slot in pad 55. Consequently, the entire mechanism 18c is adjusted up or down, as desired, by the rotation of shaft 51.

The neck pin mechanism 18c is periodically raised and lowered to engage the neck mold with the blank mold and to thereafter lower the neck mold for the transfer of a completed blank and subsequent closing of intermediate mold 21c, by piston 56 in which nut 47 is rotatably fitted, as shown, and which is contained in piston 57. Piston 56 is held against rotation by pin 58 received therein.

In addition to the adjustment of the lower position of the neck pin mechanism, means are provided for adjustably predetermining the stroke of piston 56 and hence the uppermost position of the mechanism, neck mold and blank in accordance with the height of the intermediate mold 21c. Such means include a stop collar 59 on rod 61 pinned in the tubular extension 62 of piston 56 and a stop 63 slidably keyed to rod 61 by key 64. Stop 63 is adjusted up or down by a collar 65 in which it is threaded. This collar is rotated by bevel gear 66 thereon in mesh with bevel gear 67 on shaft 68. Shaft 68 has a squared end 69 for engagement by a key or wrench to effect the desired adjustment of the stroke of piston 56.

Looking at Figs. 9 and 10, it will be apparent that the neck mold could not be raised and lowered in a straight line path without tilting, for the purpose of raising the blank in the neck mold and to permit closing the mold 21c, merely by raising and lowering the holders 71—71. The reason for this is that holders 71—71 would move in an arc of a circle instead of reciprocating. These holders are carried by air cylinders 72—72 which are adapted to slide toward and away from each other to open and close the neck mold 17c. The holders and cylinders are oscillated together by gear 73, rack 74 and air motor 75 to swing the blank from the position shown in Fig. 9 into alignment with a blow mold shown at 76. This transfer mechanism and its operation are more fully described in the patent to Ingle referred to above.

Accordingly, my invention makes provision for vertical movement of the transfer arms 71—71 independently of the cylinders 72—72 to which they are connected. As shown in Figs. 10, 11 and 12, each arm 71 is slidably mounted on a guide 77 which, in turn, is adjustably secured to a cylinder 72 by means of clamp 78 and bolt 79. Loosening of bolt 79 permits the guide and transfer arm to be adjusted for molds of different heights. Each transfer arm is yieldingly held in assembled relation with its guide 77 by means of a compression spring 81, which by bearing at its lower end on a lug 82 of arm 71 and at its upper end against lug 83 on guide 77, yieldingly holds a stop 84 against the top of lug 83. Consequently, each arm can be raised and lowered relative to its cylinder 72, but is so connected thereto that the arms serve their normal function as a mold carrier and oscillating transfer device.

The transfer arms 71—71 are raised and lowered by the raising and lowering of the neck pin mechanism, not only by the engagement of said mechanism with the neck mold, but by bifurcated lifter 85 which is carried by rod 86 in lugs 87—87 on the neck pin mechanism 18c, and engaging each of the arms 71—71 adjacent and almost beneath each spring 81 to insure that these springs will be compressed and the holders moved vertically and rectilinearly instead of being oscillated or tilted.

It has not been deemed necessary to describe the distribution of air pressure to the various cylinders because it will be understood that this is controlled by a timer 88 and valve mechanism 89 in a manner, which will become apparent from the above mentioned Ingle patent taken in conjunction with the above description.

This invention is not to be considered as limited to the specific embodiments described herein except in so far as may be required by the express terms of the appended claims. Various changes in the method and apparatus may be made without departing from the scope of the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The method of forming blanks by the narrow neck method which comprises forming a tapered blank in a tapered blank mold, cracking the blank mold between compacting and counterblowing operations to reheat the settled blank, and effecting relative axial movement between the blank and the blank mold to produce in effect movement of the blank toward the large end of the blank mold to separate and leave a clearance between the blank and the blank mold whereby the pinching of the blank by the closing of the blank mold is prevented.

2. The method of forming blanks by the narrow neck method which comprises forming a tapered blank in a blank mold tapered toward the neck of the blank, cracking the blank mold between compacting and counterblowing operations to reheat the blank, and moving the blank axially in the blank mold toward the large end of the latter to provide a clearance whereby pinching of the blank by the closing of the blank mold is prevented.

3. The method of forming blanks by the narrow neck method which comprises forming a tapered blank in a tapered blank mold and associated neck mold, cracking the blank mold be-

tween compacting and counterblowing operations to reheat the blank, axially separating the blank mold and neck mold to move the blank toward the large end of the tapered blank mold to provide a clearance between the blank and blank mold and thus prevent pinching of the blank when the blank mold is closed, and closing an intermediate mold about the settled blank prior to the counterblowing operation.

4. The method of forming glassware by the narrow neck method which comprises forming a tapered blank in a tapered blank mold, cracking the blank mold between compacting and counterblowing operations to reheat the blank and forming a constriction in the blank adjacent the neck finish and effecting a relative axial movement between the blank and blank mold to move the blank toward the large end of the tapered blank mold to provide a clearance when the blank mold is closed, whereby pinching of the blank by closing the blank mold is prevented.

5. The method of forming glassware by the narrow neck method which comprises delivering a charge of glass to and compacting it in a tapered blank mold, a neck mold and an intermediate mold which is shaped to form a temporary constriction in the blank, cracking the blank mold and removing the intermediate mold to reheat the blank, then, while the blank is held by the neck mold, engaging the neck mold and blank mold to move the blank axially toward the large end of the tapered mold to provide a clearance between the blank and the blank mold when the latter is closed, whereby pinching of the blank by closing the blank mold is prevented, and thereafter counterblowing the blank in the blank mold.

6. In a narrow neck machine comprising a blank mold and a neck mold, means to open and close the blank and neck molds, an intermediate mold adapted to be closed in assembled relation with the blank mold and neck mold, means for opening and closing the intermediate mold, and means for effecting relative axial movement between the blank mold and neck mold when the intermediate mold and blank mold are open to change the position of a blank within the blank mold.

7. In a narrow neck machine comprising a tapered blank mold and a neck mold, an intermediate mold, means for opening the intermediate mold and for closing it in assembled relation with the blank mold and neck mold, said intermediate mold being shaped to provide a constriction in a blank adjacent the neck finish thereof, means for cracking the blank mold to reheat the blank, and means for effecting relative axial movement between the blank and blank mold to move the blank toward the large end of the blank mold to provide a clearance therebetween and thus prevent pinching of the blank when the blank mold is closed.

8. In a narrow neck machine comprising a tapered blank mold a blow mold and a neck mold, means including an arm for oscillating and inverting the neck mold to transfer a blank, means for cracking the blank mold to reheat the blank prior to transfer thereof, and means providing for vertical movement of said neck mold independently of its oscillatory movement and axially of the blank mold so as to move the blank toward the large end of the blank mold whereby pinching of the blank by the closing of the blank mold is prevented.

GEORGE E. HOWARD.