Dec. 7, 1943. E. G. BRIDGES 2,336,162

SAFETY MECHANISM FOR GLASSWARE FORMING MACHINES

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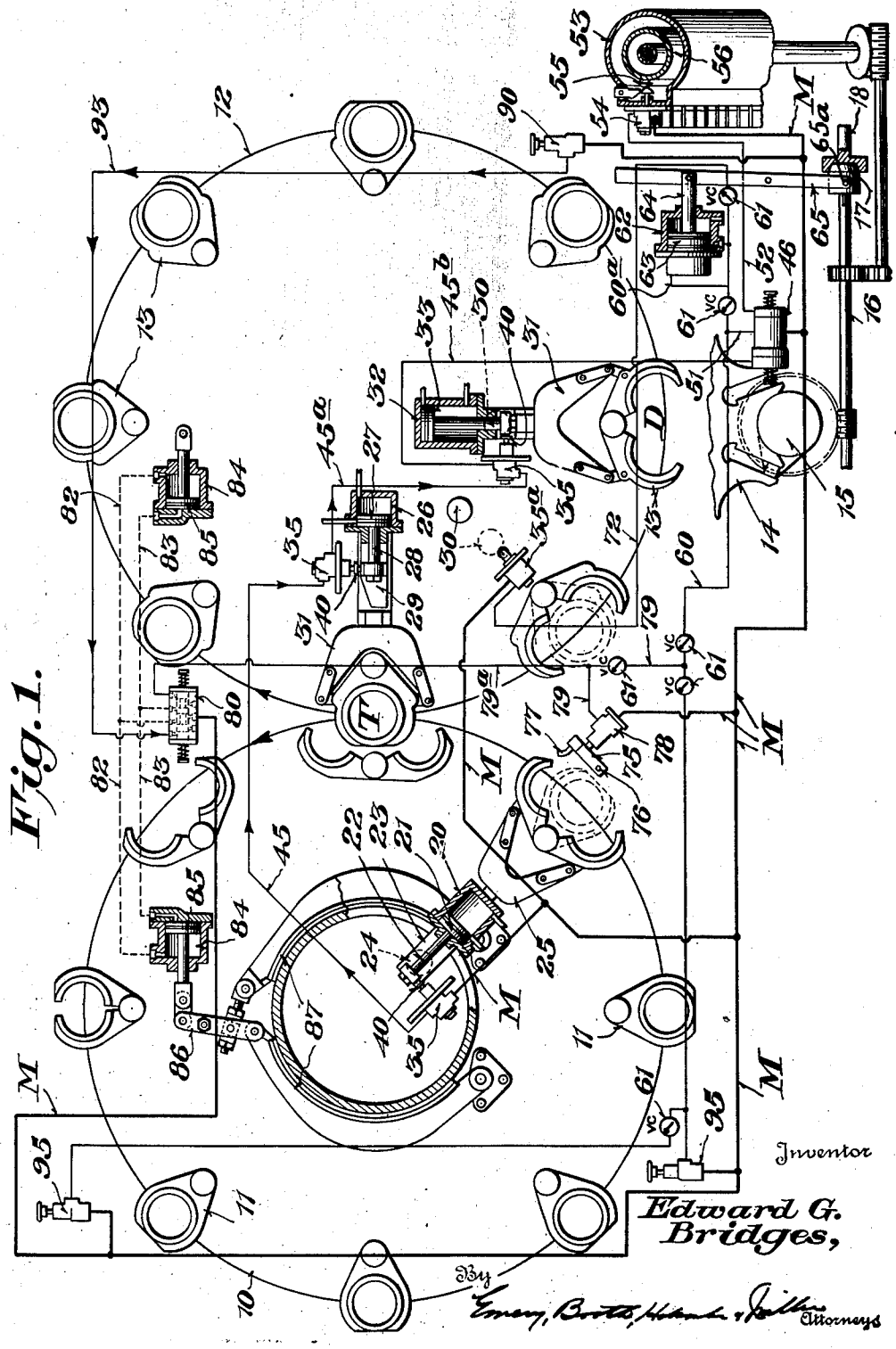


Fig. 1.

Inventor
Edward G. Bridges,
By Emery, Booth, Hamilton & Miller
Attorneys

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Fig. 2.

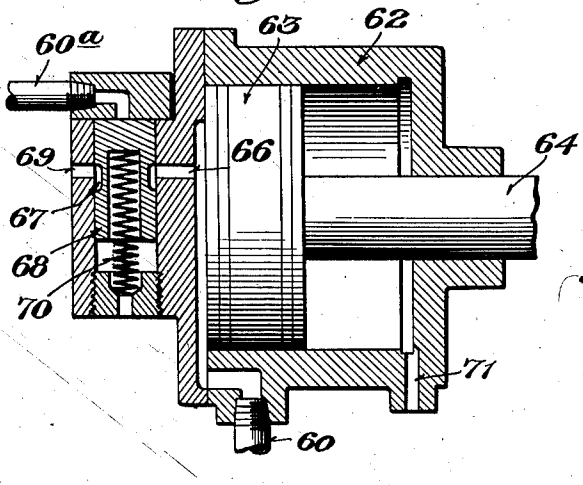


Fig. 4.

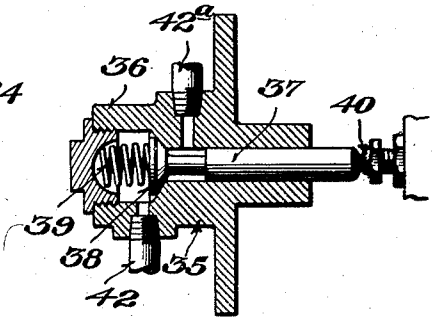


Fig. 3.

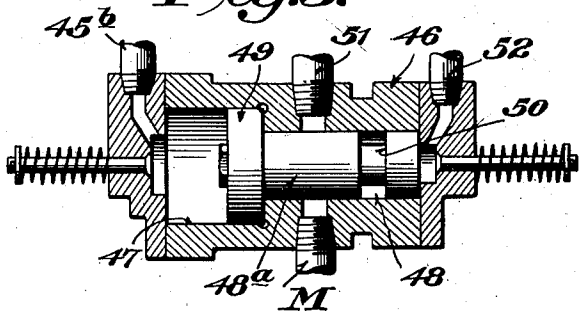


Fig. 5.

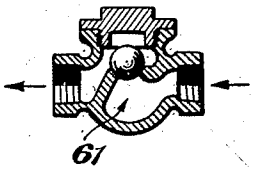


Fig. 6.

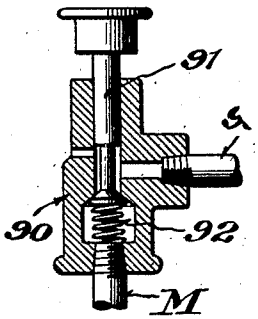
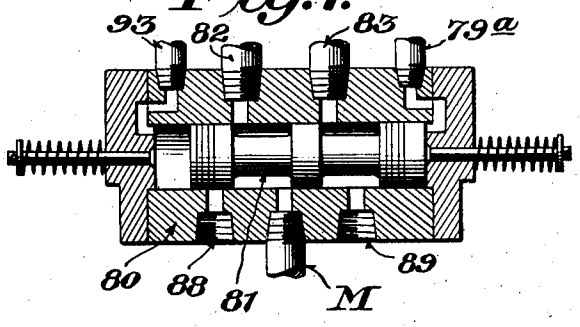


Fig. 7.



Inventor

Edward G. Bridges,

By Emery, Booth, Holcombe & Miller

Attorneys

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UNITED STATES PATENT OFFICE

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SAFETY MECHANISM FOR GLASSWARE FORMING MACHINES

Edward G. Bridges, Anderson, Ind., assignor to Lynch Corporation, Anderson, Ind., a corporation of Indiana

Application February 1, 1940, Serial No. 316,833

19 Claims. (Cl. 49—9)

The present invention relates to glassware forming machines, particularly to forming machines of the rotary type having automatic mechanism for opening and closing the molds, and aims generally to improve existing machines of the above type.

Many glassware forming machines of the rotary type include as a part of their mechanism certain bodily movable elements, such as mold mechanism and the like, which conveniently are operated by reciprocable fluid pressure actuated motors.

One of the principal aims and objects of the invention is the provision of a simple and efficient safety system arranged to prevent operation of the machine, such as rotation or indexing of the mold carriers, until the bodily movable fluid pressure operated members have completed their actuating movement and assumed their cleared position where they will not be jammed during the succeeding operations of the machine.

A further object of the invention is to provide a safety system that will disengage the driving mechanism and apply a brake to the mold carrier, when a bodily movable mechanism, as for example, a mold, has not been moved to its proper opened position.

A further object of the invention is the provision of a safety system for glassware forming machines including a plurality of trip devices located at selected positions about the machine, so that the operator may readily stop the machine from any one of a number of different locations.

Illustrative of a preferred embodiment of the invention, selected for illustrative purposes, reference is made to the accompanying drawings in which—

Fig. 1 is a diagrammatic plan view illustrating one type of forming machine equipped with my invention;

Fig. 2 is an enlarged sectional view of the clutch safety throw-out cylinder;

Fig. 3 is a similar view of the clutch cylinder control valve;

Fig. 4 is a similar view of the operating mechanism safety valve;

Fig. 5 is a similar view of a ball check valve as preferred in the system;

Fig. 6 is a similar view of one of the hand trip valves; and

Fig. 7 is a detail sectional view of the brake cylinder control valve.

The invention is illustrated for convenience, as applied to a forming machine of the two-table or mold-carrier type, employing a blank mold carrier 10 having a series of blank molds 11 thereon, and a separate blow mold carrier 12 having a series of blow molds 13 thereon, both mold carriers being interconnected for intermittent rotation as by a Geneva driving gear comprising a Geneva wheel 14 connected to each mold carrier, and driven by a Geneva rotor 15 driven by a shaft 16 adapted to be clutched as at 17 to a motor driven shaft 18. However, it will be apparent that the invention is equally applicable to machines employing a single mold carrier, and the mold carrier may be intermittently rotated by other means, for example, fluid pressure, or may be continuously rotated as desired.

As stated above, glassware forming machines usually include bodily movable mechanisms, movable toward and from the molds, as for example, the blank mold opening mechanism, the blow mold opening mechanism and the blow mold closing mechanism. It is obviously important in the intermittently rotated machines to insure that the mold operating pistons are in their proper positions at the completion of their actuating stroke ready for subsequent indexing of the mold carrier.

For example, the blank mold opening mechanism may comprise a cylinder 20 fixedly mounted on fixed parts of the machine above the blank mold carrier 10 and having a piston 21 therein, the piston rod 22 of which is connected to a slide 23 adapted to engage a roll 24 on blank mold operating yoke 25 for opening the mold. This operation advantageously takes place during a stop period of the machine, air being supplied to the cylinder 20 for operation of the piston 21 by any suitable means (not shown).

Similarly, the blow mold closing mechanism at the transfer station T may comprise a cylinder 26 mounted on a fixed part of the machine above the blow mold carrier 12, having a piston 27 working therein, the rod 28 of which is connected to a slide 29 for engaging a roller 30 on a blow mold operating yoke 31 for moving the roller outwardly to close the blow mold around the parison in a manner disclosed in my prior Patent No. 2,049,422. This operation likewise takes place during a stop period of the machine, air being admitted to the cylinder 26 from any suitable source (not shown).

Simultaneously the blow molds are opened at the discharge station D by means of a cylinder 32 having a piston 33 therein, the stem of which carries a slide adapted to engage the roller 30 and retract it to open the blow mold. It will be understood that the blow molds may be held closed

during travel from position T to D and open from position D to T by any suitable means, as for example, cams as shown by my Patent No. 2,049,422. These features form no part of my present invention and therefore are not illustrated.

The above operating mechanisms are in their inactive or cleared positions when they have completed their actuating strokes, as when the blank mold opening piston 21 and the blow mold opening piston 33 are retracted and the blow mold closing piston 27 is extended. When in these positions, the mold carriers 10—12 may be indexed without liability of damage to the mold operating mechanism.

In order to prevent such indexing operations of the mold carriers, unless the operating mechanisms have moved to their inactive or cleared positions, as explained, I provide safety valves 35 (see Figs. 1 and 4) comprising a casing 36 housing a reciprocable stem 37 formed with a poppet valve 38 normally held closed by a spring 39. The stem 37 is adapted to be engaged by buttons 40 adjustably secured to the slides on the piston rods of the movable parts, so as to open the valves and permit the flow of air from the inlet port 42 to the outlet 42a.

The several valves are advantageously connected in series, the inlet port 42 of the valve 35 for the blank mold opening mechanism being connected with the main or constant air line M, while the outlet port 42a thereof is connected to the inlet port of valve 35 for the blow mold closing mechanism by pipe line 45. Similarly a pipe line 45a connects the outlet of the blow mold closing safety valve 35 with the inlet of blow mold opening safety valve which, when open, supplies air through line 45b to one end of a valve 46 (Figs. 1 and 3).

Valve 46 preferably comprises a casing having a large diameter bore 47 in one end and a smaller diameter bore 48 in the other end. A valve stem 48a is positioned in the smaller diameter bore 48 and carries a piston head 49 positioned in the larger diameter bore 47. The valve stem 48a is formed with a groove 50 adapted in one position of the stem to align with ports connected to main air line M and line 51.

The smaller end of valve casing 46 is provided with an air inlet 52 leading from a machine timer 53, comprising a casing having a poppet valve 54 therein adapted to be opened by a button 55 on a rotary drum 56, so as to admit a flash of air from main or constant air line M to line 52. Preferably the timer drum is geared to the driving shaft 16 to rotate in synchronism therewith. Preferably the button 55 is adjustably positioned upon the drum 56 so as to admit a flash of air to line 52 just prior to indexing time.

Air line 51 from valve 46 connects with line 60 leading through ball check valve 61 to a clutch safety cylinder 62 (see Fig. 2) having a piston 63, the rod 64 of which is pivotally connected to a lever 65 pivoted at 65a connected to the clutch 17 of the machine driving mechanism, so that when air flows through line 60, the piston 63 in cylinder 62 is actuated outwardly to disengage the clutch and stop or prevent indexing of the machine. The rear end of cylinder 62 normally is open to exhaust through port 66 communicating with groove 67 of valve stem 68 and exhaust port 69. The valve stem is normally held raised or in exhaust position by spring 70. When, however, air is admitted to line 60a leading to the upper end of valve stem 68, the stem is depressed against tension of spring 70, thus shutting off the exhaust from cylinder 62 through ports 66—69. The forward end of cylinder 62 is continuously on exhaust through port 71 so as not to delay the movement of the piston 63 in clutch disengaging direction. The lever 65 may be manually operated to engage the clutch when starting the machine.

It will be apparent that if all of the operating pistons 21, 27 and 33 are in their inactive or cleared positions, as for example when they have completed their actuating strokes, each of the respective safety valves 35 will be opened, permitting the flow of air under pressure from main air line M through pipe lines 45, 45a and 45b to the larger bore 47 of the safety valve 46, holding the valve stem 48a closed as shown in Fig. 3, against any pressure applied to the smaller end of the stem 48a through line 52 from timer 53, and thus preventing the flow of air from main air line M to line 51 and line 60. The clutch operating piston 63 will not be operated and the machine will operate to make the next succeeding indexing movement of the mold carrier.

If, however, one of the pistons 21, 27 or 33 fails to move to or remain in its fully inactive or cleared position, its associated safety valve 35 will remain closed and no air will flow through the lines 45, 45a or 45b, as the case may be, to the larger bore end 47 of valve 46. Under these conditions the flash of air from the timer 53 through line 52 in advance of indexing will exert pressure on smaller end of valve stem 48a and shift valve to the left (Fig. 3) bringing groove 50 in communication with ports connecting main air line M and line 51, permitting the flow of air to lines 60, 60a to actuate the piston 63 to disengage the clutch 17, thus preventing the subsequent indexing movement.

Occasionally a mold operating mechanism may complete its movement to inactive or cleared position, but due to breakage of a part, such as a piston rod, or mold yoke roller 24 or 30, fails to open a mold. Subsequent movement of the closed mold into a position where it should be opened would result in serious damage to the machine.

For example, in machines of the type shown in my prior Patent No. 2,049,422 there is an idle station between the discharge station and the transfer station at which the blow molds are cooled. The molds must be opened at this station preparatory to being moved into the transfer station where they are closed around the parison by the blow mold closing mechanism described above.

Should, for any reason, the blow mold opening piston 33 complete its movement, yet fail to open the blow mold 13, the mold will arrive at the next position closed. In this position the roller 30 (dotted line position in Fig. 1) engages the stem of safety valve 35a (in all respects like valve 35, (see Fig. 4)), thus opening the valve, permitting the flow of air from main air line M to line 72 and ball check 61 to line 60 to operate the clutch release mechanism 62—63 in the manner above described, preventing further indexing of the machine.

Furthermore the failure of a mold to open may take place at a position which is immediately in advance of a position where the mold must be open. If the mold operating mechanism has completed its movement to inactive or cleared position, and failure of mold opening is due to breakage of some part of the mold operating mechanism, then ordinarily there is nothing to

prevent subsequent indexing of the mold to the next succeeding station. Such a condition may happen in a narrow neck bottle forming machine of the type disclosed in my Patent No. 2,049,422 wherein the blank molds must be opened at the station in advance of the transfer station.

According to the invention, I provide a secondary safety stop mechanism adapted to stop the machine by disengaging the clutch 17 and applying a brake to the mold carriers, which stop mechanism is located in the path of a closed mold but out of the path of an opened mold. Such secondary safety mechanism advantageously may comprise a support 75 pivoted on a post 76 and carrying an adjustable finger 77, one end of which lies in the path of the closed mold. A safety valve 78 similar to the valve 35 is suitably mounted so that its stem is engaged by the support 75. If the mold has been properly opened, the sections will be moved in a path clear of the finger 77 and proper indexing of the molds will take place. If, however, the mold is not opened as desired, indexing of the mold carrier will move the closed mold into engagement with the finger 77, moving it on its support 75 outwardly, opening valve 78 to permit the flow of air under pressure from main air line M to line 79 through ball check valve 61 to line 60 leading to the clutch throw-out cylinder 62 to disengage the clutch.

The momentum imparted to the mold carriers may be sufficient to carry the closed mold into the next station, which would result in jamming of the machine, and accordingly I find it desirable to stop the rotation of the mold carrier before such indexing can be completed. Accordingly a branch line 79a is connected to the line 79 between the valve 78 and the check valve 61 thereon, and leads to one end of a brake cylinder valve 80 (Fig. 7).

The valve 80 comprises a casing having a pneumatically shiftable valve stem 81 therein adapted to supply air alternately from main air line M to lines 82 and 83 leading to opposite ends of a brake cylinder 84 having a piston 85 connected to an operating link 86 of a band brake 87 surrounding the hub of the mold carriers, the details of construction of which are shown and described in my Patent No. 2,307,564, aforesaid. The valve casing 80 is also provided with exhaust ports 88—89 for exhausting air from lines 82—83. Thus the clutch 17 is disengaged and the machine is stopped by application of the brake to prevent full indexing movement of the mold to the succeeding station.

The pneumatically operated brake cylinder valve 80 is reset to actuate the pistons 85 to release the brake by means of a hand trip valve 90 (see Fig. 6), comprising a casing and a manually operated valve 91 normally held closed by a spring 92. When the valve 91 is manually opened by depression of the stem, air is admitted from main air line M to line 93 leading to the end of valve casing 80 opposite line 79a to shift valve 81 to the right as shown in Fig. 7, exhausting air from line 83 and admitting air to line 82 to release the brake.

Furthermore the machine may be provided with a plurality of hand trip valves 95 similar in construction to valve 90 (see Fig. 6), located at selected positions around the machine and connected to line 60, so that when the valves 95 are manually opened by the operator noticing a defective operating condition, air is supplied from main air line M to line 60 to actuate the clutch throw-out cylinder 62 to disengage the clutch and stop the machine.

The use of the check valves 61 in the air lines as indicated, provides for a most direct circuit to the clutch throughout cylinder 62 and insures fast and speedy operation thereof. The provision of the check valve 61 in the line 79a and line 60 provides for operation of the brake cylinder 84 when the valve 78 is opened as is desired, yet prevents the flow of air through line 79a to shift valve 80 when air is in line 60 from other valves, and application of the brakes is not necessary.

It will be thus noticed that my invention includes a clutch or clutch in the carrier rotating means with a control valve periodically supplied with air to move it to open position to actuate the clutch. Thus successive cyclic operations of the machine are prevented unless the mold operating mechanisms and the like are in their proper cleared positions, in which case opening of the control valve is prevented and subsequent cyclic operations are permitted. However, should certain molds remain closed or other movable rotatable parts fail to move to proper position, the machine will be stopped irrespective of the cleared position of the mold operating mechanism and the closed position of the control valve. The particular details of the mechanisms for driving the outer drums 56, the mold carriers 10 and 12 and for applying the brakes 87 thereto are not essential to the present invention and are illustrated only diagrammatically in the drawings. Such mechanisms are more fully shown and described in my copending Patent No. 2,307,564, dated January 5, 1943.

It will be obvious to those skilled in the art that the several features of the invention are not restricted to the particular embodiment of forming machine illustrated and described, and that the invention is susceptible of use on single carrier machines as well as machines employing two carriers. Furthermore, it will be understood that the invention provides a safety mechanism for forming machines generally designed to stop the machine in the event that one or more pneumatically operated parts fail to move to desired position or in the event that any movable part of the machine fails to perform its one intended operation.

I claim:

1. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, and means for supplying air under pressure to said clutch disengaging means in the event the said mold opening or closing means do not complete their actuating movements.

2. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, and means for supplying air under pressure to said clutch disengaging means in the event the said mold opening or closing means do not complete their actuating movements, and means for preventing operation of said last named means when said mold opening

and closing means are in their fully operated positions.

3. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, mechanically driven means for intermittently rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, and means for supplying air under pressure to said clutch disengaging means to disengage the clutch and prevent subsequent indexing movement of the mold carrier in the event the said mold opening and closing means are not in their cleared position.

4. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, mechanically driven means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, valve means associated with said mold opening and closing means adapted to be opened by said mold opening and closing means when the latter have completed their operative movements, and additional means interposed between and pneumatically connected to said valve means and clutch disengaging means for effecting operation of the latter when said valve means are closed.

5. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, mechanically driven means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, valve means associated with said mold opening and closing means adapted to be opened by said mold opening and closing means when the latter have completed their operative movements, means interposed between and pneumatically connected to said valve means and clutching means for pneumatically actuating said clutch disengaging means, and means for preventing such actuation of the clutch disengaging means when said valve means are opened.

6. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted on said carrier, pneumatically operated means for opening said molds, separate pneumatically operated means for closing said molds, means for rotating said carrier including a clutch, pneumatically operated clutch disengaging means therefor, series connected valve means associated with said mold opening and closing means, means interposed between said first named valve means and said clutch disengaging means and operative normally to pneumatically actuate said clutch disengaging means at periodic intervals of rotation of said carrier, and means for preventing operation of the clutch disengaging means when an air flow is established through said series connected valve means.

7. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds thereon, means for rotating said mold carrier, pneumatically operated means for opening the molds, a clutch in the rotating means adapted to render said rotating means ineffective to rotate said mold carrier, pneumatically operated clutch disengaging means therefor, valve means adapted to be opened by said mold opening means when said molds are opened, time controlled means pneumatically connected to said clutch disengaging means at periodic intervals in the rotation of the mold carrier, and pneumatic connections between said valve means and timer controlled means for preventing operation of the latter and the clutch disengaging means when air flow is established through said connection.

8. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds thereon, means for rotating said mold carrier, pneumatically operated means for closing the molds, a clutch in the rotating means adapted to render said rotating means ineffective to rotate said mold carrier, valve means adapted to be opened by said mold opening means when said molds are closed, time controlled means pneumatically connected to said clutch disengaging means at periodic intervals in the rotation of the mold carrier, and pneumatic connections between said valve means and timer controlled means for preventing operation of the latter and the clutch disengaging means when air flow is established through said connection.

9. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds thereon, means for rotating said mold carrier, pneumatically operated means for opening the molds, pneumatically operated means for closing the molds, a clutch for the rotating means adapted to render said rotating means ineffective to rotate said mold carrier, pneumatically operated clutch disengaging means therefor, valve means adapted to be opened by said mold opening and closing means at the ends of their operative movements, time controlled means pneumatically connected to said clutch disengaging means at periodic intervals in the rotation of the mold carrier, and pneumatic connections between said valve means and timer controlled means for preventing operation of the latter and the clutch disengaging means when air flow is established through said connection.

10. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds thereon, means for rotating said mold carrier, pneumatically operated means for opening the molds, a clutch in the rotating means adapted to render said rotating means ineffective to rotate said mold carrier, and valve means operable by the movement of an improperly opened mold for pneumatically operating said clutch disengaging means.

11. A glassware forming machine comprising a mold carrier, a plurality of sectional openable molds hingedly mounted thereon, means for opening and closing said molds, means for rotating said mold carrier including a shaft, a clutch for said shaft, a pneumatically operated clutch throw-out cylinder connected to said clutch, a valve controlling the supply of air to clutch throw-out cylinder, means operating in synchronism with the rotation of said shaft for periodically shifting said valve to open it to supply air to said clutch cylinder, and means for preventing such operation of said valve when said mold opening and closing means have completed their operating movements.

12. A glassware forming machine comprising a mold carrier, a plurality of sectional openable molds hingedly mounted thereon, means for opening and closing said molds, means for ro-

tating said mold carrier including a shaft, a clutch for said shaft, a pneumatically operated clutch throw-out cylinder connected to said clutch, a valve controlling the supply of air to the clutch throw-out cylinder, means operating in synchronism with the rotation of said shaft for periodically supplying air to one end of said valve tending to shift said valve to open it to supply air to said clutch cylinder, and means for preventing such operation of said valve when said mold opening and closing means have each completed their operating movements.

13. A glassware forming machine comprising a mold carrier, a plurality of sectional openable molds hingedly mounted thereon, fluid pressure operated means for opening and closing said molds, means for rotating said mold carrier including a shaft, a clutch for said shaft, a pneumatically operated clutch throw-out cylinder connected to said clutch, a valve controlling the supply of air to the clutch throw-out cylinder, means operating in synchronism with the rotation of said shaft for periodically shifting said valve to open it to supply air to said clutch cylinder, and means for preventing such operation of said valve when said fluid pressure operated means have completed their operating movements.

14. A glassware forming machine comprising a mold carrier, a plurality of sectional molds hingedly mounted thereon, fluid pressure operated means for operating said molds, means for intermittently rotating said carrier including a shaft, a clutch for said shaft, fluid pressure operated means for disengaging the clutch of said shaft, valve means pneumatically connected to said clutch disengaging means adapted when in open position to admit a supply of air to said means, means operating in synchronism with the rotation of said shaft for periodically supplying air to said valve in advance of mold rotating movements and operative to shift said valve to open position, and means controlled by the fluid pressure operated mold operating means for preventing movement of said vlave to open position when said mold operating means have concluded their actuating operation.

15. A glassware forming machine comprising a mold carrier, a plurality of sectional molds hingedly mounted thereon, fluid pressure operated means for operating said molds, means for intermittently rotating said carrier including a shaft, a clutch for said shaft, fluid pressure operated means for disengaging the clutch of said shaft, valve means pneumatically connected to said clutch disengaging means adapted when in open position to admit a supply of air to said means, means operating in synchronism with the rotation of said shaft for periodically supplying air to said valve means in advance of mold rotating movements and operative to shift said valve to open position, and valve means controlled by the fluid pressure operated mold operating means for preventing movement of said valve to open position when said mold operating means have concluded their actuating operation.

16. A glassware forming machine comprising a mold carrier, a plurality of sectional molds hingedly mounted thereon, fluid pressure operated means for operating said molds, means for intermittently rotating said carrier including a shaft, a clutch for said shaft, fluid pressure operated means for disengaging the clutch of said shaft, valve means pneumatically connected to said clutch disengaging means adapted when in open position to admit a supply of air to said clutch disengaging means, means operating in synchronism with the rotation of said shaft for periodically supplying air to said valve in advance of mold rotating movements and operative to shift said valve to open position, and series connected valve means controlled by the fluid pressure operated mold operating means for preventing movement of said valve to open position when said mold operating means have concluded their actuating operation.

17. A glass forming machine including a rotary mold table, means for driving the mold table, a clutch in the driving mechanism, a brake for preventing the rotation of the table, and means operated by rotation of the table for disengaging the clutch and applying the brake, when parts of the forming machine are in abnormal position.

18. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, and timer controlled means for supplying air under pressure to said clutch disengaging means in the event the said mold opening or closing means do not complete their actuating movements.

19. A glassware forming machine comprising a rotatable mold carrier, a plurality of sectional openable molds mounted thereon, separate means for opening and closing said molds, means for rotating said mold carrier including a clutch, pneumatically operated clutch disengaging means therefor, and timer controlled means for supplying air under pressure to said clutch disengaging means in the event the said mold opening or closing means do not complete their actuating movements, and means for preventing operation of said timer controlled means when said mold opening and closing means are in their fully operated position.

EDWARD G. BRIDGES.