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APRIL 27, 1943.

BY A. P. C.

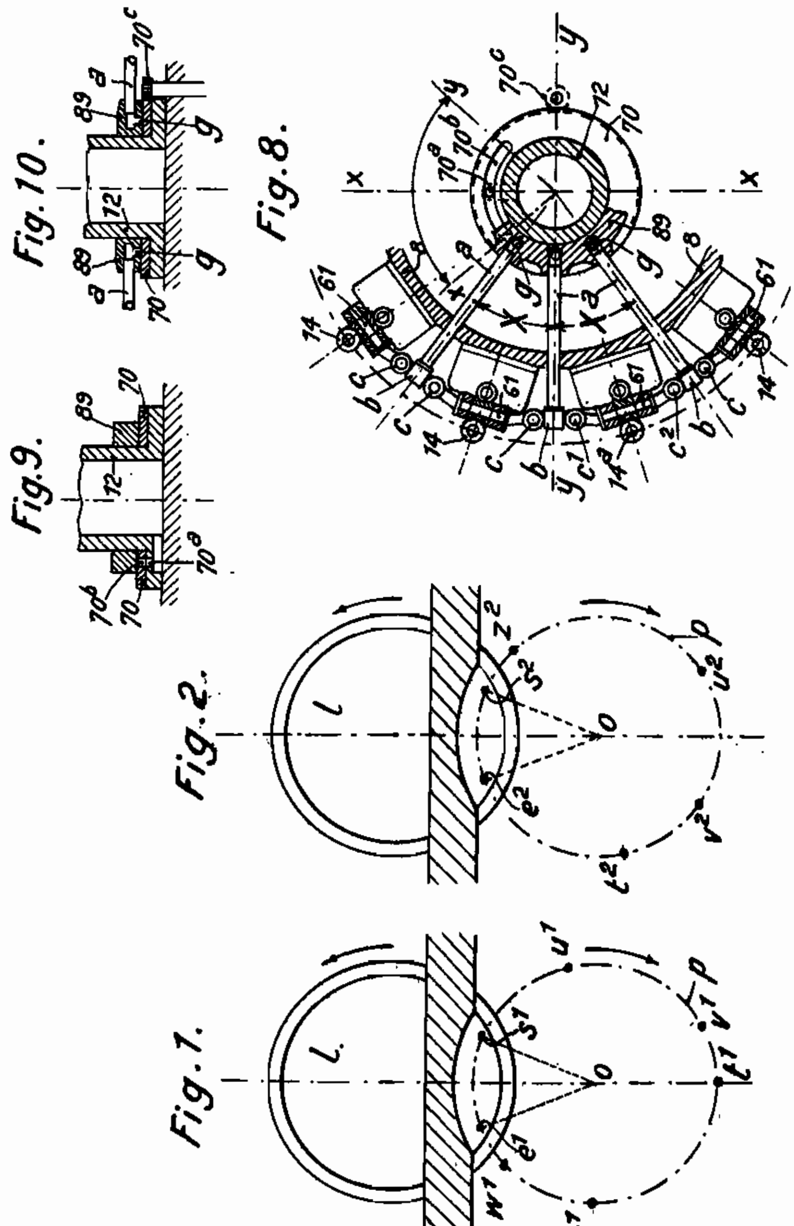
E. ROIRANT

AUTOMATIC MACHINE FOR THE MANUFACTURE OF BOTTLES AND LIKE ARTICLES

Filed Dec. 16, 1938

Serial No. 246,223

6 Sheets-Sheet 1



E. Roirant
Inventor

By: Glascock Downing & Seebold
Attys.

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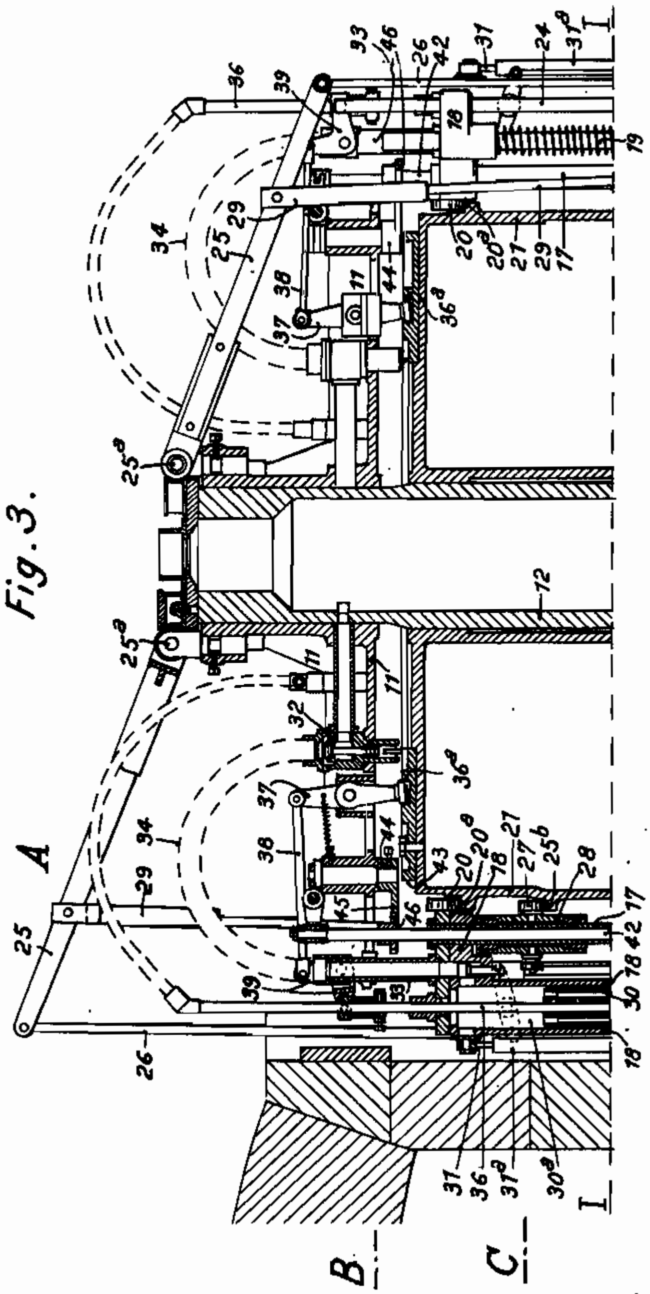

Fig. 3.

E. Roirant
Inventor

By: Glascock Downing & Seebold
Attys.

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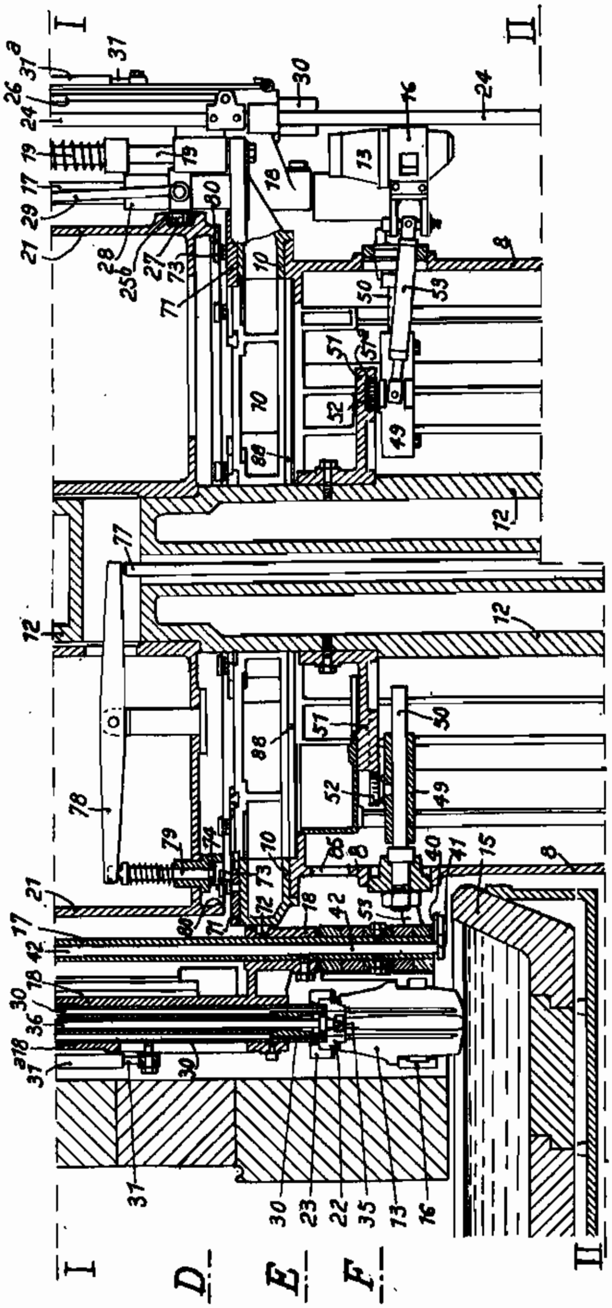
Fig. 4.



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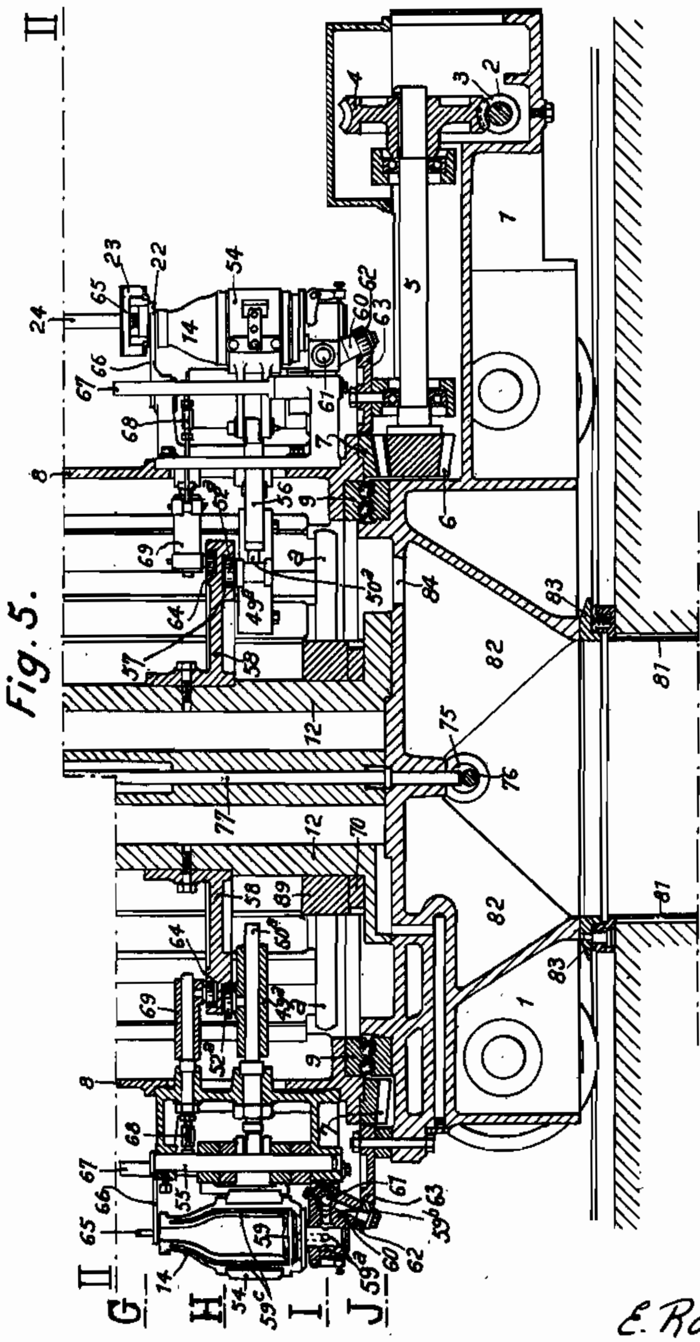

Fig. 5.

E. Roirant
Inventor

By: Glascock Downing & Seebold
Attys.

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E. ROIRANT

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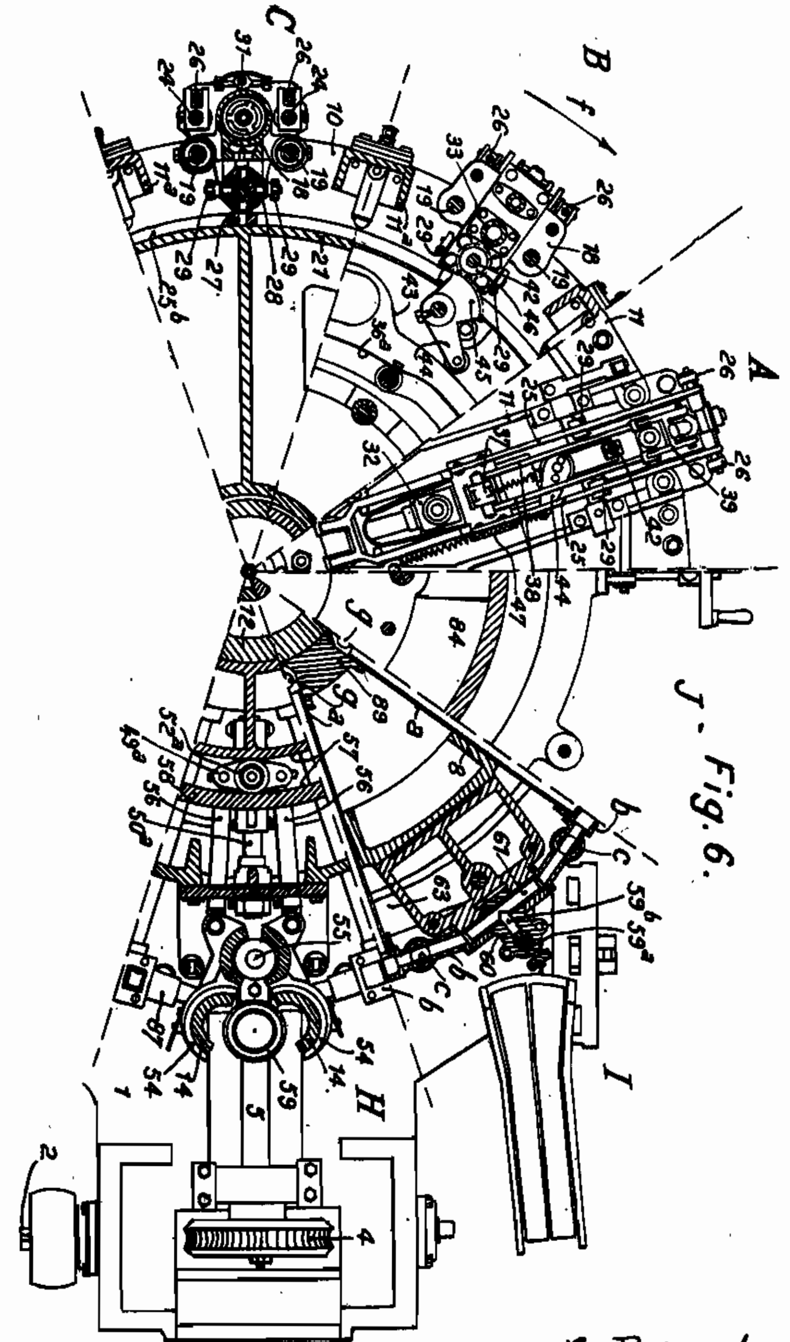

Fig. 6.

E. Roirant
Inventor

By: Glascock Downing & Seebold
Attys.

PUBLISHED

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E. ROIRANT

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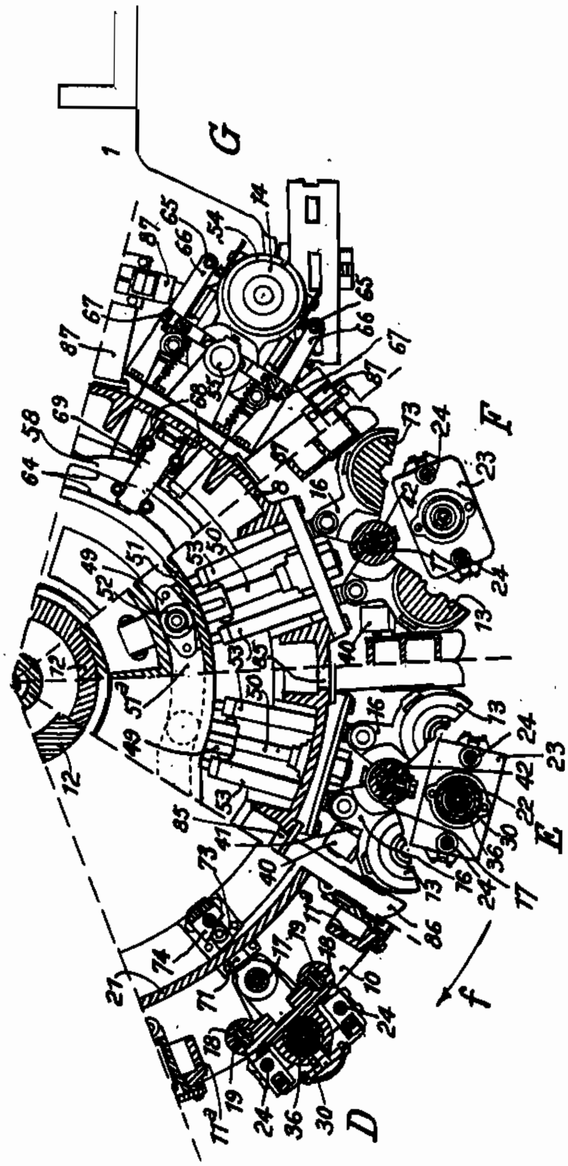
Fig. 7.



E. Roirant,
Inventor

By: Glascock Downing & Seebold
Attys.

Published Apr. 27, 1943 **Serial No. 246,223**

ALIEN PROPERTY CUSTODIAN

AUTOMATIC MACHINE FOR THE MANUFACTURE OF BOTTLES AND LIKE ARTICLES

Emile Roirant, Paris, France; vested in the Alien Property Custodian

Application filed December 16, 1938

The present invention relates to a machine for the automatic manufacture of bottles, flasks, or other articles made of hollow glass. Said machine belongs to the class of automatic machines provided with a plurality of pairs of parison and finishing moulds which rotate at a uniform speed about a central column and take up glass by suction from a receptacle containing molten glass.

In this general framework, the invention has for its object a machine which is capable of producing a large output, while being of very substantially reduced weight and bulk relatively to the known machines of the same class, which have an equal number of pairs of moulds.

As the capacity of output is directly proportional to the rhythm of the up-takes of glass, that is to say to the speed of rotation of the rotating part of the machine, all the essential original features of the machine according to the invention have been designed and combined to contribute to a common end, which is the construction of a machine having a high speed of rotation, in particular higher than that of the machines of the same class.

In order to eliminate the various physical or kinematic causes which act to retard the speed of rotation of a machine of the above defined class, or to impose an impassable upper limit on said speed, the invention provides a group of characteristic solutions which follow from each other and complete each other so as to make possible the high speed that is necessary for the high output required from the machine.

A first characteristic peculiarity which, in the machine according to the invention, has enabled the speed of rotation to be fundamentally increased, rests on the following considerations which are illustrated by Figs. 1 and 2 of the accompanying drawings.

A parison mould,—belonging to a series of moulds which are evenly distributed about a central column having o as its axis, on a pitch circumference or trajectory *p* and successively taking up glass from a supply tank or its equivalent *l*—collects its charge of glass from said tank along the arc e^1—s^1. When the taking up has been completed at s^1, it is necessary for the charge of glass of the mould to cool in the latter until the glass has reached a degree of rigidity which enables the parison to be transferred into the finishing mould without danger of dislocation. A predetermined minimum time therefore has to elapse between the instant when the parison mould is filled and the instant when the parison is released.

Then, a likewise predetermined minimum time is required for said parison to be ready to be subjected to blowing in the finishing mould.

The blowing operation itself requires a predetermined time and also the mechanical operations which restore the parison mould to condition for sucking up a fresh charge of glass.

In the known machines—belonging to the class under consideration—this succession of predetermined duration corresponds to the following arcs on the pitch circumference of the moulds: taking up along the arc (e^1—s^1); cooling the parison in the parison mould along the arc (s^1—u^1); transfer of the parison to the finishing mould, along the arc (u^1—v^1); stay of the parison in the latter, along the arc (v^1—t^1); blowing the parison to its final shape in the finishing mould, along the arc (t^1—z^1). The arc (z^1—w^1) corresponds to the return to conjunction of the finishing mould and of the parison mould.

In the known machines, the mechanical constructions are such that the blowing in the finishing mould has necessarily to be completed before the parison mould has reached the point e^1. In fact, in said machines, the blowing means are part of the parison mould and consequently have to be returned to, or placed in relation with the latter at, the point w^1 before the suction operation begins, that is to say before the parison mould has reached the point e^1.

In this connection, an essential feature of the machine which is the object of the invention consists in the fact that, in each group of moulds, the blowing in the finishing mould is effected by means of members which are not involved in the sucking up of the charge of glass into the parison mould of the group. Thus, the blowing of the parison does not require any member that is lacking in the parison mould when the latter comes into position for sucking up again the charge of glass which is to form the next parison. In the embodiment described hereinafter, blowing is effected by a vacuum action.

Fig. 2 illustrates the distribution of the various characteristic stages along the pitch circumference of the moulds, for the machine according to the invention. The arcs are in this case given the index (2).

In this machine, blowing can continue to be exerted beyond the point e^2—since the blowing operation does not deprive the parison mould of any of the members which are necessary for the action of taking up by suction exerted by said mould from the point e^2—and can even start beyond the point e^2.

In the example of Fig. 2, blowing can terminate at z^2, that is to say beyond the point s^2. Now, owing to the fact that the duration of blowing is constant, the arc (s^2—u^2—v^2—t^2) described by each of the pairs of moulds from the point s^2 (which marks the end of the take-up) to the point t^2 (which marks the beginning of the blowing) may be larger than in the known machines (arc s^1—u^1—v^1—t^1).

As the time for travelling through these two different arcs must be the same, the speed of rotation must be higher in the case of the new machine, which is equivalent to an increase of output.

In such a machine which has to operate with a high speed of rotation of the rotating part, the determination and the adjustment of the instant at which the blowing of the parison in the finising mould has to begin, specially form decisive factors for the regularity of manufacture.

It is therefore necessary to have means available which enable the position of the point t^2 to be fixed at will and very simply, for blowing a parison which is intended to form a bottle or a flask of predetermined dimensions. This position of the initial point of blowing is liable to vary within relatively wide limits, according to the requirement of the successive manufactures.

The experimental determination of the initial point of blowing is particularly important in the case of high speed machines since, in the latter, the results of a premature or a late start of the blowing are of a nature such as to impair very substantially the efficiency of the blowing operation.

In this respect, a second essential feature of the invention, in close relation with the speed factor, consists in a combined group of adjusting means for distributing the vacuum to the various finishing moulds.

Said adjusting means enable the point of origin of the blowing in said finishing moulds to be displaced within the wide limits required to enable the machine to be adapted instantly to the various changes of manufacture.

According to the invention, two factors for adjusting said initial point of blowing are provided, one enabling the rough setting of the adjusting to be effected by a substantial angular displacement of the starting point of the blowing, the other enabling the adjustment of the best position to be accurately completed.

For this purpose, in each group of moulds, the finishing mould is surrounded by two vacuum supply pipes and is connected to the latter by two respective supply cocks which can be alternately opened and closed, said pipes accompanying the rotation of the finishing mould which they supply and terminating, towards the central part of the machine, by orifices which circulate along a fixed supply slot which is connected to the vacuum reservoir and extends along a certain arc about the general axis of rotation of the moulds.

To this arrangement—which enables the initial point of blowing to be systematically and instantaneously displaced, by the simple alternate actuation of the cocks, between two extreme positions which are separated by an arc corresponding to the angular distance between two groups of moulds—is added a second adjusting control by means of which a balance of angular displacement can be given the point of origin of blowing. Said second adjusting control acts by means of an angular displacement of any desirable amplitude, which is communicated to the member in which is provided the slot forming a vacuum supply valve.

The device as a whole therefore permits of any combination as regards the beginning of the blowing in the finishing moulds, which beginning forms an important factor of the manufacture.

A third feature of the machine, which also contributes to make possible a substantial increase in the speed of rotation and in the capacity of output, consists in the considerable reduction of the pitch circle forming the trajectory of the centres of the moulds, with respect to machines of the same class.

In fact, it is known that the speed of rotation—and consequently the efficiency of a machine of this kind—is limited by the effects of centrifugal force which, being exerted on the parisons that are suspended on the ring moulds, is liable to cause the deformation or the untimely displacement of said parisons outside the trajectory they should normally follow. The considerable reduction of the diameter of the pitch circle of the moulds therefore enables the effects of centrifugal force to be attenuated very substantially and consequently makes it possible to increase considerably the speed of rotation.

In the machine according to the invention, this result is obtained in practice under the following conditions:

(*a*) The radius of opening of the moulds, that is to say the distance from the axis of the parts of the mould to the pivotal axis of said parts, is extremely short, so that the displacement of said parts during their opening movements is angularly reduced, thereby enabling, for a given transverse diameter of the machine, the latter to be provided with a greater number of mould systems.

(*b*) Concurrently with the previous arrangement of moulds having a short radius of opening, the construction of the machine is such that no member is interposed between two groups of adjacent moulds, thereby procuring the minimum peripheral bulk.

(*c*) No intermediate member exists between the cams which generate the upward and downward movements of the parison moulds and the parison mould carrier slides which are subjected to the action of said cams. Said slides, which are of very reduced width, directly carry the rollers that actuate them.

Owing to these three arrangements, at the same time as the production is increased, the cost of constructing the machine is reduced to a considerable extent relatively to comparable machines belonging to the same class.

Furthermore, owing to the fact that the angle corresponding to the suction of the glass in the take-up receptacle is constant, the arc described by the parison mould in dipping into the glass is proportional to the diameter of the pitch circle of the moulds. The substantial reduction of said diameter will therefore enable the length of the suction arc to be correspondingly reduced. Consequently, it will be possible to decrease in a corresponding manner the surface of the glass exposed to the atmosphere. In the case of a rotating tank, the diameter of same can be reduced in the same proportions.

A fourth feature of the machine relates to the faculty possessed by same for producing, during the same cycle of manufacture, articles of different dimensions and shapes, some moulds being, for example, used for the manufacture of bottles, others for flasks having more reduced dimensions.

When such a mixed manufacture is started, it is necessary to effect the adjustments which compensate the variations of height of the various parison and finishing moulds that are put into use on the machine.

Said adjustments are obviously dependent on the suction members through which the take-up of glass may be effected.

Now, in the known machines, the adjustment in question requires an intervention on the parison mould carrier. In the machine according to the invention, the adjustment in height is not effected on the mould carrier member, but on a sliding tube which is adjustable in said member and against which the ring mould is adapted to rest, so as to determine the position of origin of the latter, whereas the tube furthermore serves for establishing the communication of the ring mould and of the parison mould with the vacuum reservoir. For this purpose, said tube is moved, for its adjustment in height, in a fluid-tight chamber of the parison mould carrier member, which chamber communicates with a vacuum inlet valve.

In practice, it therefore suffices, the parison mould being mounted on the mold carrier, to bring the tube into the predetermined position corresponding to the type of said mould, for the adjustment to be obtained immediately.

A fifth feature of the machine relates to the fact that, owing to the closeness of the groups of moulds—which has enabled the substantial decrease to be obtained in the pitch circumference of their centres—said moulds follow each other at close intervals in the supply tank. It ensues that constantly, at least one parison mould touches the glass in the supply tank and that, under these conditions, it would not at any instant be possible to move the machine backwards, said machine being only able to move away horizontally from the supply tank.

In view of the fact that, under certain circumstances, it is indispensable to move the machine away from the tank, the invention includes a special device for this purpose, whereby the withdrawal of the machine can be obtained without running the risk of a part of the latter, in particular a parison mould, striking the wall of the tank during said withdrawal.

These characteristic devices—which for the above reasons form an indispensable complement of the high output machine in question—act to prevent the downward movement of the parison moulds at the instant when they should normally effect their dip into the tank.

A sixth characteristic peculiarity of the machine according to the invention relates to the cooling of said machine.

It is known that it is always necessary to cool the moulds of a bottle-making machine and that this necessity is more particularly imperious for a machine which, as it rotates at the maximum speed, takes up a considerable tonnage of hot glass.

However, as it is a matter of a machine belonging to the class under consideration, that is to say in which all the moulds rotate about a vertical axis, it is necessary to contend, not only with the heating of the moulds, but also with that of the entire central portion which contains the mechanisms determining the take-up, the transfer and the transformation of the glass, and is surrounded by a relatively large number of moulds, the mean temperature of which is of the order of 500° C. This heating of the central portion of the machine by conductivity and by radiation is more important as the dimensions of the machine are relatively reduced with respect to the number of moulds it carries.

The carrying out of the cooling in the machine according to the invention, has therefore set a particular problem, owing to the compact structure of said machine and to the concentration of heat of which it tends to be the seat because of the proportionally large mass of hot glass it takes up and transforms in each unit of time.

The invention provides, for this purpose, means for cooling the actual body of the machine, said means chiefly consisting in the creation of a circulation of cooling air inside a central drum which carries or encloses the most exposed mechanisms, so that the machine thus acquires the aeration which is indispensable and sufficient for the complete safety of its mechanical operation.

Figs. 3 to 7 of the accompanying drawings show a machine possessing all the above defined features.

Figs. 3, 4 and 5, which are to be joined together along the section lines indicated in Roman figures, show as a whole a vertical section of said machine through the plane determined by the axis of the machine and by the axis of a parison mould in the take-up position in the molten glass.

Each of Figs. 6 and 7 assembles a number of views in horizontal section, these sections being staged along planes projected at B—C—D . . . H—I—J in Figs. 3 to 5.

The correspondence between these sectional views and their line of projection on the vertical plane of Figs. 3 to 5 is established by the same reference letters B—C—D . . . H—I—J.

The view A of Fig. 6 is a plan view, seen from the top, of the machine limited to a pair of parison moulds vertically above the supply receptacle.

Fig. 8 shows the diagrammatical horizontal section of a device for adjusting the initial instant of blowing in the sequence of finishing moulds.

Fig. 9 is a view along the plane projected at $x—x$ in Fig. 8.

Fig. 10 is a view along the plane projected at $y—y$ in Fig. 8.

The rotating part of the machine is arranged on a base forming a carriage **1**, and receives a continuous rotary movement from an electric or other motor, through the intermediary of a shaft **2**, a worm **3**, a worm wheel **4**, a shaft **5**, a pinion **6**, and finally a gear wheel **7** fixed to the base of the rotating part.

The latter is composed of three assembled main parts: the drum **8** which rests on the ball thrust bearing **9**, the intermediate plate **10** and the upper plate **11** which is connected to the former, **10**, by braces **11**ᵃ evenly distributed at the periphery of said plates.

The structural rotating part thus composed rotates about a central column **12** which is fixed on the frame **1** and carries the various cams which actuate the mechanism of the machine.

A plurality of groups of similarly formed moulds (parison mould—finishing mould), are evenly distributed at the periphery of the rotating parts. In the example of the drawings, the machine is provided with a number of groups of moulds equal to ten.

Each group comprises a parison mould **13**—and all the mechanisms appertaining thereto—and a finishing mould 14 with all its accessory members.

In each of said groups, the parison mould and the finishing mould are arranged in the same vertical plane, the first above the second. Between the parison mould and the finishing mould, an empty space is provided to enable the supply tank 15, in which the parison moulds successively take up their charge of glass by suction, to pass and to rotate.

Each of the parison moulds 13 rests on a separate mould-carrier 16 which is pivoted about a long hollow pivot 17 carried by a vertical slide 18 that is guided on two fixed parallel rods 19.

An upward and downward movement is imparted to the slide 18 at the opportune instants by means of a roller 20 rolling on an outer slope 20^a of a cam-drum 21 which is itself fixed on the central column 12.

This downward and upward movement is intended to cause the base of the parison mould 13 to dip in the glass of the tank 15 for the purpose of filling said mould and of lifting same over the wall of the tank after the filling is completed.

Fitted in the upper part of the parison mould 13, the opening parts of the ring mould 22 are arranged inside a slide 23, the latter being carried by two parallel rods 24 which are guided in the slide 18. Said parallel rods are connected to a lever 25 by connecting rods 26.

The lever 25, which is pivoted at 25^a on the upper plate 11 of the machine, receives an oscillating movement which is imparted to it by a cam slope 25^b arranged outside the cam-drum 21. The movement is transmitted by a roller 27 carried by a slide 28 which is guided on the hollow pivot 17 and transmits its movement by means of the connecting rods 29.

The vertical reciprocating movement which is thus imparted to the ring-mould carrier is intended, at the opportune instant, to lower vertically the parison which issues from the parison mould and introduce said parison into the previously opened finishing mould, then, after said parison has been delivered to the finishing mould, to return the empty ring mould to its original position.

Said position, which is a function of the height of the parison mould under consideration and consequently of the size of the bottle to be manufactured, can be adjusted by an appropriate displacement of the rods 24 in the slide after having released them from the connecting rods 26, but it is also controlled by a tube 30. The ring mould is closed about the lower end of said tube which is fixed in the position suitable for a given parison mould by means of a rod 31, the latter being provided with a screw sleeve 31^a which enables the height of the tube to be adjusted.

The tube 30 also fulfils a second function, viz.: placing the ring mould and parison mould assembly in communication with the vacuum.

For this purpose, said tube 30 is lodged in a fluid-tight cavity 30^a of the slide 18, which cavity communicates with a valve 32 through the intermediary of the tube 33 and of the hose 34. The adjustment in height consists in simply moving the tube 30 vertically inside this fluid-tight housing. After the adjustment has been completed, during the rotation of the machine, the valve 32, which is actuated by a slope arranged on the drum 21, serves in particular for effecting the suction of the glass into the parison mould 13.

Inside the tube 30 is lodged a rod 36 which is terminated by the usual mandrel 35. Said rod is actuated by another slope 36^a of the drum 21, by means of a lever 37, connecting rods 38 and a bell crank lever 39.

In order to effect the cutting of the glass after same has been sucked into the parison mould, a chisel 40, which is fixed at the end of an arm 41 pivoted on a shaft 42, receives a circular movement from a slope 43 of the cam-drum. The lever 44, the toothed quadrant 45 and the pinion 46 which is keyed on the shaft 42 are the members which transmit said movement. After having cut off the tail of the glass at the base of the parison mould 13, the chisel is returned to its starting position by a retracting spring 47.

The parison mould is opened and closed at the opportune instants by the action of two connecting rods 53 which are pivoted on each of the parts of the mould-carrier 16 and on a slide 49 which is adapted to slide on a bar 50.

The cam disc 51, with grooves 51^a, are, together with the roller 52, responsible for this movement.

The connecting rods 53 are provided with a cardan joint so as to yield to the upward and downward movements of the parison mould.

In each of the groups of moulds, the finishing mould 14 which is in two parts, is arranged in a mould-carrier 54 composed of two parts which open about a pivot 55. Its opening and its closing are effected in the same manner as those of the parison mould and the mechanism for this purpose is composed of the same elements, viz.: the slide 49^a and the bar 50^a. Contrary to the mounting of the connecting rods 53, the connecting rods 56 are not necessarily fitted with a cardan joint.

At the required time and by means of the roller 52^a, the groove 57 of the cam disc 58 produces the opening and closing movements of the mould.

The base of the finishing mould 14 closes about a bottom 59 carried on an arm 60 which is pivoted at 61. Said arm is provided with a roller 62 compelled to roll on a disc 63 which is itself fixed on the frame. At a predetermined spot on this raceway, a depression of appropriate depth causes the tipping of the bottom 59 and consequently that of the bottle contained in the mould.

In the machine under consideration, the blowing of the bottle, or other similar article made of hollow glass, is effected by means of a vacuum.

Such blowing by means of a vacuum has already been used, in particular in the machines which were the object of U. S. Patent No. 1,946,411 of February 6, 1934.

A similar arrangement can be obtained, and is moreover illustrated in the accompanying drawings in a machine according to the present invention. Reference is made to the fact that the bottom 59 of the finishing mould is provided with grooves, in this case 59^a, which communicate, on the one hand with a conduit 59^b connected to the vacuum reservoir, on the other hand with grooves 59^c provided in the contiguous faces of the two parts of the finishing mould. When the latter is closed, the action of the vacuum for blowing the bottle takes place through this set of grooves and conduits and through the joint between the bearing faces of the mould parts.

On the other hand, the disc 58 carries a second cam groove 64 which is intended to effect the opening of the ring mould 22.

This latter, in which the parison is suspended, engages, at the end of its downward travel, in two pins 65 carried by arms 66 which are rigidly fixed on two parallel shafts 67. Said shafts receive a slight rotary motion through connecting rods 68 extending from the slide 68 which is actuated by the cam groove 84. Consequently, at the required instants, the pins 65 move apart and cause the two parts of the ring mould in which they are engaged to undergo the same movement. The ring mould consequently leaves the parison, which it supports, in the perviously closed finishing mould and can then return empty to its starting position.

The machine which has just been described operates as follows:

The groups of moulds 13—14 on the one hand, the tank 15 on the other hand, rotate respectively and in opposite directions, with a uniform rotary movement, at the same linear speed, like two intermeshing gear wheels.

As soon as the parison mould 13, rotating in the direction *f*, has passed over the wall of the tank 15, it moves downwards in the latter, touches the glass and fills. Then it moves upwards and the chisel 40 cuts off the tail of the glass by sliding against the base of the parison mould. The glass which has been taken up then remains enclosed in the mould, while the mandrel 35—which has previously moved downwards—moves upwards, having thus prepared a start for the blowing.

After a certain angle of rotation, the parison mould opens and the parison remains suspended on the ring mould 22. The latter is lowered while the finishing mould 14 opens; the parison is introduced between the open parts of the latter.

The parts of the finishing mould then close about the parison and the ring mould releases the latter by opening. Then, the ring mould returns to its starting position, the parison mould closes and the mandrel moves downwards whereas the group has returned adjacent the tank.

During a fresh suction which is effected by this same parison mould, the previous parison, which is enclosed in the finishing mould, is blown and is ready to be ejected as soon as the parison mould which corresponds to it opens to enable a fresh parison to take the place of the bottle which the bottom of the finishing mould will have tipped out of said mould.

It must be observed that each group of moulds successively effects a similar cycle of operations to that which has just been described.

As was explained at the outset, the machine according to the invention is provided with means enabling the initial instant of the blowing in each of the finishing moulds to be accurately adjusted.

Said means, which are illustrated in Figs. 8 to 10, comprise a ring 89 having the same rotary movement as the moulds and communicating, through evenly spaced radial pipes *a*, with the respective finishing moulds of each group. Each of the pipes *a* is connected by means of nipples *b* to the hollow shaft 61 which the conduit 69^b places in communication with the grooves 59^a—59^c of the finishing mould and of its bottom. Between each of the pipes *a* and the adjacent finishing moulds, are interposed cocks *c* on the nipples *b*. The evenly divided ring 89 rotates on a fixed disc 70 which carries a slot 70^b which extends over an arc *x*—*y* representing the angle corresponding to the duration of the blowing. Said slot is in constant communication, through a hole 70^a, with the inside of the column 12 which forms the vacuum reservoir. Each of the bores *g* terminating the pipes *a* towards the centre, passes over the slot 70^b and thus places one or the other of the finishing moulds supplied by the corresponding pipe *a* in communication with the vacuum, according to whether the open cock *c* precedes or follows said pipe. For example, in the case of the finishing mould 14^a, blowing will be effected with an advance or with a retard corresponding to the angle X between two consecutive pipes *a*, according to whether the open cock is c^1 or c^2.

It is therefore possible, during the manufacture, to vary very simply, by merely operating the cocks, the beginning of the blowing in the finishing mould by advancing or by retarding said beginning a considerable angle, in this case (machine having ten groups of moulds) equal to 36°.

Furthermore, the disc 70—which is fixed during operation—can be adjusted by means of an angular displacement which is imparted to it by a toothed pinion 70^c which is driven from the outside of the machine by any suitable means, so that all the blowing operations can be simultaneously advanced or retarded with great accuracy.

As explained above, another feature of the machine consists in means which enable the downward movement of the parison moulds to be prevented at will at the instant when they should normally effect their dip.

For this purpose, horizontal slides 71, which are equal in number to the groups of moulds, are arranged on the intermediate plate 18, in the same vertical plane as the axis of the corresponding slides 18 and are adapted to engage in a notch 72 of said slides before same have started their downward movement which is effected by the action of gravity.

The movement of each slide 71 is caused by a corresponding roller 73 on which may act, if necessary, a slope portion 74 mounted on the fixed cam-drum 21; said slope only acts on the slide when it has moved down below its normal inoperative position.

In normal operation, the roller 73 of each slide 71 circulates below said slope. When it is desired to prevent the parison moulds from dipping, the shaft 75 is acted on from the outside of the machine and the eccentric knob 76 of said shaft causes the rod 77 to move upwards and the slope 74 to move downwards by means of the lever 78 and of the rod 79, at the end of which said slope is fixed.

It is obvious that in order to prevent the downward movement of the parison moulds, the slope 74 is moved downwards before the roller 73 belonging to one of the heads of the parison moulds reaches it. All the heads are successively locked in their upper position by the engagement of the nose of their slide 71 in the corresponding notch 72.

The withdrawal of the slide 71 is effected beyond the dipping position of the slope 80 of the cam-drum 21. Said slope in its turn acts in the opposite direction on the roller 73. Each of the supports 18 will therefore be automatically released and will be re-engaged at each revolution until the slope 74 has been raised.

It will therefore be possible to move the machine away from the furnace at any instant, both during the rotation of the moulds and during the phases when the latter are stationary.

The cooling of the machine takes advantage of the drum 8 in which air is driven through a pipe 81 and a conduit 82 provided in the frame. A resilient nozzle 83 ensures the joint between these two parts. The air penetrates into the drum 8 through openings 84 and issues from same through a circular series of openings 85 whence it is directed on to the parison and finishing moulds through a series of nozzles 88 and 87. As it passes through the drum, the air circulates over all the mechanisms which are contained in the latter and prevents or limits their heating. A metal plate 88 closes the upper part of the drum 8. Said plate may be provided with suitably arranged openings so that the air which escapes therefrom also cools the upper region of the machine, its being observed that the latter is moreover less liable to become excessively heated.

EMILE ROIRANT.