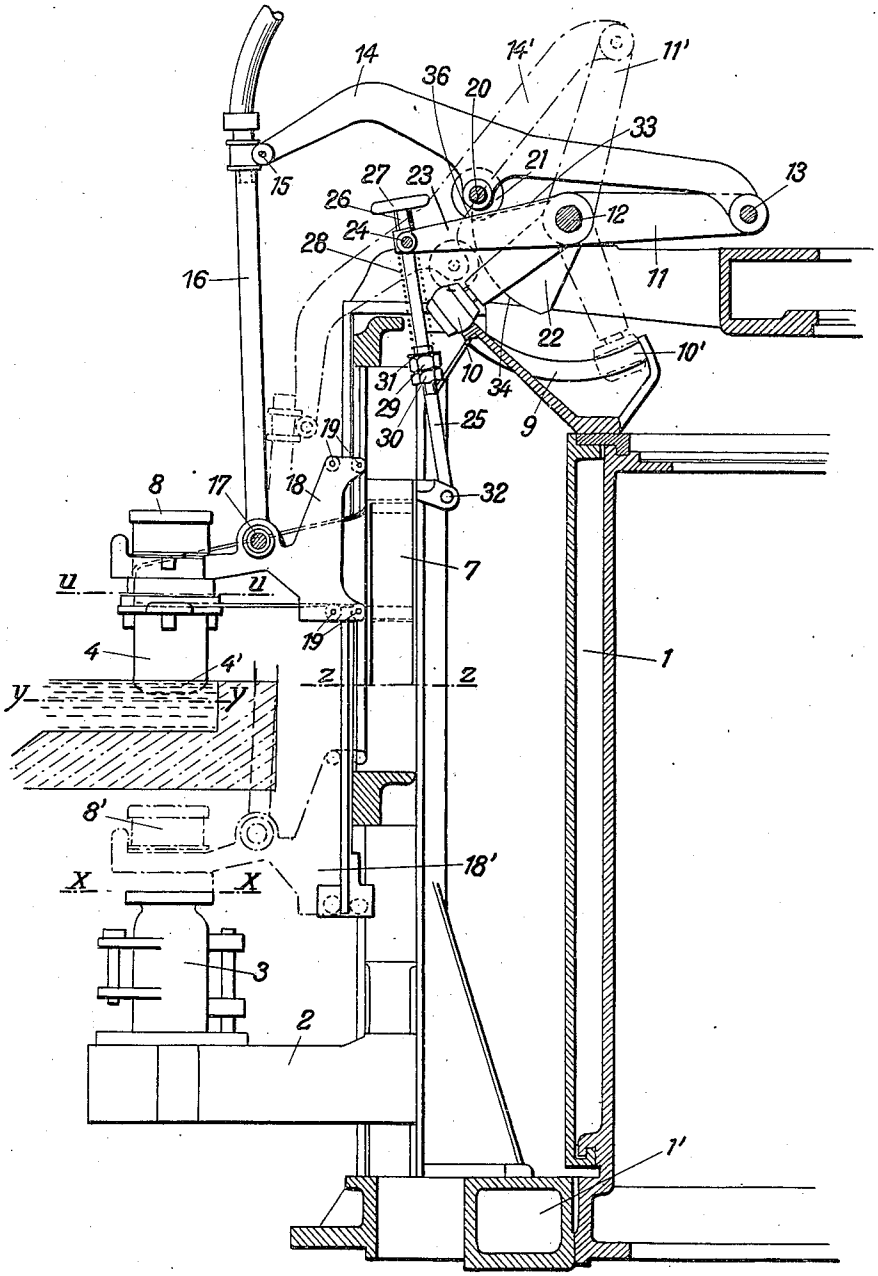
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BOTTLE BLOWING MACHINE

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BOTTLE-BLOWING MACHINE

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This invention relates to apparatus for moving a vertically reciprocating mould in bottle blowing machines, more particularly in those machines in which the parison or blank roughly blown in the preliminary mould, is transferred into the finishing mould owing to the preliminary mould which is constituted by two halves, opening laterally, and owing to the neck mould with the parison, passing through the opened preliminary mould arms downwardly on to the finishing mould. In these machines, the finishing mould stands at the bottom of the machine. The height or level of the upper edge of the finishing mould is the same for all the finishing moulds. The height or level of the bottom edge of the preliminary mould is determined by the level of the surface of the molten glass contained in the bath. If when bottles of a different size are to be blown, it is necessary to change the moulds, larger finishing moulds are placed on the machine, and the latter moulds are set with their upper edge again at the level of the upper edge of the preceding mould, and further, other preliminary moulds are introduced and arranged as regards the level so that their lower edge corresponds to the level of the glass. As in changing the preliminary moulds, the level of the upper edge of the preliminary moulds changes so that the highest position of the neck mould to be placed on the preliminary mould is higher or lower, the replacement of the moulds always necessitates a change of that control cam which produces the movement of the neck mould, unless means are used for the purpose of avoiding this change of the control cam. The invention consists in using for the movement of the neck mould only one rigid cam secured to the machine bed, and to provide means by which, in spite of the nonvariability of the whole control curve, an adjustment or setting of the neck mould may be made at different levels. This means consists in inserting into the drive for the mould to be vertically reciprocated, more particularly for the neck mould, an intermediate member which controls the stroke of the said drive, and the position and action of which is influenced by the position of another mould, more particularly of the preliminary mould.

A construction according to the invention is illustrated by way of example in the accompanying drawing. In the same, 1 is the central column of a bottle blowing machine, on which are mounted in any desired manner the different cams for the control of the single movements, and which as they form no part of this invention, are not shown in the drawing. The machine carries at the bottom on a vertically adjustable bracket 2, the finishing mould 3. The level of the upper edge of the said finishing mould 3 is always determined by the line x—x.

When a larger finishing mould is required, the bracket 2 is lowered to such an extent that the said larger finishing mould is situated with its upper edge also in the line x—x, whilst when a smaller mould is used, the bracket is raised to such an extent that the smaller mould placed on it, also reaches with its upper edge the line x—x. The preliminary mould into which the glass is drawn from the bath (shown in part) and in which the parison is formed in a preliminary manner, is marked 4 in the drawing. This preliminary mould is vertically divided in a known manner in the central radial plane passing through the central axis of the machine, so that two halves are produced which are adapted to open or close sideways. On the said arms are suspended interchangeably the single preliminary mould halves. If, for instance, there is a preliminary mould 4 of the size shown in the drawing, that is to say, the lower edge 4′ of the preliminary mould is in the line y—y which corresponds to the height of the glass level in the bath, then the carriage 7 carrying the preliminary mould, is set accordingly in the machine at the level z—z and secured there. When the preliminary mould 4 is changed, and in its place is introduced a larger preliminary mould, then, since this new preliminary mould 4 is longer than that previously used, but must stand with its bottom edge again in the line y—y, the preliminary mould carriage 7 must be moved upwards to a corresponding extent.

If the preliminary mould 4 is smaller, then in order to bring its upper edge again to the line y—y, the carriage must be lowered to a corresponding extent below the line z—z.

The neck mould 8 is placed on the preliminary mould at the level of the line u—u. If, therefore, a preliminary mould 4 is used, which is larger than that shown in the drawing, this line u—u will be moved upwards to suit the length of the mould. If the preliminary mould to be introduced is lower, the line u—u will be moved downwards. It follows from this that the stroke or travel of the preliminary mould 8 ends at different levels for different preliminary moulds. This would necessitate a change of the driving cam for this neck mould, if means were not provided according to this invention for avoiding such a disadvantage. These means are as follows:—

At the top of the machine frame or bed is provided a control cam 9, the shape of which is invariable and which is mounted in a rigidly fixed manner on the machine frame. This cam always remains in the same place, whilst the other parts of the machine, namely the mould with its supports and driving members, rotate in a known manner about the central axis of the machine. On the said control cam travels the roller 10 of a double-armed control lever 11 which is rotatable about a spindle 12 fixed in the rotating machine frame. To the free end of the said double lever 11 is connected by means of a joint 13 another lever 14, the other free end of which is connected by the joint 15 to a rod 16 which engages by means of the joint 17 with the carriage 18 which carries the neck mould 8. This carriage 18 is arranged to slide up and down by means of rollers 19 or the like in corresponding guides of the rotating machine frame. The lever 14 carries approximately in the centre a supporting roller 21 rotatable about a pin 20. This roller engages with a segment piece or bearing support 22 which is rotatable about the pin 12 and rigidly secured to a one-armed lever 23, the free end of which engages by means of a joint 24 with a pressure rod 25. This joint 24 includes a collar which is mounted loosely on the rod 25 and engages at the top with the nuts 26 and 27, whilst at the bottom a helical spring 28 presses against the collar, the other end of the helical spring engaging with a washer 31 held by the nuts 29 and 30. The pressure rod 25 is connected by the joint 32 to the carriage 7 which, as stated in the foregoing, carries preliminary mould arms which may be opened laterally and the level of adjustment z—z of which changes according to the size of the preliminary mould 4. The segment piece 22 has at one side a radially extending supporting surface 33, and at the other side a supporting surface 34 in the form of an arc of a circle.

The working of the arrangement is as follows:—

Assume that the machine bed 1 is standing still. On the contrary, the frame marked 1′, which carries by means of the brackets 2 the finishing moulds 3, by means of the carriage 7 the preliminary moulds 4 and by means of the carriage 18, the neck moulds, as well as the driving gear parts intended for the movement of the said parts, rotates in the known manner about the fixed bed 1 on which the control cam 9 is mounted in a fixed and rigid manner as already mentioned.

If the neck mould 8 with the parison suspended from it, is to be brought down to the finishing mould 3, into the position marked 8′ in the drawing, it will be necessary to lower the carriage 18 carrying the neck mould 8, into the position 18′ shown in dotted lines. This is done in the following manner:—

At the corresponding position of the rotating part 1′, the roller 10 begins to roll down on the cam 9 rigidly secured to the fixed part of the machine, so that the levers 11 and 14 are brought into the position 11′, 14′ shown in the drawing. During that time the supporting roller 21 runs down first from the upper edge 33 of the segment 22 and then runs along the circular surface 34 of the segment, namely, until the lower edge of the neck mould 8 has been brought from the line u—u down to the line x—x. The finishing mould which was opened during that process, is now laterally closed, and the blowing of the bottle completed. After the blowing is finished, the finishing mould opens again laterally, and the neck mould 8 is again raised. This is effected owing to the roller 10 travelling upwards on a cam corresponding to the cam 9, until it reaches again the position shown in the drawing.

During this upward movement, the supporting roller 21 first travels upwards on the circular circumference 34 of the segment. As soon as the line u—u is reached by the bottom edge of the preliminary mould 8, the roller 21 leaves the curved track 34 and passes to the radial supporting surface 33. As the lever 14 is pivotally connected to the rod 16, and the latter in its turn to the carriage 18, from the moment the roller 10 reaches the crest of the cam 9 there takes place no longer any raising of the neck mould.

The level or height to which the supporting roller 21 must always pass after leaving the curve 34 onto the radial supporting surface 33, determines therefore the cessation of the upward movement of the neck mould 8. When another preliminary mould 4 is required which is, for instance, larger than the mould 4 shown in the drawing, then as the bottom edge 4′ of the head mould

must always remain on the line y—y, the carriage 7 must be raised upwards and locked in the corresponding position. This upward movement of the carriage 7 brings about, through the supporting rod 25 and lever 23, an upward turning of the segment piece 22, so that in that way the height of the neck mould is shifted upwards in accordance with the change of level of the line u—u. The up and down movement on the cam 9 which remains invariable, enables the roller 21, during the upward movement of the carriage 18, to pass later to the supporting surface 33, that is to say, the neck mould will be raised still more.

When, on the contrary, a smaller preliminary mould 4 is required, so that the line u—u must be lowered, the preliminary mould carriage 7 is also lowered, and thereby the surface 33 of the segment piece 22 moved down to the same amount. During the upward movement of the carriage 18, the roller 21 therefore passes earlier than before from the circular track 34 to the radial supporting surface 33, so that the lifting movement of the carriage 18 will be finished earlier than before.

It has been shown how owing to the rotation of the segment 22 the highest position of the neck mould automatically follows a shifting of the preliminary mould carriage 7. It remains, therefore, to explain how it happens that the lower position of the neck mould always corresponds to the line x—x. This is ensured by the circular portion 34 of the segment on which the supporting roller 21 travels during the downward movement, which is a cam which, relatively to the lever system, is concentric because this cam 34 is a portion of a circle, the centre of which is situated in the centre of rotation of the lever system. As the movement of the roller 10 always changes during the downward movement to the position 10′, the lower neck mould edge must, according to the line u—u, always end its movement at the line x—x.

For the fine adjustment of the cam 22 and for the compensation of any wear on the tracks of the roller 21, according to the invention the distance of the point 24 from the point 32 may be varied by any desired means, for instance by means of a nut 26 with a hand wheel 27.

The invention is not limited to the construction of bottle blowing machines described and shown in the drawing. It may be applied wherever a change of a mould or of its level requires a shifting of the level of another mould.

The invention may also be used in cases in which the blow moulds, and not the preliminary moulds, are shifted. Then the intermediate member influencing the drive of the neck mould, must have its level determined by the level of the finishing mould. The invention may be applied in a similar way for the balancing of the position of the preliminary mould and of the finishing mould relatively to each other.

The invention may also be applied to machines in which the finishing mould is situated above the preliminary mould.

I claim:—

1. In a glass blowing machine of the class described, an adjustable mold support, a vertically reciprocating mold associated with said support, and an adjustable bearing support for positively varying the stroke of said mold, the position and operation of said bearing support being determined by the position of said adjustable support.

2. In a glass blowing machine of the class described, an adjustable mold support, a vertically reciprocating mold associated with said support, actuating means for imparting reciprocation to said mold, and stroke controlling means coacting with said actuating means and adjustable incident to the adjustment of said support to maintain cooperative relation between the mold and said support in its different positions.

3. In a glass blowing machine of the class described, an adjustable mold support, a vertically reciprocating mold associated with said support, actuating means for imparting reciprocation to said mold, and a cam cooperative with said actuating means and connected with said support for adjusting the stroke of said actuating means incident to the adjustments of said support.

4. In a glass blowing machine of the class described, an adjustable mold support, a mold associated with said support, operating means for moving said mold into and out of cooperation with said support and comprising a rocking lever, and supporting means for said lever movable with said support to vary the rocking movement of said lever and thereby allow the cooperative relation between the mold and said support to be established in the various adjustments of the latter.

5. In a glass blowing machine of the class described, an adjustable mold support, a mold associated with said support, means to vertically reciprocate the mold comprising a lever system, and a cam member associated with said lever system and constructed to alter the highest position of the mold to accord with the adjustment of said support without change of the lowest position.

6. In a glass blowing machine of the class described, an adjustable mold support, a mold associated with said support, means to vertically reciprocate the mold comprising a lever system, and a cam member associated with said lever system and having two cam surfaces each of which determines a limit of travel of the movable mold.

7. In a glass blowing machine of the class

described, an adjustable mold support, a mold associated with said support, means to vertically reciprocate the mold comprising a lever system, a cam member associated with said lever system and having two cam surfaces each of which determines an extreme position of the movable mold, and a connection between the cam member and the support whereby adjustment of the support will adjust the cam surface affecting one of the extreme positions of the mold to permit cooperation of the mold and said support in the various adjustments of the latter.

8. In a glass blowing machine of the class described, upper and lower adjustable mold supports adapted to receive molds of different sizes, means to transfer glass to be blown from one mold to the other, means to vertically reciprocate said transfer means to effect cooperation between said means and the molds, and a bearing support with which the reciprocating means coacts, said bearing support being adjustable to vary the stroke of the reciprocating means to accord with the adjustment of one of said mold supports relative to the other.

9. In a glass blowing machine of the class described, upper and lower adjustable mold supports adapted to receive molds of different sizes, means to transfer glass to be blown from one mold to the other, means to vertically reciprocate said transfer means to effect cooperation between said means and the molds, and a bearing support with which the reciprocating means coacts, said bearing support being adjustable to vary the stroke of the reciprocating means to accord with the adjustment of one of said supports relative to the other, said means being operatively connected with one of said supports.

10. In a glass blowing machine of the class described, a rotary support, a glass tank associated with said support, a mold support carried by said rotary support and adjustable relative to said tank, a preliminary mold carried by said mold support, a finishing mold disposed on said rotary support at a lower level, means to transfer the glass from the preliminary mold to the finishing mold including actuating means for vertically reciprocating said transfer means, a supporting member coacting with said actuating means, and a connection between the last named means and the support for the preliminary mold.

11. In a glass blowing machine of the class described, a rotary mold support, a glass tank associated with said support, a vertically adjustable carriage on said rotary support, a preliminary mold mounted on said carriage, a finishing mold adjustably mounted on said rotary support, a neck mold adapted to cooperate with the preliminary mold in one position and with the finishing mold in another position, actuating means for moving said neck mold to said respective positions, cam means controlled from the preliminary mold carriage to effect the cooperation of the neck mold with the preliminary mold in the various positions of the latter, a stationary support, and means on said stationary support for operating the actuating means aforesaid.

In testimony whereof I have signed my name to this specification.

HANS HILLMANN.