

Dec. 12, 1950

H. J. ROTHSCHILD

2,533,959

SHOCKLESS JOLTING DEVICE FOR MOLDING MACHINES

Filed Feb. 10, 1949

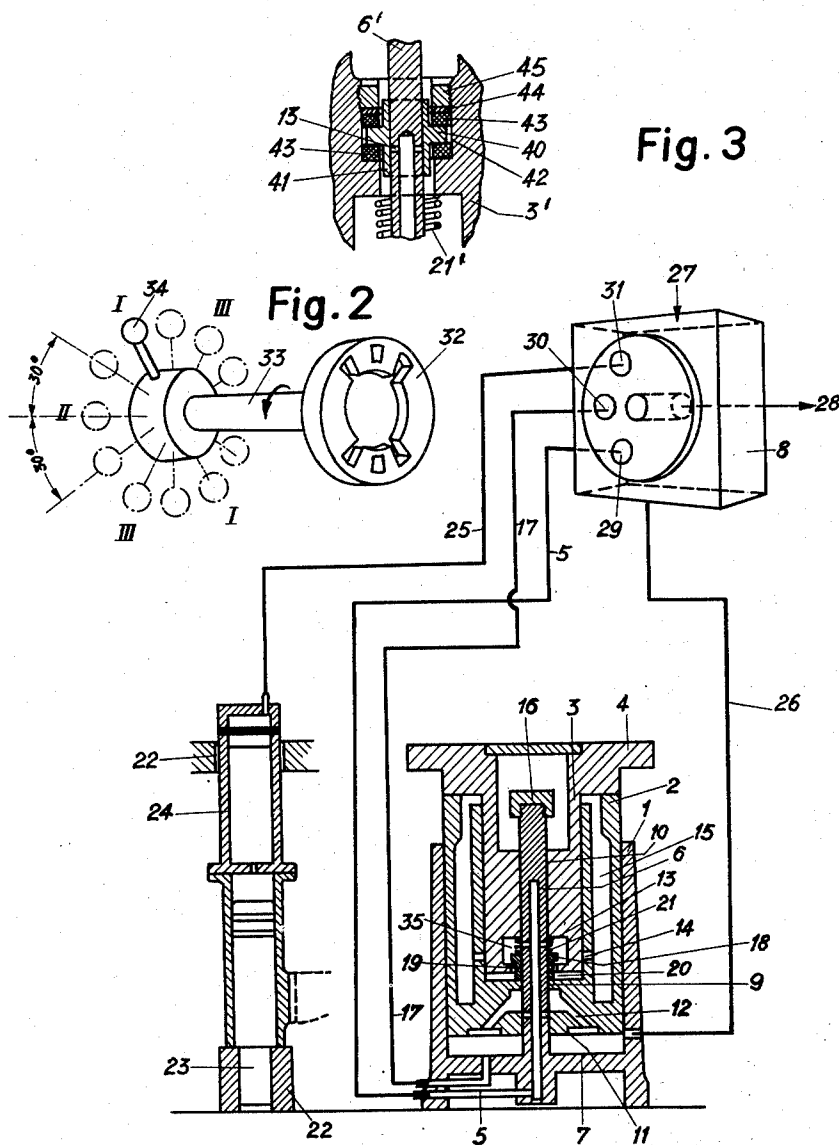


Fig. 1

INVENTOR
H. J. Rothschild
By *Richard J. Guin*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,533,959

SHOCKLESS JOLTING DEVICE FOR
MOLDING MACHINESHans Jakob Rothschild, Schaffhausen, Switzer-
land, assignor to Georg Fischer Aktiengesell-
schaft, Schaffhausen, SwitzerlandApplication February 10, 1949, Serial No. 75,704
In Switzerland December 9, 1948

3 Claims. (Cl. 22--45)

1

This invention relates to molding machines of the jolt, squeeze and draw type in combination with shockless jolting on an air cushion. In molding machines of the above described type an air cushion is built below the squeeze piston to act as a shock absorber during the operation of the jolt piston.

In known control means for molding machines of the above described type, it may happen that due to minute air leaks in the control means between the jolt cylinder and the squeeze cylinder, additional air enters the space below the squeeze plunger. This may cause an ever increasing height of the air cushion, whereby the squeeze plunger keeps on rising until it has reached the squeezing position; i. e. the jolting operation is prematurely interrupted.

A principal object of the invention is to provide means for building up and limiting the height of an air cushion under the squeeze piston during the operation of the jolt piston.

Another object of the invention is to provide in the jolt piston, and slideable on a hollow valve rod, a jolt valve which opens when its lowermost edge rests on the squeeze piston.

Another object of the invention is to provide guiding means for the hollow valve rod in the bores of the jolt piston and in the squeeze piston which allow for radial adjustments between the various moving parts and at the same provide an air tight axial connection.

The nature of our improvements will be best understood as described in connection with the drawings in which they are illustrated and in which:

Fig. 1 is a vertical sectional elevation of the molding machine with the necessary air conduits.

Fig. 2 shows the control valve disk and operating lever of the control valve.

Fig. 3 shows a modified and improved construction of the valve rod guide.

Fig. 1 illustrates the squeeze cylinder 1 in which slides a squeeze plunger 2, the bore of which serves as a guide for a jolt piston 3. On top of the molding machine table 4 rest the pattern or molding plate and the flask with the mold, which are not shown in Fig. 1 attached into the centre of the bottom 7 of the squeeze cylinder 1 is the hollow valve rod 6, which is closed at the upper end where the abutment 16 is screwed on. By means of conduit 5, the lower open end of the hollow valve rod 6 is connected with the control valve body 8. The hollow valve rod 6 is guided in the squeeze plunger 2 in the valve rod guide 9 and in the jolt piston 3 in the valve

2

rod guide 13. In the lower part of said hollow valve rod 6 are the openings 11 which in the lowermost position of said squeeze plunger 2 lead into the passages 12 directed towards the bottom of said squeeze plunger 2. Other openings 13 in the upper part of said hollow valve rod 6 are closed by the upper valve rod guide 10 in the lowermost position of said jolt piston 3 and squeeze plunger 2. The exhaust ports 14 in said squeeze plunger 2 are closed by said jolt piston 3 in the latter's lowermost position. Said abutment 16 on said hollow valve rod 6 serves as end stop for the maximum length of the pressing stroke of said squeeze plunger 2. Conduit 17 leads from the bottom 7 of said squeeze cylinder 1 into said control valve body 8.

Inside of said jolt piston 3 and adjacent to the lower end of said valve rod guide 10 is provided a valve chamber 35 in which the valve 18 with its valve sleeve 19 is pressed downwards into the closed position by means of the spring 21. The valve sleeve 19 is slideable on said hollow valve rod 6. The lower face of said valve sleeve 19 rests on the bottom of the bore 25 of said squeeze plunger 2. The lower portion of the jolt piston 3 forming the recess 35 may consist of a separate bushing (not shown) to facilitate the insertion of the valve sleeve 19. Between the outside diameter of the valve sleeve 19 and the lowermost bore of said jolt piston 3 is the annular space 20 for the passage of air. Overflow conduit 26 leads from the lower portion of said squeeze cylinder 1 at a certain height above the bottom 7 into the valve body 8.

In the molding machine standard 22 which in Fig. 1 is only indicated by fragments is rigidly secured the drawing plunger 23 on which is vertically slideable the drawing cylinder 24. Conduit 25 leads from the upper end of said drawing cylinder 24 to the control valve body 8. Rigidly connected with the drawing cylinder 24 are means for supporting the mold lifting pins which serve for lifting the mold from the pattern on the molding machine table 4; these parts are not shown in Fig. 1.

The supply of compressed air for the various operations on a molding machine of the described type is controlled by a common control valve, consisting of the control valve body 8 with the various ports 29, 30 and 31, the supply conduit 27, the exhaust conduit 28 and said conduits 5, 17, 25 and 26.

Fig. 2 shows the control valve disk 32 with the control valve axle 33 and the operating lever 34. Said control valve disk 32 is placed inside

of the control valve body 8 and each of the indicated positions of the partial rotations of the operating lever 34 corresponds to one of the operations in the sequence of the molding process on a molding machine of the above described type. Twelve partial rotations of the operating lever 34 are equal to two complete operating cycles.

Fig. 3 illustrates details of an alternative design of the upper valve rod guide in the jolt piston. The jolt piston 3' has a bore 42 larger in diameter than the flange 40 of the guide sleeve 41 which serves for opening and closing the openings 13 in the hollow valve rod 6'. The flange 40 rests between two rubber rings 43. A washer 44 is put on top of the upper rubber ring 43 and the whole arrangement is tightened by means of ring nut 45. The inside diameters of the rubber rings 43, of the washer 44 and of the ring nut 45 are larger than the outside diameter of the sleeve 41. By this arrangement it is possible to obtain an air-tight connection in axial direction and at the same time possibilities for radial adjustments between the various moving parts.

Thus the construction of Fig. 3 relates to an adjustable valve rod guide which is so constructed that in the position of rest, namely, when the squeeze plunger and the jolt piston are located in their lowermost positions, the guide sleeve 41 covers the openings 13 and thus prevents air passing from the valve rod into the chamber 35. During the jolting compressed air can pass from the openings 13 into the chamber 35 only when an air cushion is formed. The spring 21' of Fig. 3 has the same function as the spring 21 of Fig. 1, namely, it presses the valve downwardly.

A similar design of a valve rod guide may be used in place of the lower valve rod guide 9 in Fig. 1 in the lower part of the squeeze plunger 2.

The operation of producing or forming a mold may be briefly described as follows:

In the starting position of the molding machine the squeeze plunger 2 rests in its lowermost position; i. e. on the bottom 7 of the squeeze cylinder 1 and the openings 11 in the hollow valve rod 6 communicate with the passages 12 in the lower part of the squeeze plunger 2, whereas the openings 13 are closed by the upper valve rod guide 10 in the jolt piston 3.

To initiate the jolting operation the operating lever 34 of the control valve disk 32 is turned to one of the positions marked with I. In this position the conduit 26 is connected with the exhaust conduit 28 and compressed air enters from the supply conduit 27 into port 29, conduit 5 and then into the hollow valve rod 6. Because of the lowermost position of the squeeze plunger 2 and the jolt piston 3 the upper openings 13 remain closed and the air can only enter through the openings 11 into the passages 12 and below the squeeze plunger 2. Now the squeeze plunger 2 begins to ascend together with the jolt piston 3 and it ascends until the openings 11 are closed by the lower cylindrical bore in the squeeze plunger 2. Shortly before the termination of this ascending movement of the squeeze plunger 2 and the jolt piston 3, the air openings 13 in the hollow valve rod 6, which so far had been closed by the valve rod guide 10, are opened and the air can enter into the valve chamber 35. Since the jolt piston 3 stays in its lowermost position inside of the squeeze plunger 2 the lower end of the valve sleeve 19

rests on the bottom of the bore of the squeeze plunger 2 and thus keeps the jolt valve 18 open. Air enters through the annular space 20 below the jolt piston 3 which now commences to ascend. During this ascending movement of the jolt piston 3, the valve 18 closes because of the action of the spring 21 which presses the valve sleeve 19 onto its seat above the annular space 20. The air enclosed below the jolt piston 3 expands, which results in a continuation of the ascending movement of the jolt piston 3 inside of the squeeze plunger 2 until the exhaust ports 14 become free, i. e. stay below the lower edge of the jolt piston 3; then the air is exhausted through the exhaust openings 15 into the atmosphere.

Due to the weights of the jolt piston 3, of the molding machine table 4 and of the pattern and mold (—the latter parts are not shown in Fig. 1—), the jolt piston 3 falls downwardly inside of the press plunger 2 and the shock is absorbed by the air cushion which previously had been built up between the squeeze plunger 2 and the bottom 7 of the press cylinder 1.

Due to the unavoidable air leaks between the various sliding parts, additional air might enter the space of the air cushion. If this happens, then the squeeze plunger keeps on ascending until the maximum allowable height of this air cushion for the jolting operation is reached. The overflow conduit 26 serves for exhausting the excess of air through exhaust conduit 28 into the atmosphere and thus limits the height of the air cushion.

When the jolting operation is completed, the operating lever 34 is turned to the next position in the sequence of the molding operations. In doing so the conduit 5 is connected with the exhaust conduit 28, and the jolt piston 3, as well as the squeeze plunger 2, descend to their lowermost positions. At the same time, the overflow conduit 26 is closed in the valve body 3, since it has served its purpose.

To initiate the squeezing operation the operating lever 34 is turned to one of the positions marked with II. The overflow conduit 26 remains closed and compressed air from the supply conduit 27 enters into port 30 and conduit 17 into the space between the squeeze plunger 2 and the bottom 7 of the squeeze cylinder 1. The squeeze plunger 2, together with the jolt piston 3, begin to ascend to carry out the squeezing operation. If for some reason the squeeze movement is carried out with the press plate not being in its proper position, then the abutment 16 at the upper end of the hollow valve rod 6 acts as an end stop for the jolt piston and squeeze piston.

When the squeezing operation is completed the operating lever 34 is turned to the next position for connecting the conduit 17 with the exhaust conduit 28, whereupon the squeeze plunger 2 descends to its lowermost position. Conduit 26 remains closed.

For the next molding operation, which comprises the drawing of the mold, the operating lever 34 is turned to one of the positions marked with III. Compressed air enters from the supply conduit 27 through port 31 and conduit 25 into the upper end of the drawing cylinder 24 which is filled with oil. The conduit 26 remains closed. With the drawing cylinder 24 ascending, the mold is lifted off the pattern on the molding machine table 4; these parts are not shown in Fig. 1.

When the drawing operation is completed, which means that the mold has been taken away from the lifting pins, the operating lever 34 is turned to the next position where conduit 25 is connected with the exhaust conduit 23. The drawing cylinder 24 with the lifting pins and their supporting means descend now and the molding machine returns to its initial position. The cycle of the various molding operations is complete.

The valve rod guide shown in Figure 3 operates as follows:

Radial movements of the valve rod 6 are absorbed by the rubber rings 43. These radial movements are possible since the outer diameter of the guide sleeve 41 is smaller than the face of the jolt piston 3 at its lower end and is also smaller than the washer 44 and the ring nut 45. Furthermore, there is a space between the bore 42 and the outer surfaces of the flange 40.

The utilization of this novel valve rod guide increases the safety in the operation of the jolt and squeeze plungers considerably. The combination of the overflow conduit with a suitable control valve assures a regularly working air cushion which is independent of the weight and form of the flask and also to a great extent independent of the air pressure in the air supply conduit.

I claim:

1. A molding machine with shockless jolting, comprising a squeeze cylinder, a hollow squeeze plunger reciprocable within said cylinder and having a recess formed at the bottom thereof, a jolt piston reciprocably mounted in said squeeze plunger and reciprocable along with said plunger, a hollow valve rod immovably mounted in said cylinder and extending through said squeeze plunger and said jolt piston, said valve rod having upper openings formed therein, said upper openings of the valve rod communicating with said recesses of the jolt piston in the upper position of said plunger, said valve rod further having lower openings formed therein, recesses formed in the bottom of said squeeze plunger, said lower openings of the valve rod communicating with said recesses in the bottom of the squeeze plunger in the lower position of the plunger, a conduit connected with said valve rod for supplying compressed air thereto, the com-

pressed air entering the recesses of the plunger through the lower openings and raising said squeeze plunger and forming a cushion at the bottom of said squeeze cylinder at the beginning of the jolting operation, said plunger while being raised closing said lower openings and connecting said upper openings with the recesses of said jolt piston to commence the actual jolting operation, an overflow conduit communicating with the interior of said cylinder at a height above the bottom thereof and below said squeeze plunger in the upper position of the latter, and a control valve connected with the first-mentioned conduit and with said overflow conduit and having means connecting said overflow conduit with the atmosphere during the jolting operation to exhaust any possible excess of air after having built up the necessary height of the air cushion.

2. A molding machine according to claim 1, characterized in that the jolt piston contains a valve chamber formed at the lower end thereof, and in said valve chamber, slidable on said hollow valve rod, a valve sleeve, and means maintaining open said valve sleeve when the lower end of said valve sleeve rests on the squeeze plunger.

3. A molding machine according to claim 1, comprising guiding means for the hollow valve rod in the jolt piston and in the squeeze plunger, said guiding means consisting of guide sleeves which permit radial adjustments and at the same time secure an axially air-tight connection between the hollow valve rod and the squeeze plunger and the jolt piston.

HANS JAKOB ROTHSCILD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,157,403	Lewis	Oct. 19, 1915
1,642,074	Lewis	Sept. 13, 1927

FOREIGN PATENTS

Number	Country	Date
473,794	Germany	Apr. 3, 1929
583,389	Germany	Sept. 2, 1933