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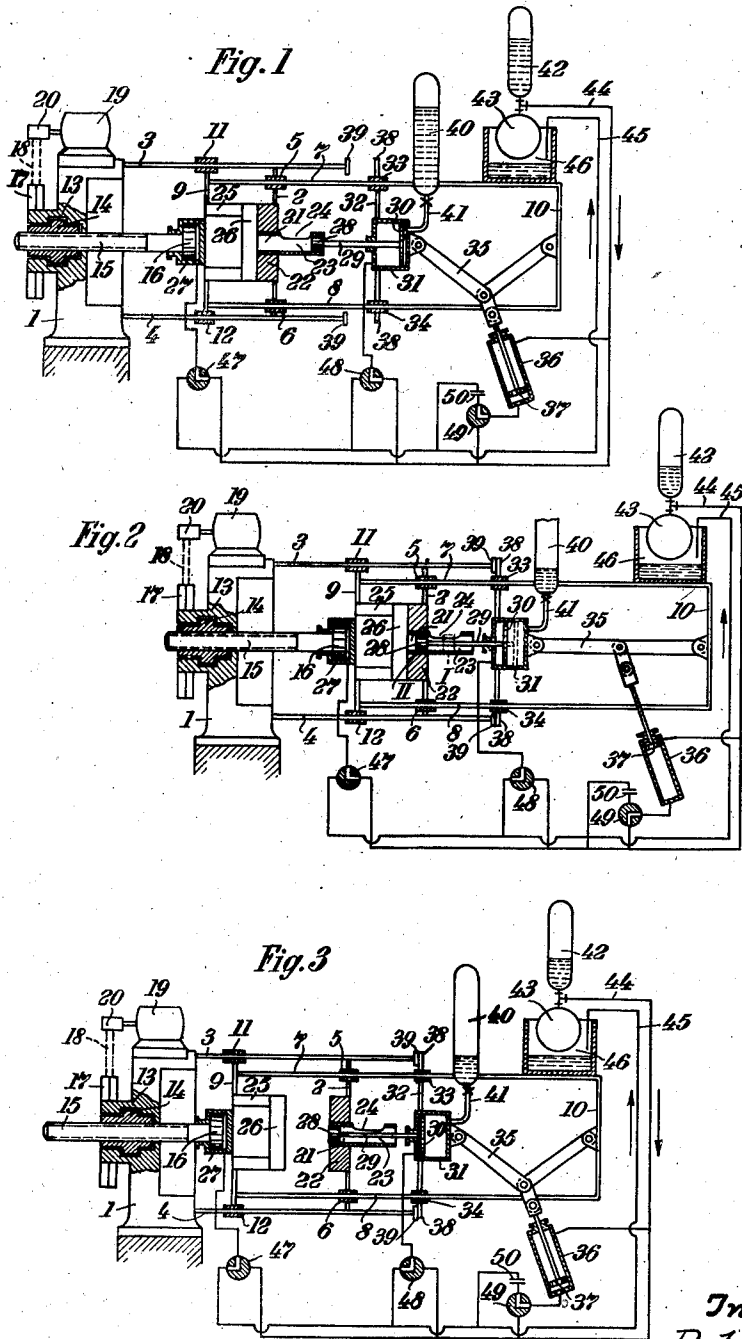
P. HAESSLER

2,088,134

DIE CASTING AND PRESSURE MOLDING MACHINE

Filed July 23, 1936

2 Sheets-Sheet 1



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Fig. 4

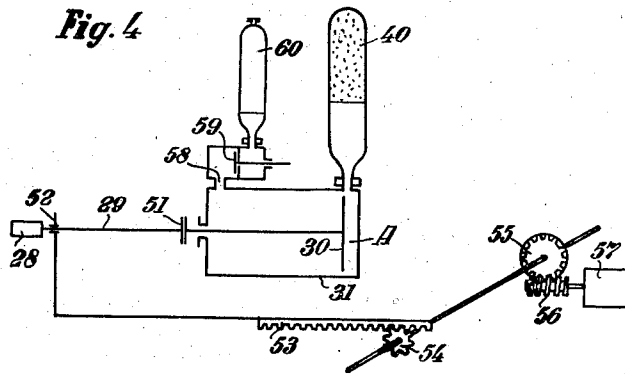


Fig. 5

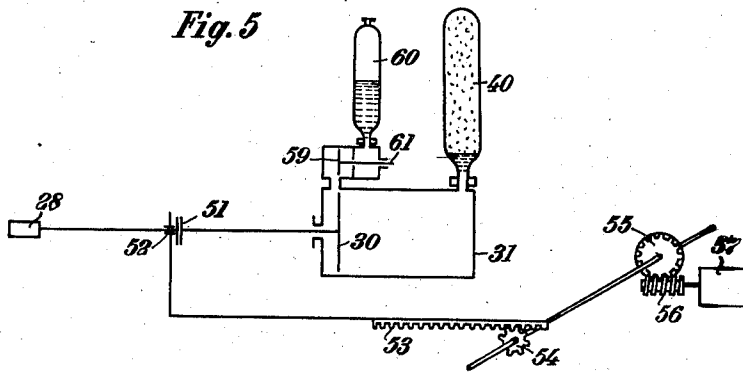
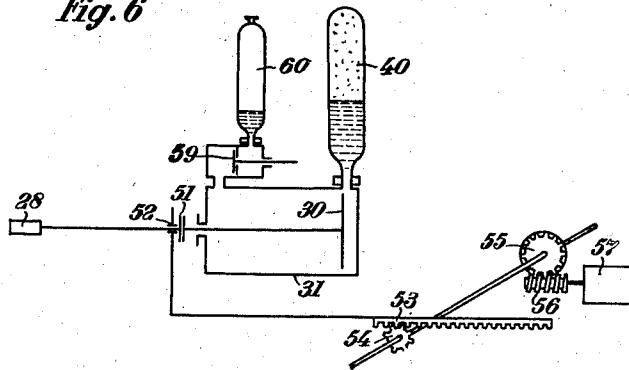


Fig. 6



Inventor:

P. Haessler

By *Glascok Downing*
Attys.

UNITED STATES PATENT OFFICE

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DIE-CASTING AND PRESSURE MOLDING
MACHINE

Paul Haessler, Nuremberg, Germany

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In Germany May 31, 1933

9 Claims. (Cl. 22-68)

This invention relates to means for driving die-casting and pressure molding machines, more particularly for the movable half of the mold and the working piston. The object of the invention is to avoid the disadvantage of the known arrangements, which consist in this, that the entire motion is effected by hydraulic means, involving a great consumption of water under pressure. A further object of the invention is to obtain a more uniform drive than was possible with the devices hitherto employed.

An essential feature of the invention is, that the closing motion of the mold half and the forward motion of the working piston till it enters the pressure chamber is effected mechanically, whilst the mold-closing pressure and the motion of the working piston for applying pressure are produced hydraulically. During the pressing operation the cylinder which drives the working piston is rigidly connected with the movable half of the mold. A further feature of the invention is that, for avoiding the use of the usual control valves, accumulators and pumps, the liquid which serves during pressing for moving the working piston is forced back into the pressure accumulator through the working piston being moved back mechanically. According to the invention the working piston may be held in its extreme position by a column of liquid. The cylinder chamber lying at the rear side of the piston has an outlet which is provided with an adjustable valve. Preferably the outlet is in communication with a pressureless collecting chamber.

In the accompanying drawings the invention is illustrated by two constructional examples,

Figure 1 shows the driving apparatus according to the invention in a position in which the press mold is already closed and the working piston for filling in the pressed material is still in the initial position;

Figure 2 shows the same apparatus as Figure 1, with the working piston in the pressing position;

Figure 3 shows the same apparatus as Figures 1 and 2, with the press mold opened;

Figure 4 shows a modification of the means for returning the pressure liquid into the pressure reservoir, in the position immediately preceding the pressing;

Figure 5 shows this modification in the pressing position; and

Figure 6 shows the same modification immediately after the backward movement of the working piston.

In the drawings 1 is a portion of the machine pedestal of a die-casting and pressure molding machine. The standard supports the bars 3 and 4 which are connected to one another by a transverse member 2. On the transverse member 2 are sliding bearings 5 and 6 for bars 7 and 8. The bars 7 and 8 have transverse members 9 and 10. The transverse member 9 has its ends formed into sliding bearings 11 and 12 which are guided on the bars 3 and 4. In the standard 1 is provided a two-sided thrust bearing 13 in which the nut 14 is rotatable. 15 is a self-locking spindle which runs in the nut 14 and the head 16 of which is in the form of a piston. The nut 14 is connected to belt pulleys 17 which are driven through a belt drive 18 by a driving pulley 20 mounted on the shaft of an electric motor 19. The motor 19 may be a motor capable of running in either direction. The right-handed and left-handed rotary motion of the nut 14 may also be produced by a suitable construction of the countershaft arrangement. The stationary half 22 of the mold, which is in communication with the press bore 21 is fixed to the transverse member 2. The press bore 21 is continued in the form of a slide channel 23, to which, through an opening 24 the material to be pressed is fed. On the forward side of the transverse member 9 are two brackets 25, to which the movable half 26 of the mold is screwed. On the rear side of the transverse member 9 is a cylinder 27 in which the piston 16 can move with a stroke of about 10 mm. In the slide channel 23 a working piston 28 is slidable. The working piston 28 is mounted on a rod 29 of a pressure piston 30. The pressure piston is disposed in a cylinder 31 which is supported by a transverse member 32 which with the aid of sliding bearings 33 and 34 is slidable on the bars 7 and 8. On the bottom of the cylinder 31 and on the transverse member 10 are brackets, between which a toggle lever arrangement 35 is disposed, which can be buckled and extended by means of a piston 37 moving in a cylinder 36. On the transverse member 32 are extensions 38 which strike against adjustable abutments 39 and the bars 3 and 4, whereby the forward stroke of the cylinder 31 is limited. A pressure water reservoir 40 which is loaded by compressed air is in permanent communication with the rear part of the cylinder 31 by way of a pipe 41. A second pressure water reservoir 42 is fed by a pressure water pump 43 which is driven by an electric motor (not shown). The pressure water reservoir 42 is connected to a pressure pipe 44.

45 is a return pipe, through which the pressure liquid flows back, after performing work, into the collecting vessel 46. Out of this collecting vessel 46 the pump 43 pumps the liquid into the pressure vessel 42. By way of the pipe 45 the two ends of the cylinder 36 and the forward ends of the cylinders 27 and 31 are supplied with water under pressure. The distribution of the pressure water is effected by means of control members 47, 48 and 49. These control members are displaced positively with the motion of the machine.

Fig. 1 shows the arrangement in the position after the closing of the mold and the withdrawal of the pressure piston. Through the nut 14 being turned to a suitable extent the spindle 15 will have moved forward, the piston 16 will have laid itself against the end of the cylinder 27 and consequently the transverse member 9 together with the brackets 25 and the movable half 26 of the mold will have slid forward against the stationary half 22 of the mold. The motion of the transverse member 9 will have been shared by the parts 7, 8 and 10 and consequently by the cylinder 31 which is supported on the bars 7 and 8. On the halves of the mold meeting, the control members 47 and 48 will have been displaced. The displacement of the control member 47 establishes the connection of the pressure water accumulator 42 with the front part of the cylinder 27, causing the closing pressure of the mold to take effect. By the displacement of the control member 48 pressure water will have been supplied to the cylinder 31, so that the pressure piston 30 will have been forced backwards and the pressure liquid in the rear part of the cylinder will have been displaced into the pressure water accumulator 40. The working piston 28 will thus have reached its rearward position.

Thereupon the slide channel 23 is fed with the material to be pressed. Through reversing the control member 49 the lower part of the cylinder 36 is connected with the pressure water accumulator 42. The piston 37 moves upwards and extends the toggle lever arrangement 35. By this means the cylinder 31 and the working piston 28 are moved into the position I shown in Fig. 2 and the material is pushed forward out of the slide channel 23 into the press bore 21. In this position the control member 48 connects the front space of the cylinder 31 with the return pipe 45. The pressure piston 30 which is under the pressure of the pressure water accumulator 40 and together with it the working piston 28 move forwards, the material being forced out of the press bore 21 by casting it and shearing off into the interior of the mold. The piston 28 now occupies the position II. During the opening of the mold, which immediately follows, the working piston 28 continues to move in the pressing direction and ejects the residue of material remaining in the press bore 21.

After the mold has been opened the parts of the arrangement occupy the position shown in Fig. 3. For effecting the opening the two shut-off members 47 and 48 are first changed over in such a manner that the cylinder 27 and the lower space in the cylinder 36 are connected with the return pipe 45. Simultaneously with this operation the nut 14 is turned back, causing the spindle 15 to move backwards. The piston 16 lays itself against the closure of the cylinder 27. The transverse member 9 together with the brackets 25 and the movable half 26 of the mold take part in the rearward motion. The motion of the transverse

member 9 is shared by the bars 7 and 8 and the rear transverse member 10. For forcing the cylinder 31 to remain stationary in the position referred to in the previous operation adjustable stops 38, 39 are provided. Through the throttling device 50 the escape of liquid out of the lower part of the cylinder 36 is regulated in such a manner that the motion of the toggle lever arrangement 35 lags slightly behind that of the parts 7, 8, 9 and 10. The result of this is, that the cylinder 31 will not prematurely leave the stops 39.

This operation is followed by the closing of the mold and the return motion of the working piston, the parts occupying the position shown in Fig. 1.

Whilst in the constructional form according to Figs. 1 to 3 valves and a pump are provided for returning the liquid to the pressure vessel, in the constructional form shown in Figs. 4 to 6 the return of the liquid is effected by a mechanical backward motion of the working piston. For this purpose the piston rod is provided with a flange 51 which acts as an abutment for carrying along a member 52 which is slidable on the piston rod 29. This member 52 is connected to a rack 53 which is displaceable by means of an electric motor 57 through a pinion and worm drive 54, 55 and 56. The forward part of the space in the cylinder 31 has an outlet 58 which is in communication by way of a controllable non-return valve 59 with a pressure-free vessel 60.

Fig. 4 shows the arrangement immediately before the pressing operation. The pressure exerted by the liquid from the pressure chamber 40 on the pressure piston 30 causes the valve 59 to close, so that the working piston 28 remains in the position shown. For pressing, the valve 59 is, as shown in Fig. 5, opened by pressure being exerted on the control bar 61 and the water can flow from the front part of the cylinder back into the vessel 60. Under the pressure of the liquid in the pressure vessel 40 the working piston moves to the left. According to the amount the valve 59 opens the motion of the piston will be quicker or slower. If the valve 59 is controlled in such a manner that for a certain portion of the forward motion of the piston 30 it allows only a small quantity of water to flow out and for the remaining portion a large amount of water, the working piston will at first move only slowly, but during the last part of its path, which is the part that is of importance for the actual pressing operation, more quickly.

Fig. 6 shows the backward motion of the piston 30. Under the action of the pinion and the rack 53 the member 52 is caused to bear against the flange 51 and takes the piston rod 29 and the piston 30 along with it to the right. The piston 30 forces the water out of the rear end of the cylinder into the accumulator 40, whilst through the automatically opening valve 59 water flows back out of the vessel 60 into the front part of the cylinder. When the piston 30 has reached the position shown in Fig. 6, the motor 57 is reversed, whereby the rack is brought back again into the position shown in Figs. 4 and 5. The motor is then cut off.

The mechanical gearing of the constructional form shown in Figs. 4 to 6 can also be constructed in another way. The screw spindle drive which effects the displacement of the movable half of the mold could also be replaced by any other mechanical drive. The screw spindle drive is however preferred, as the force to be

given off by the spindle is the same in all positions, in contradistinction to a crank, eccentric or toggle lever drive. Between the spindle and the motor driving the spindle a slip coupling
 5 is with advantage interposed, preferably a hydraulic oil coupling, in order to prevent the motor and the machine being overloaded.

What I claim is:—

1. In a pressure molding device a pressing
 10 mold having a movable part and a non-movable part, mechanical means for moving the said movable part, a charging channel on the said non-movable part, a pressure cylinder movable
 15 towards and away from the non-movable part of the mold, a pressing piston slidable in the said pressure cylinder, a working piston connected to the said pressing piston and movable
 20 along the said charging channel, means capable of moving the pressure cylinder and the working piston into the closing position and for
 actuating the pressing piston in the pressure cylinder and thereby moving the working piston into the pressing position.

2. In a pressure molding device a pressing
 25 mold having a non-movable part, a charging channel on the said non-movable part, an axially displaceable pressure cylinder in line with the charging channel, a pressing piston axially displaceable
 30 in said cylinder, a working piston rigidly connected with the said pressing piston and movable along the said charging channel, means adapted to move the movable pressure cylinder and the working piston into the closing
 35 position and means for actuating the pressing piston in the pressure cylinder and thereby moving the working piston into the pressing position.

3. A pressure molding device as claimed in claim 2, and in which the said means for actuating the pressing piston comprise a storage vessel
 40 containing a supply of liquid under pressure and a pipe connecting said vessel with the rear pressure space of the said pressure cylinder.

4. A pressure molding device as claimed in claim 2 and in which the said means adapted to
 45 move the movable pressure cylinder comprise a spreading device having two pressure applying bars adapted, when in the spread position, to hold the said pressure cylinder rigidly.

50 5. A pressure molding device as claimed in

claim 2 and in which the said means adapted to move the movable pressure cylinder comprise a spreading device having two pressure applying bars adapted, when in the spread position, to hold the said pressure cylinder rigidly, and a
 5 hydraulic pressure arrangement for moving the pressure bars.

6. In a pressure molding device a pressing mold having a non-movable part, a charging channel
 10 on the said non-movable part, an axially displaceable pressure cylinder in line with the charging channel, a pressing piston axially displaceable in said cylinder, a working piston rigidly connected with the said pressing piston
 15 and movable along the said charging channel, means adapted to move the movable pressure cylinder and the working piston into the closing position, means for actuating the pressing piston in the pressure cylinder and thereby moving
 20 the working piston into the pressing position, and mechanical means capable of returning the pressing piston into the initial position.

7. In a pressure molding device as claimed in claim 6, an outlet at the forward pressure space
 25 of the said pressure cylinder and on the said outlet a non-return valve adapted to control the escape of liquid from the forward pressure space.

8. In a pressure molding device as claimed in claim 6, an outlet at the forward pressure space
 30 of the said pressure cylinder, on the said outlet a non-return valve adapted to control the escape of liquid from the forward pressure space and a collecting vessel in communication with
 35 the said outlet.

9. In a pressure molding device as claimed in claim 6, an outlet at the forward pressure space
 40 of the said pressure cylinder, on the said outlet a non-return valve adapted to control the escape of liquid from the forward pressure space, the said mechanical means for returning the pressing piston comprising a connecting rod,
 45 connected to the pressure piston a piston rod, an abutment on the said piston rod, a driving member on the said connecting rod which is adapted to engage the abutment member on one side and driving means for moving the said connecting rod to and fro.

PAUL HAESSLER. 50