July 31, 1962 H. C. WERNECKE 3,046,622

DIE CASTING MACHINE

Original Filed Jan. 2, 1958 2 Sheets-Sheet 1

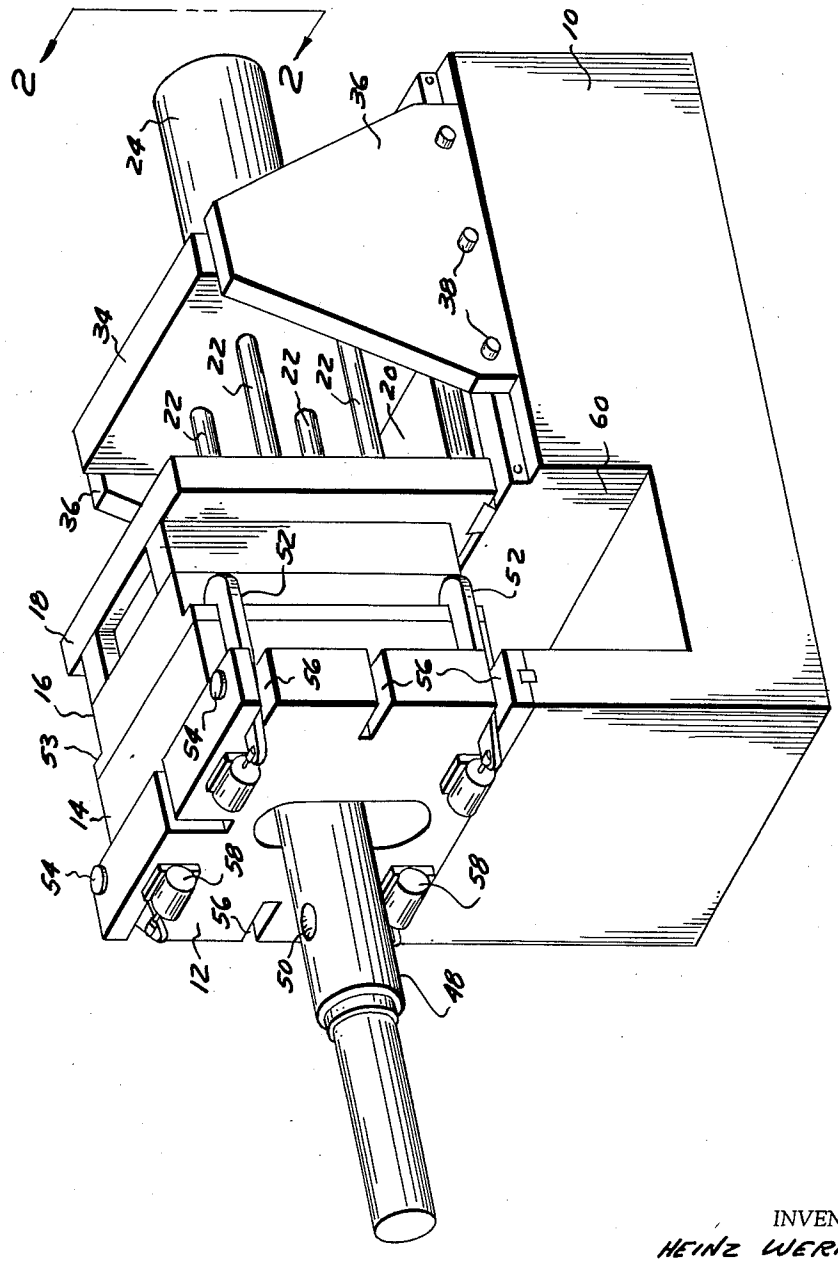


Fig. 1

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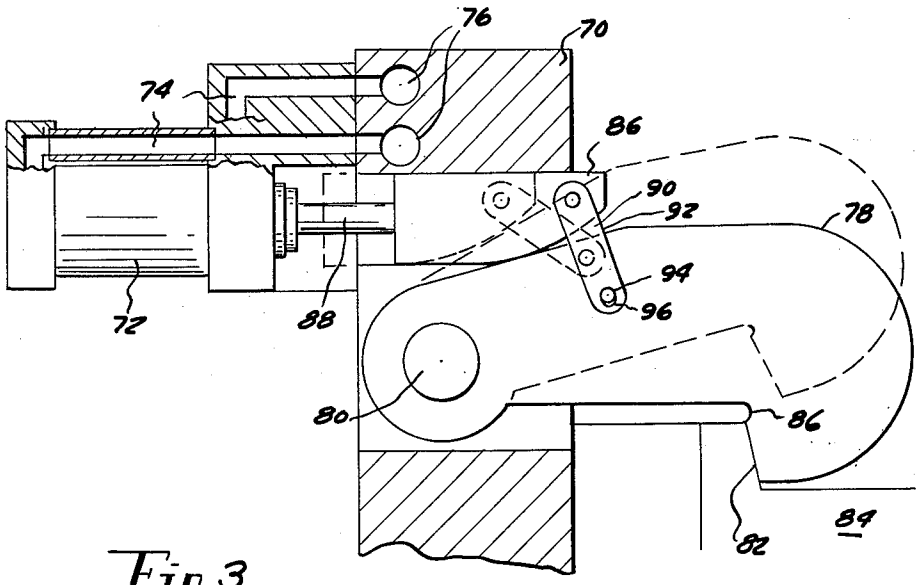


Fig. 3

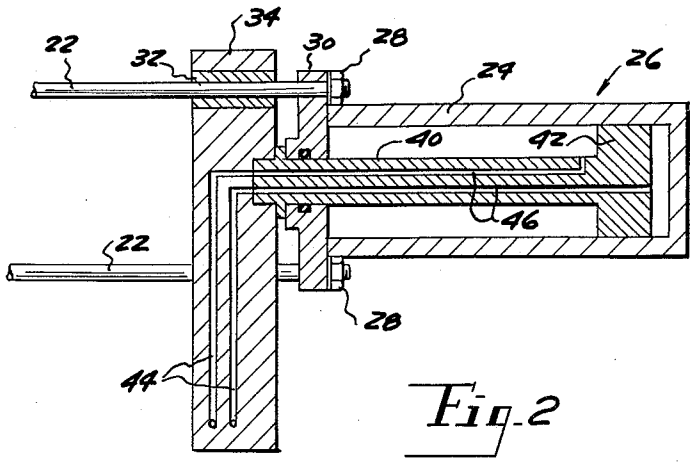


Fig. 2

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United States Patent Office 3,046,622 Patented July 31, 1962

3,046,622

DIE CASTING MACHINE

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Original application Jan. 2, 1958, Ser. No. 706,851. Divided and this application Nov. 26, 1958, Ser. No. 776,490

1 Claim. (Cl. 22—68)

This invention relates to die casting machines of the type having two die halves which are separable for the purpose of removing finished work pieces and into which molten casting material is injected under pressure. More particularly this invention relates to special mechanism for opening and closing the die halves and for locking the die halves in a closed position in such a secure manner as to resist the opening forces exerted by the pressured injection of the molten casting material.

Die casting machines generally employ two cooperating die halves, one of which is fixed relative to the machine base and a second which is movable with respect to the first so as to be disposable in a first closed position in which the casting operation is performed and a second open position in which the finished casting may be removed from between the dies. When the dies are in a closed position molten casting material is injected into the cavity between them under high pressure so as to insure that the cavity becomes completely filled with the material. This injection pressure acts to separate the die halves from one another. If any separating motion does occur during the injection the dimensions of the finished casting will be affected. Also, die separation during injection may allow the molten casting material to spray out of the die cavity along the parting line so as to endanger the operation. For these reasons it is essential that the die halves be rigidly locked together during the casting portion of the cycle.

Present casting machines generally utilize a single mechanism for moving the die halves with respect to one another and for locking them in a closed position. Commonly this mechanism includes a linkage which has one end directly connected to the movable die half and the other end connected to the fixed die half through the rods which also act as guides for the movable die half. These tie rods therefore extend from the fixed die half to the far end of the linkage. Because of the length of the connection thus formed between the fixed and the movable die halves, temperature changes often affect the exact positioning of the dies with respect to one another. Additionally, the connections in the linkage make it difficult to achieve exact positioning of the movable die half.

The present invention contemplates a die closing and locking mechanism for die casting machines in which the die moving and die locking actions are accomplished by separate mechanisms so that it is possible to have a short, direct, inflexible connection between the dies when they are in a closed position.

In essence, the present invention provides a unique form of hydraulic cylinder and piston which performs the sole function of transferring the movable die half toward and away from the fixed die half. Additionally, a locking latch is provided which operates directly across the parting line so as to directly connect the die halves.

Because the die opening and closing cylinder is independent of the locking mechanism, it is possible to obtain a cushioned closing motion and a quick opening motion.

An additional advantage of the present invention lies in the fact that the tie bars which pass between the fixed and movable die halves of the present casting machines may be eliminated. The operator is thereby given complete unhampered access to the dies from all angles. This greatly simplifies the problem of removing and replacing

the dies from their platens, and also simplifies the design of casting removing devices which operate in conjunction with the fixed die half.

Other applications and advantages of the present invention are indicated in the following detailed description of an embodiment of the invention. The description makes reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a die casting machine embodying the principles of the present invention;

FIGURE 2 is a sectional view through the die moving mechanism of the present invention; and

FIGURE 3 is a sectional view of alternative latching arrangement.

The machine is supported on a base 10 which is preferably formed of welded plate steel. A fixed platen 12 is mounted on the base 10 and is adapted to retain the fixed die half 14. The movable die 16 is supported on a platen 18 which has its lower edge resting on hardened and ground ways 20 that are fixedly attached to the upper surface of the base 10.

Four tie rods 22 each have one end fixed to the movable platen 18 and have their other ends attached to the cylinder end 24 of a hydraulically actuated ram generally indicated at 26. Nuts 28 connect the threaded ends of the rods 22 to a head plate 30 of the ram 26. As is seen in FIGURE 2 the rods 22 pass through bushings 32 which are disposed in a cylinder support bracket 34. The bracket 34 is supported on its outer edges by brackets 36 which are adjustably attached to the base 10 by means of bolts 38.

As is seen in FIGURE 2 the rod 40 of the ram 26 has its outer end fixedly attached to the support plate 34. Therefore, the piston end 42 of the rod 40 remains stationary with respect to the base of the machine while the cylinder end 24 moves as fluid is admitted to the various ram chambers. Although fluid may be admitted to the ram chambers in the normal manner with lines directly connecting to either end of the cylinder 24, it is preferred that fluid connections be made internally through the plate 34 and the rod 40. For this purpose fluid conduits 44 are cut in the support plate 34 and attached to the outlet ports of the fluid valve (not shown) at one of their ends. At their other ends they connect to two fluid passages 46 in the rod 40. One of the passages 46 outlets on one side of the piston 42 while the other fluid passage outlets on the opposite side.

Cushioning devices which are not shown may be provided to slow down the piston action as it nears either or both ends of its stroke.

Several advantages in operation result from the fact that the movable platen 18 is driven by the cylinder end of the ram 26 rather than by the rod end as is normally the case. First, the maximum forces of the ram are developed when the dies are opened and the casting has to be ejected. This is because the oil pressure injected into the cylinder 24 at the end of the piston not connected to the rod acts against the total piston area while oil injected at the rod end acts against the piston area minus the rod area. Therefore the dies are opened quickly with a low force and they are closed more slowly with a large force. This is advantageous since no particular force is required to close the dies and this can be done at a higher rate of speed. The closing stroke is also accomplished with a lower force than the opening so that damage to the dies as a result of their slamming together is minimized.

The molten casting material is injected into the cavity formed by the fixed and movable die halves by a shot cylinder 48. The cylinder and the appended shot sleeve are supported directly in the fixed platen 14. A pour hole 50 is provided through which the molten casting material is inserted into the shot cylinder 48.

It is to be understood that the die closing and locking system herein described could also be applied to a hot chamber type machine which is used for casting metals having lower melting points and in which the material is melted directly within the machine.

After the die halves have been closed by the action of the ram 26 a plurality of latches 52 which are arranged about the periphery of the dies close over a lip 53 on the edge of the movable die 16. The latches are pivotably supported on trunnions 54 and operate in notches 56 cut in a surface of the fixed platen 12. Notches are provided at regular intervals along side of the platens so that as many latches as are required may be utilized. The latches are actuated by small shot cylinders 58 which are supported on the outer side of the fixed platen 12. The cylinders 58 also receive their hydraulic fluid through lines which are internal of the fixed platen 12.

Because of the short length of these latches 52 and because of the direct connection they afford between the fixed platen and the movable die half, they form a specially rigid connection which maintains the dies tightly closed during the pressured injection.

A cavity 60 is provided in the base directly below the die halves so that the operator has complete access to the dies from all sides.

FIGURE 3 illustrates another embodiment of a die latching mechanism. The latching mechanism is supported on a fixed platen 70 of a die casting machine. The latch is powered by a cylinder 72 which receives and disposes of hydraulic fluid through lines 74 which are connected to passages 76 within the fixed platen 70. A latch 78 is supported in trunnion fashion on a pin 80 that is fixed in the sides of the fixed platen 70 in the same manner that the pins 54 are fixed within the platen 12. The latch 78 includes a flattened portion 82 which is adapted to engage a similar surface on the rear edge of the movable die half 84. A recessed curve 86 on the latch connects the section 82 in such a manner as to obviate the possibility of the latch sticking against the movable die surface.

The latch 78 is energized by a wedged drive 86 which

is driven by the rod 88 of the cylinder 72. The wedge 86 contacts the latch 78 on a rounded surface 90 which is also designed to prevent binding. As the rod 88 drives the wedge 86 towards the right in FIGURE 3 the latch 78 has its extended end 82 driven downward. The wedge 86 is also connected to the latch 78 by means of a link 92 which is pin connected to both members. The connection between the link 92 and latch 78 is achieved by a pin 94 which moves in elongated slot 96 in the link. Therefore, as the wedge 86 is retracted to lift the latch 78 the latch member lags slightly behind the movement of the wedge. In that manner the wedge has achieved an initial velocity before the latch 78 is moved. This action causes the latch to be open with a jerk which frees any possible bind between the latch surface 82 and the mating section of the movable die half.

This application is a division of application Serial No. 706,851, filed January 2, 1958, for Die Casting Machine.

Having thus described my invention, I claim:

In a die casting machine having a first fixed die half, a second movable die half, and latching means operable across the parting line of the die halves to maintain the halves in fixed cooperating relationship, means for moving said movable die half into and out of cooperating relationship with said first die half, said means comprising: a fluid actuated ram having its piston end fixed with respect to said first die half; at least a pair of fluid passages passing through a portion of said first fixed die half and the rod of said cylinder and terminating on both sides of the piston of said cylinder whereby hydraulic fluid may be admitted into the cylinder on either side of said piston; and a plurality of tie rods connecting the cylinder end of said ram with said second die half, whereby as fluid is admitted or extracted from the chambers of said ram the second die half is moved with the cylinder of said ram.

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