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F. HALWARD

2,582,029

DIE CASTING MACHINE

Filed March 11, 1948

3 Sheets-Sheet 1

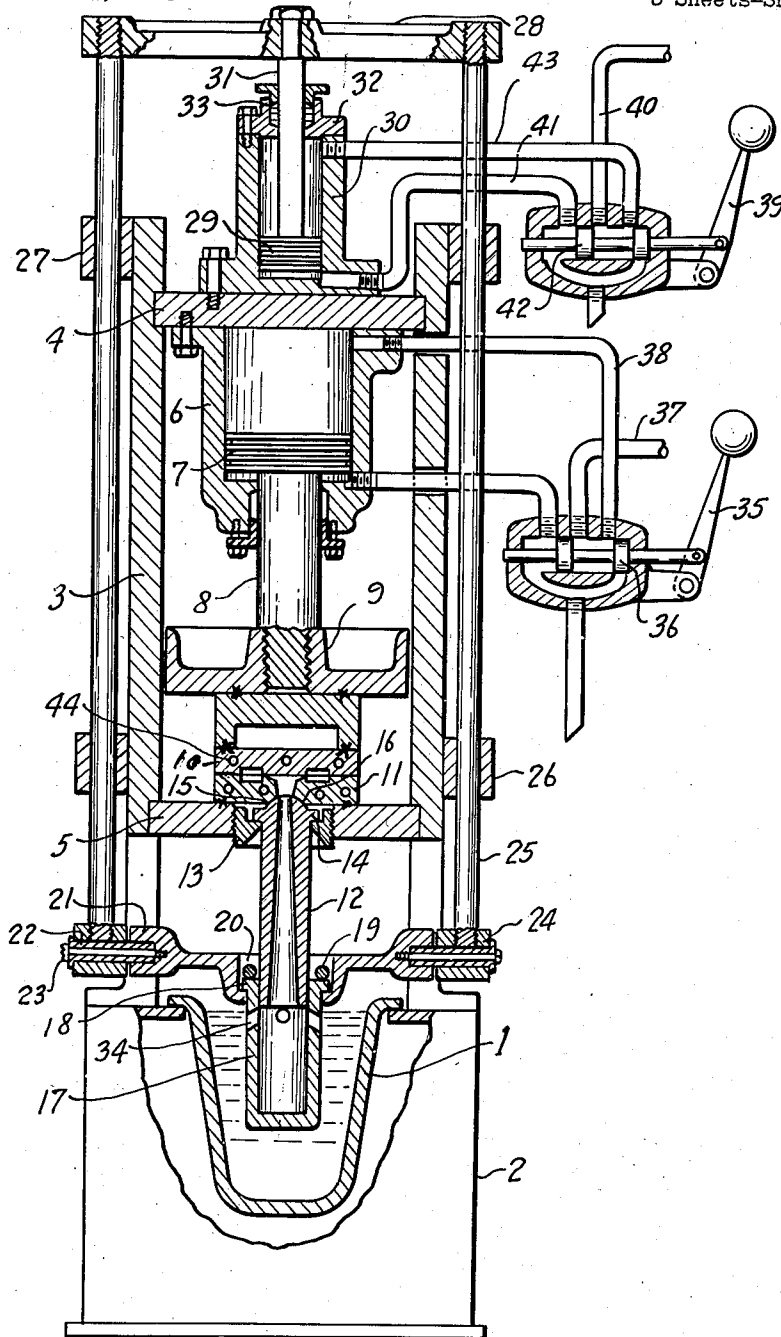


FIG. 1.

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3 Sheets-Sheet 2

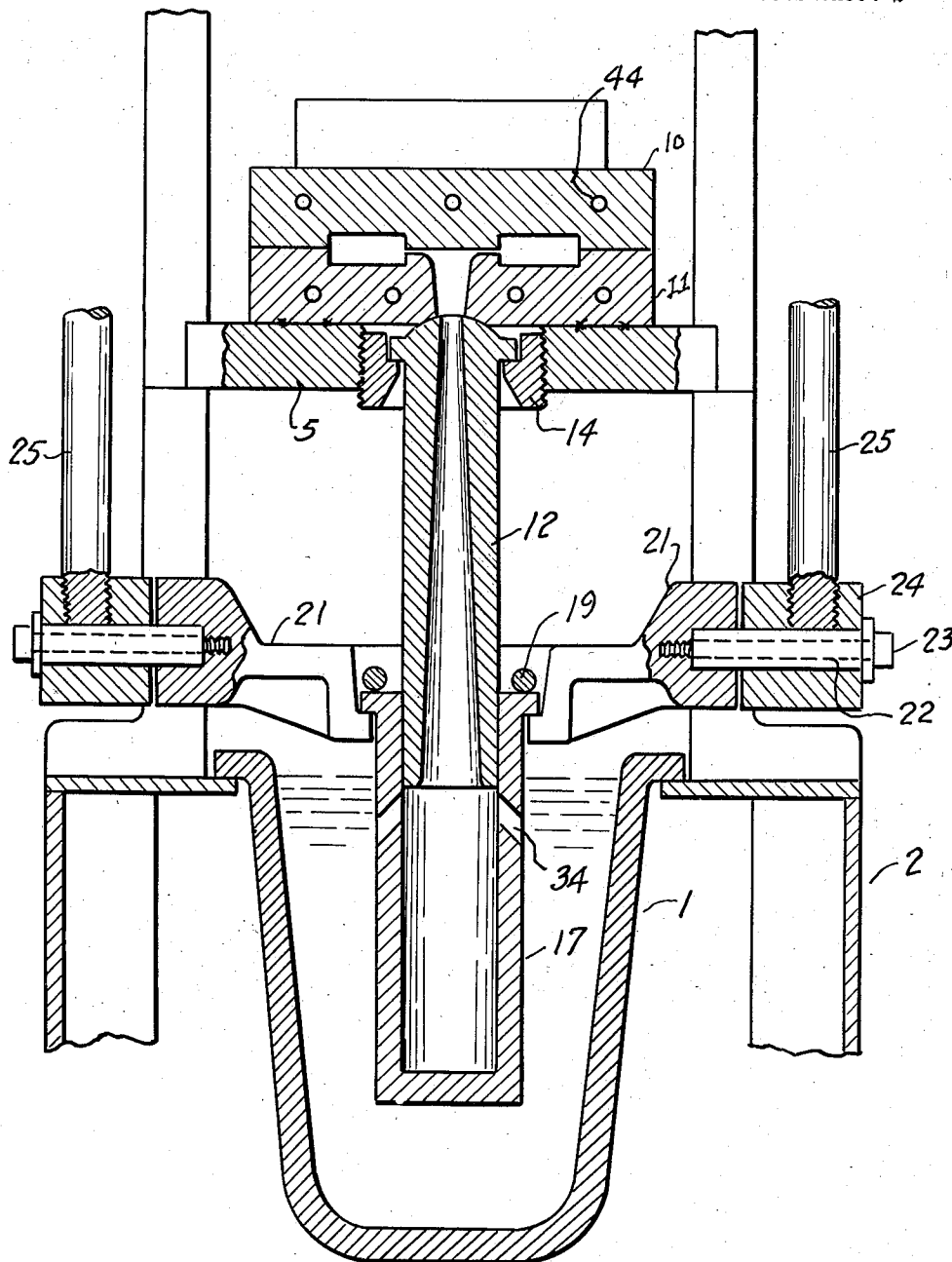


FIG. 2.

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FIG. 3.

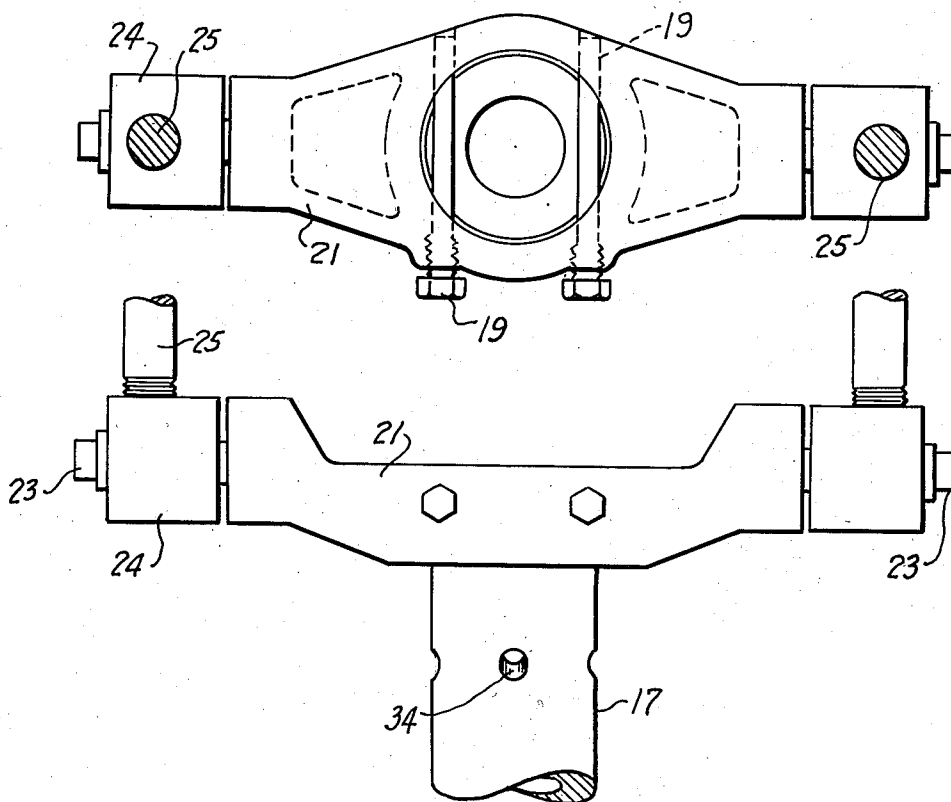


FIG. 4.

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UNITED STATES PATENT OFFICE

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DIE CASTING MACHINE

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3 Claims. (Cl. 22-68)

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This invention relates to die casting machines. It is the object of the invention to provide an improved power operated die casting machine in which the dies are closed and the molten metal pump is forced into the dies by separate power applications.

The dies when closed are stationary and do not move with the operation of the force pump. No check valves are employed. The cylinder of the pump when idle rests in a crucible of molten metal.

The cylinder of the injection pump is supported to swing on trunnions to permit the plunger and nozzle to be easily swung out of the crucible when the plunger and nozzle is uncoupled from the stationary mold support platen. This is advantageous in repairing and replacement operations.

The injection cylinder has outwardly and downwardly inclined ports just below the liquid level in the crucible. This insures the entry of clean molten metal into the injector cylinder as the outward ends of the passageways are below the surface of the molten liquid. This avoids the dross and foreign matter, which collects on the surface of the liquid.

The lower die supporting platen is stationary at all times which facilitates loading and forcing inserts into the die. The only movable part of the machine to force the metal into the die is the injection cylinder and the cross bar supporting it.

Referring to the drawings:

Figure 1 is a vertical section of the improved machine, the valves controlling the fluid pistons being diagrammatically shown.

Figure 2 is an enlarged vertical section of the lower part of the machine showing particularly the trunnion support of the cross member that carries the injection cylinder.

Figure 3 is a plan view of the cross member and the injection cylinder.

Figure 4 is a detailed elevation of the cross member and part of the injection cylinder.

1 designates the crucible, 2 the heating chamber, and 3 the main frame of the machine. This frame supports two stationary platens 4 and 5. The upper platen 4 supports the cylinder 6 in which moves a piston 7 connected by rod 8 with the upper die support 9. The upper die is designated 10.

The lower platen 5 supports the lower die 11 and also the plunger and nozzle member 12 which is clamped to the lower die 11 by means of the nut 13 that engages with the annular

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flange 14 of the nozzle and forces the spherical nozzle head 15 up against complementary spherical cavity 16 in the bottom of the lower die. By this arrangement the nozzle and injection plunger is clamped firmly to the die.

The injection cylinder 17 is suspended loosely by the upper flange 18 and pins 19 in the recess 20 of cross member 21. This slightly floating suspension of the injection cylinder allows the cylinder to accommodate itself to the plunger and nozzle without binding, this freedom of the cylinder to accommodate itself to the stationary piston is further aided by the fact that the cross member 20 is supported on trunnions 22 which are bolted by bolts 23 to the cross member. These trunnions turn in bearings 24 which are supported on the bottom of the rods 25 which are guided in vertical reciprocating movement in the slide bearings 26 and 27. The rods 25 with the cross head 28 make a movable frame which is raised and lowered by piston 29 guided in cylinder 30. The piston rod 31 passes through the cylinder head 32 and through a packing gland 33. Cylinder 30 is bolted to the upper stationary platen 4.

It will be noted that the passageways 34 in the injector cylinder are directed outwardly and downwardly so the outside ends of the passageways are below the molten liquid level in the platen, hence the molten metal passing into the cylinder is free of dross and foreign matter that always collects on the surface of the molten metal.

To operate the machine the valve lever 35 is thrown into the outer position as shown in Figure 1. This allows oil or air under pressure to pass to the top of piston 7 by reason of the position of the slide valve 36 with respect to the fluid pipe 37 and the pipe connection 38 to top of cylinder 6. This closes the upper and lower dies 10 and 11. Thereupon valve lever 39 can be shifted to the left from the position shown in Figure 1. This will connect the fluid supply pipe 40 with pipe 41 by reason of sliding the valve 42 to the left thereupon piston 29 will be raised in cylinder 30 and this will cause the injection cylinder 17 to rise out of the crucible pot 1 and force a charge of molten metal through the plunger and nozzle 12 into the die cavities.

The stationary nozzle 12 can be kept heated with a gas flame or other source of heat to make sure that the metal will not solidify in the nozzle. As the injection cylinder rises, the ports 34 are automatically closed without the use of objectionable check valves. On the down stroke when

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valve lever 39 and valve 42 are shifted back to the right, fluid flows through the pipe 43 to the top of piston 29 and pushes the injection cylinder back into the pot, a vacuum is caused in the tapered interior of the nozzle plunger member and this, with gravity, causes the molten metal to flow back into the pot. The liquid in the dies solidifies almost immediately because they are water cooled by water passing through the passages 44.

If it is desired to repair or replace the injection pump or either member thereof this may be easily done by loosening the nut 13 to release the nozzle and then swinging the pump out of the crucible by turning it on the trunnions.

It will be obvious that other ways of moving the dies closed and moving the injector pump element may be provided. These actions may be made automatic by tripping the valve actuating members automatically instead of swinging the levers by hand. Some other form of mechanical operation for closing dies and operating the injector pump may be used. So I want it understood that I am not limited to actuating motors shown in the drawing unless these actuating members are specifically recited in the claims.

The connection or fastening between the die supports and the dies is indicated in the drawings by crosses or asterisks where the surfaces contact. This is merely a graphic showing of the fastening between these members, of course in practice some form of clamp or other fastening device will have to be used so as to allow the removal of the dies from the die supports.

What I claim is:

1. In a die casting machine the combination of dies, means for supporting and moving the dies from open to closed position and from closed to open position, a crucible, an injector pump comprising a plunger and nozzle located above the crucible and secured to the lower die support and die by a removable nut and shoulder on the nozzle a closed end injector cylinder with side ports near the top and just under the lower end of the plunger when the cylinder is in lowermost position and fitted over the plunger and nozzle and means for reciprocating the injector cylinder from a position in the metal contained in said crucible with the open ports below the molten metal below the lower end of the plunger and the cylinder telescoped over the nozzle to a raised position above the lower end of the plunger and nozzle to thereby close the said ports and thereby inject a charge of liquid metal through the plunger and nozzle into the cavities of the closed dies, the means for reciprocating the injector cylinder including a cross member supported to tilt on trunnions so that the injector cylinder can be swung in and out of the crucible when the nut is unscrewed and the nozzle removed.

2. In a die casting machine the combination of dies, means for supporting and moving the dies from open to closed position and from closed to open position, a crucible, an injector pump comprising a plunger and nozzle removably cou-

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pled to the lower die support and die and a closed end injector cylinder with side ports and fitted over the plunger and nozzle and means for reciprocating the injector cylinder from a position in the metal contained in said crucible with the open ports below the molten metal below the lower end of the plunger and the cylinder telescoped over the nozzle to a raised position above the lower end of the plunger and nozzle to thereby close the said ports and thereby inject a charge of liquid metal through the plunger and nozzle into the cavities of the closed dies, the means for reciprocating the injector cylinder including a cross member having a recess in which the injector cylinder is loosely rested at its top and held in place by a flange thereby to give freedom to the injector cylinder to accommodate itself to the fixed plunger and nozzle member over which it glides, said cross member supported at its ends to rock on trunnions whereby the injector cylinder and plunger may be turned up out of the crucible when the nozzle connection with the die is uncoupled.

3. In a die casting machine a frame having a stationary platen, a lower die supported on said stationary platen, a die support vertically movable with respect to the frame, an upper die supported thereby, a fixed plunger and nozzle coupled with said stationary platen and lower die, a ported closed end injector cylinder at all times telescoping over the nozzle and normally resting in molten metal with the ports below the liquid level, a crucible for containing the said molten metal, means for closing the dies together by moving the upper die, a supporting member loosely suspending the injecting cylinder in a floating relation permitting it to accommodate itself to the stationary plunger-nozzle, the said supporting member being in turn supported to rock and thereby permit the injector cylinder and the plunger-nozzle member to be rocked out of the crucible when the nozzle is uncoupled from the stationary platen, and means for raising the ported closed end cylinder out of the crucible, the cylinder moving up the exterior of the plunger-nozzle member thereby closing said ports and forcing a charge of molten liquid into the cavities of the die.

FOLKE HALWARD.

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