Jan. 22, 1963 H. C. WERNECKE 3,074,131

CASTING MACHINE INJECTOR STRUCTURE

Filed March 26, 1958

3 Sheets-Sheet 1

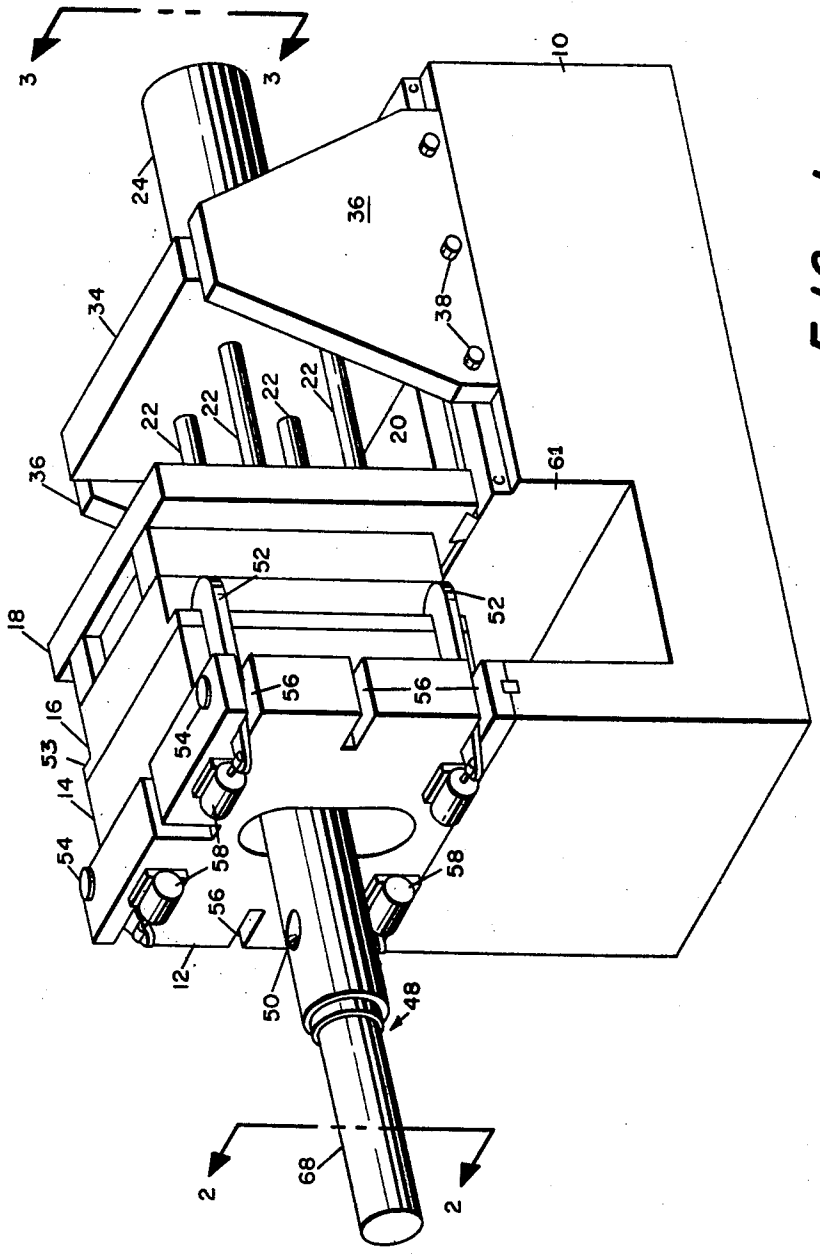

FIG 1

INVENTOR.
HEINZ WERNECKE
BY Allen M Krass
ATTY.

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3 Sheets-Sheet 2

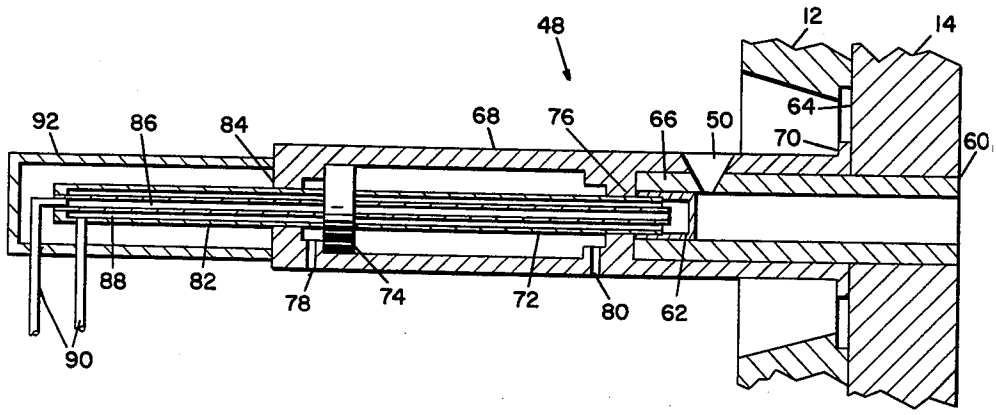

FIG. 2

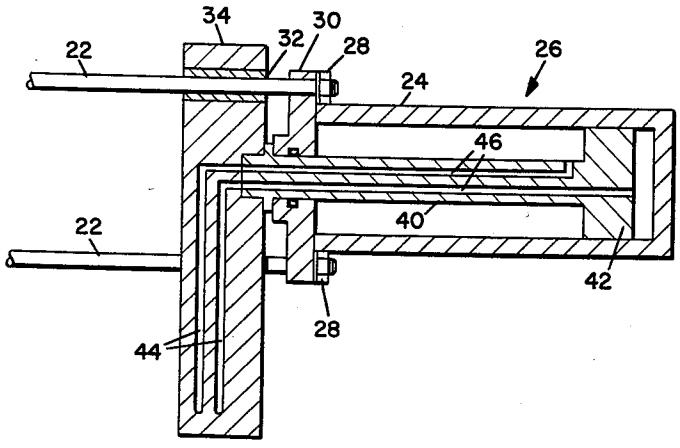

FIG. 3

INVENTOR.
HEINZ WERNECKE
BY Allen M Krass
ATTORNEY

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CASTING MACHINE INJECTOR STRUCTURE

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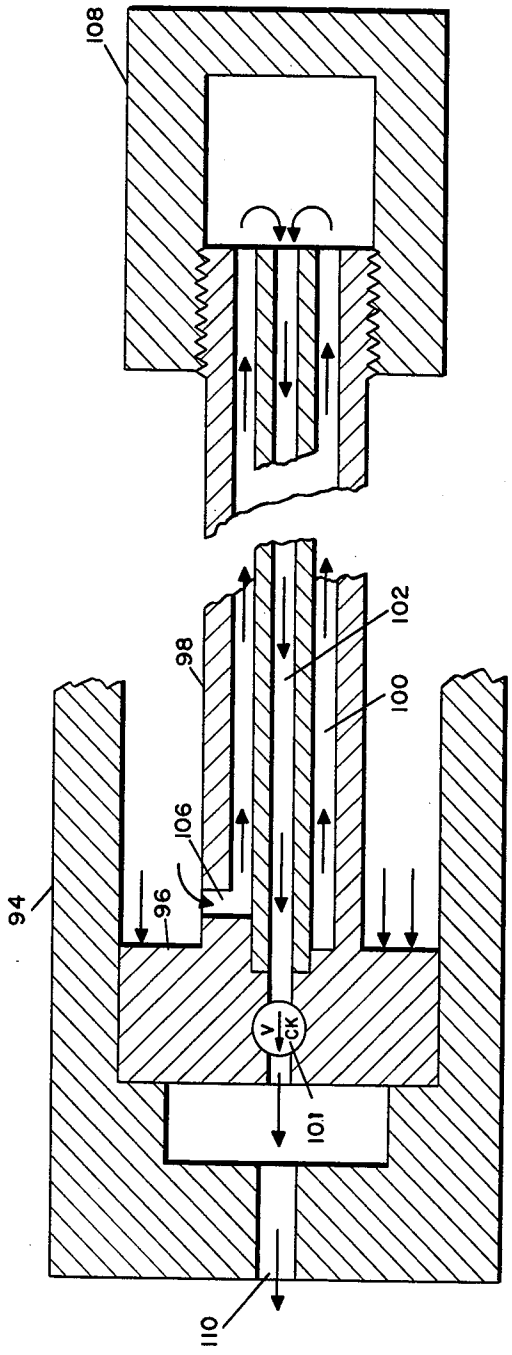

FIG 4

INVENTOR.
HEINZ WERNECKE

BY Allen M Krass

ATTORNEY

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CASTING MACHINE INJECTOR STRUCTURE

Heinz C. Wernecke, 2703 Ferncliff, Royal Oak, Mich.

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1 Claim. (Cl. 22—68)

This invention relates to die casting machines of the cold chamber type in which the casting material is melted externally of the machine and then is fed into the machine under pressure by an injector cylinder associated with the machine, and more particularly this invention relates to novel structure for such injector mechanism.

The cold chamber die casting machines known to the prior art include a shot sleeve which constitutes a high temperature resistant cylindrical passage feeding the die cavities and supported on the fixed platen of the machine. A pour hole allows molten casting material to be fed into the shot sleeve for injection into the die cavities. A hydraulically actuated injection cylinder is supported on the base of the machine removed from the fixed platen and has its cylinder rod drivingly connected with the shot piston, which is movable in the shot sleeve. Since each die has its injection point located at a point that is dependent upon the specific die shape it is necessary to vary the position of the shot sleeve and of the injection cylinder when the die is changed. As two separate adjustments must be made, each with respect to the die injection point with respect to each other, a difficult alignment problem exists.

Other disadvantages of the present cold chamber injector mechanisms result from the fact that the rod connecting the shot piston and the injector piston must be exposed so as to allow cooling lines to be attached to the shot piston through the cylinder rod. The exposed rod must be at least twice the length of the piston stroke to allow the cooling lines to clear during movement of the rod. The result is an overly long casting machine structure.

The present invention contemplates an injector structure in which the injecting cylinder is integral with and supported on the shot sleeve. In the particular embodiment contemplated, the injection cylinder is supported directly on the stationary platen and acts as a spacer between the platen and the shot sleeve. A direct connection is made between the shot piston, which forces the molten casting material into the die cavity, and the injection piston, which is movable in the injector cylinder. Because of this unitary structure, when the die is changed, it is only necessary to vary the position of one unit. Changes in dies may therefore be made with increased rapidity and accuracy.

The present invention also contemplates a novel cooling system for the shot piston in which the cooling lines pass through the shot piston as well as the piston rod. This feature allows the rod length to be limited to the length of the piston stroke and the entire machine is thereby shortened by this length.

An additional advantage of the present structure results from the molten casting material being retained within the machine by both the shot piston and the cylinder piston as well as the protective housing surrounding the two. Since the cooling lines need not be connected to the piston rod this area may be totally enclosed by the injector cylinder thereby eliminating the possibility of any molten metal splattering out of the machine from behind the shot piston.

In the system of the present invention, since it is not necessary to adjust the injector cylinder independently on its own support, more freedom may be allowed in determining the injection point on the die and the position of the injection point with respect to the fixed platen. Since a single adjustment aligns both the injector cylinder and the shot cylinder with the injection point no difficulty is encountered in making that alignment at any point on the fixed platen.

Other objects, advantages and applications of the present invention will be made apparent by 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 present invention;

FIGURE 2 is a cross sectional view of the injector structure including the shot cylinder of the preferred embodiment taken along lines 2—2 of FIGURE 1;

FIGURE 3 is a cross sectional view of the die actuating mechanism of the preferred embodiment taken along line 3—3 of FIGURE 1; and

FIGURE 4 is a broken away, partial, sectional view of an alternative embodiment of the shot piston cooling mechanism.

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 half **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** which have one end fixed to the movable platen **18** and have their other end 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** on the ram **26**. As is seen in FIGURE 3, 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**.

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, the 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 the two fluid passages **46** and 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 of the piston.

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

The injector structure is generally indicated at **48**. As seen in FIGURE 2 it includes a shot sleeve **66** which directly attaches to the fixed die half **14** by means of a flanged end **70** which operates in a groove **64** in the fixed platen **12**. The position of the injection cylinder may be adjusted with respect to the fixed die half by moving it to various positions along the groove **64**. The shot sleeve **66** comprises a high temperature resistant liner which is internally coaxial to the injection cylinder **68** as its end nearest the platen. The shot sleeve extends beyond the flanged end **70** of the injection cylinder **68** and into the injection hole **60** of the fixed die half.

A pour hole **50** extends through both the injector cylinder **68** and the shot sleeve **66** so as to connect the internal hole in the shot sleeve **66** with the external side of the

injection cylinder. The molten casting material is introduced to the shot sleeve through the pour hole **50**.

A shot piston **62** which is also formed from a high temperature resistant alloy is positioned for movement within the shot sleeve **66**. A connecting rod **72** has its extreme end connected to the shot piston **62** and has its other end connected to an injection piston **74** which is fitted for movement internally of the injection cylinder **68**. A bulkhead **76** within the injection cylinder **68** separates the injector cylinder chamber from the shot sleeve chamber. Two fluid conduits **78** and **80** which are positioned at either end of the injection cylinder chamber and which connect to the outer surface of the injection cylinder are utilized to admit and remove hydraulic fluid from the injection cylinder chamber and thereby actuate the injector piston **74** and its attached shot piston **62**.

The connecting piston rod **72** extends beyond the rear end of the injection piston **74** as at **82**, passing through the rear end **84** of the injection cylinder.

The rod **72** and its extension **82** each contain two concentric passages **86** and **88** which admit cooling fluid to the shot piston **62**. The passages are interconnected within the piston **62** to allow a return flow. At their other extreme end they are connected to fluid lines **90** which admit and return cooling fluid from a pressurized piston (not shown). A sheet metal cover **92** protects the rear end of the rod **86** from exposure.

An alternative embodiment of the shot piston cooling system which may be employed when non-inflammable hydraulic fluid is used to drive the injection piston is illustrated in FIGURE 4. The injection cylinder **94** is equipped with a piston **96** and a connecting rod **98** which has two internal concentric fluid passages **100** and **102**. The central passage **102** connects through the piston **96** to its rear end through a check valve **101** which allows fluid to pass in a rearward direction only. The outer fluid passage **100** connects to the internal end of the injection cylinder through means of the passage **106**. As in the previous embodiment the fluid passages **102** connect with one another through a hollowed area in the shot piston **108**.

To accomplish the injection stroke non-inflammable hydraulic fluid is admitted into the injection cylinder chamber rear of the injection piston through a passage **110**. The check valve **101** prevents this fluid from entering the cooling system. On the return stroke fluid is admitted to the other side of the injection piston **96**. This fluid enters the outer cooling passage **100** through the port **106**, passes through the shot piston **108** into the internal cooling passage **102** and is vented out of the injection cylinder **94** through the check valve **101** and the passage **110**. In this manner the same hydraulic fluid which produces the motion of the shot piston is used to cool that piston.

The latching mechanism of the casting machine operates as follows. After the die halves have been cleared 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 the surface of the fixed platen **12**. Latches are provided at regular intervals along the side of the platen so that as many latches as are required may be utilized. The latches are actuated by small cylinders **58** which are supported on the outer side of the fixed platen **12**. Cylinders **58** also receive their hydraulic fluid through lines which are internal of the fixed platen **12**.

A cavity **61** is provided in the base directly below the die halves so that the operator has complete access to the dies from all sides.

It is thus seen that the present invention allows a die casting machine of simple and compact construction to be designed which may be adjusted to various dies much more simply than machines of the prior art, and which provides greater safety than those machines.

Having thus described my invention, I claim:

In a die casting machine having a base, a platen fixed with respect to said base, a first die half supported on said platen, and a second die half movable into and out of cooperating relationship with said first die half, means for injecting molten casting material under pressure into the cavity formed by said die halves, said means comprising a high temperature resistant casing passing through said platen and first die half; a first, high temperature resistant piston movable in said casing; means for admitting molten casting material into said casing in such a position that it may be injected into said die by the movement of said first piston; a hydraulic ram having a cylinder and a second piston, said second piston being drivingly connected to said first piston by a rod; means for admitting hydraulic fluid under pressure into said hydraulic cylinder on either side of said piston; two fluid passages passing through said rod and communicating with one another internally of said first piston, and means for passing cooling fluid through said two passages, said means comprising a uni-directional fluid connection between one of said passages and the volume of the ram cylinder on one side of said second piston and a bi-directional fluid coupling between the other passage and the ram cylinder volume on the other side of said second piston.

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