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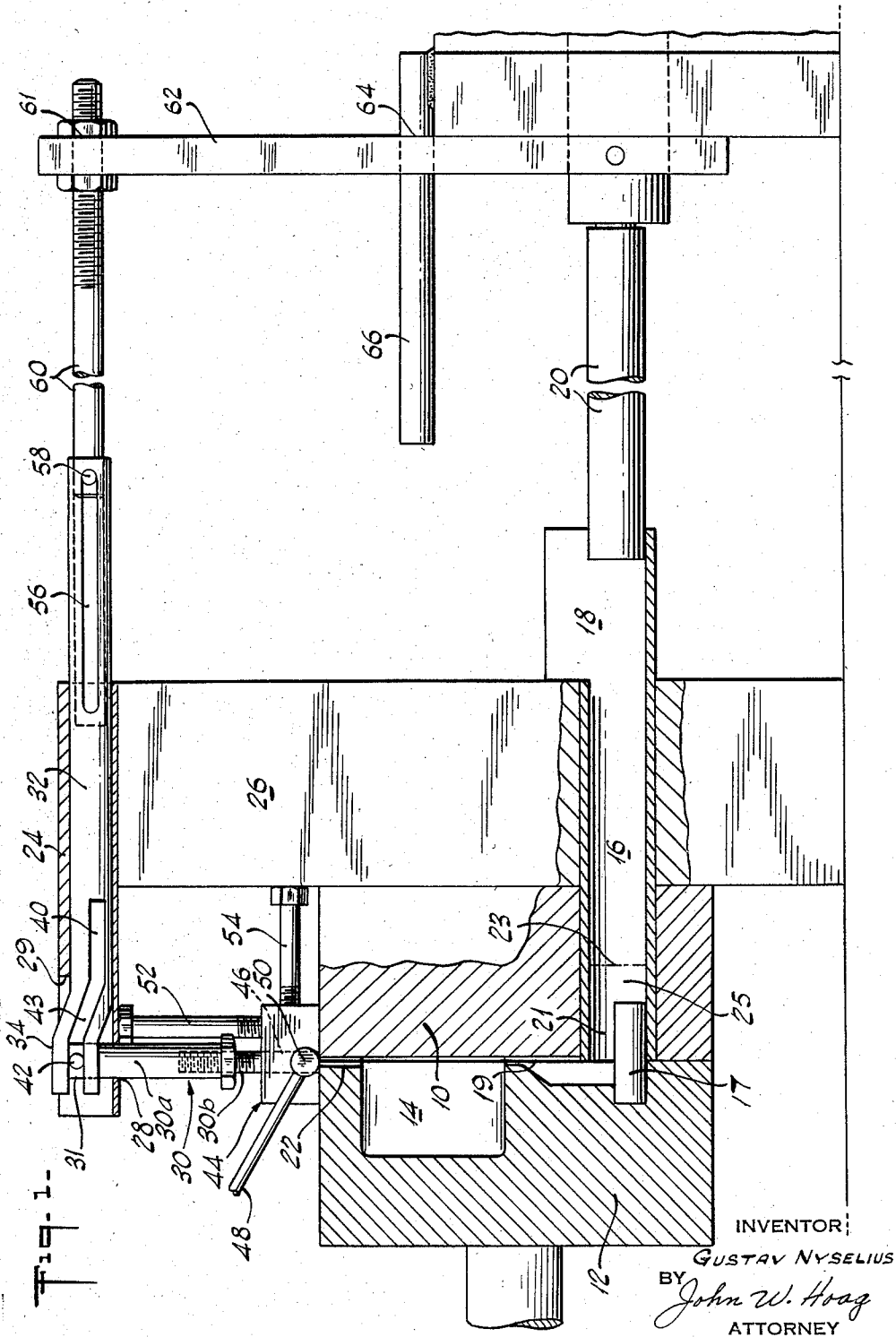
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MEANS FOR CONTROL ASSEMBLY FOR THE AIR VENT OF A DIE CAVITY

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MEANS FOR CONTROL ASSEMBLY FOR THE AIR VENT OF A DIE CAVITY

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3 Claims. (Cl. 22-68)

This invention relates to a valve means for automatically controlling the expulsion of air from the die cavity of hot and cold chamber die casting machines.

The invention is shown herein embodied in an attachment which may be readily mounted on die-casting machines now in use, without requiring any alteration in the existing machine.

Of course the invention may also be embodied as an integral part of machines built hereafter.

An object of the invention is to provide a simple and dependable means for controlling the expulsion of air and gas from a die cavity.

Another object of the invention is to provide means of the above mentioned kind operative in timed relation to reciprocations of the charging piston or plunger means by which the material to be cast is forced into the die cavity.

A further object of the invention is to provide valve means actuated by reciprocating cam means which in turn is interconnected with the charging piston or plunger of a die-casting machine by means including lost motion linkage, whereby said cam is actuated only after the charging plunger or piston has moved a predetermined distance.

The invention will best be understood if the following description is read in connection with the drawings in which:

Figure 1 is a side elevation partly in cross section and partly broken away showing a portion of a conventional die casting machine with the apparatus comprising this invention added thereto,

Figure 2 is a view similar to Figure 1 showing a portion of Figure 1 on an enlarged scale,

Figure 3 is an end view partly in cross section looking from the left of Figure 2, and

Figure 4 is a side elevation view showing diagrammatically a modification of Figure 1.

In the embodiment of the invention shown herein a two part die is provided including the stationary die part 10 and the movable die part 12, which is reciprocated by known means. In the inner surface of part 12 a cavity or recess 14 is formed which has the form of the article to be cast. A conduit 16 is provided communicating between a receptacle 18 for material to be cast and the gate 19, formed in die member 12 and opening into the die cavity 14. The material to be cast is forced from the receptacle 18 into the die cavity 14 through the conduit 16 and gate 19 by means of a plunger 20 which is reciprocated by known means. Attached to die part 12 and projecting into the discharge end of conduit 16 is a plug 17 which narrows the conduit but leaves space 21 through which the material to be cast passes from conduit 16 into gate 19. The line 23 indicates the approximate position of the end of the charging plunger 20 at the end of its charging stroke and the numeral 25 indi-

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cates a plug of casting material which remains in conduit 16 at the end of the charging stroke and provides an air seal between conduit 16 and the gate 19 while the material in cavity 14 is hardening into the desired shape. The surface of die 12 is grooved to provide a channel 22 through which the air contained in the die cavity 14 and in the charging conduit 16 and gate 19 can escape after the die parts are closed together.

The apparatus so far described is standard apparatus in wide use as the present time.

The apparatus which is the subject of this application may be incorporated in new casting machines, or it may be readily attached to many die casting machines now in use and is especially desirable for this purpose because of its simplicity. It makes possible closing of the channel 22 in a simple way as soon as the die cavity 14 is filled with the material to be cast.

It is important to the quality of the article being cast, to make it complete and free of voids, that channel 22 remain open until all of the air or gas in the die cavity is displaced therefrom by the material which is forced into the die cavity during the forward movement of the charging plunger 20. It is also desirable to close channel 22 quickly after the die cavity becomes completely exhausted of air and gas and filled with the material to be cast, in order to prevent loss of the material from the die cavity through the said channel 22.

The apparatus comprising this invention includes cam means and means for connecting it to the charging plunger 20, including lost motion linkage, and valve means for opening and closing channel 22 in response to movement of the cam means.

On the machine frame portion 26 a slideway is provided for a reciprocating cam member. In Figures 1-3 the slideway is shown in the form of a sleeve 24, which projects beyond frame portion 26 and has a wall opening at 28, aligned with the die air venting channel 22, to receive, and serve as a guide for, one end of a valve member or plunger 30. Sleeve 24 is cut away at 29 opposite the opening 28, to provide space for an offset end portion 34 of cam member 32. The end of the cam member 32 is bifurcated (Figure 3) to provide the spaced arms 36 and 38 between which projects the reduced end 31 of valve plunger 30, and the arms are slotted with cam slots 40 providing a double cam track to receive cam follower rollers mounted on the respective projecting ends of pin 42 which extends through portion 31 of the said valve plunger. The slots 40 have an inclined portion 43 which determines the length of stroke of valve plunger 30 within the main bore 46 in block 44 which is positioned on the fixed die member 10, by means of screws 52 and 54 interposed respectively between the block and the sleeve 24, and between the block and the portion 26 of the machine frame, with bore 46 aligned with the vent channel 22. A clearance on the order of 1/1000 of an inch is provided between block 44 and the movable die part 12. The diameter of bore 46 depends on the diameter of the branch bore 50 provided in the block 44 for connection to a vacuum line 48. Bore 50 communicates with bore 46 and the valve plunger 30 should be large enough to completely close bore 50 at one end of its stroke.

The end of member 32 opposite the cam slots 40 extends beyond the sleeve 24 and has longitudinally extending slot means 56 in which is received the pin means 53 projecting from the arm 60 which is attached to one end of the support member 62, the other end of which is mounted on the charging plunger 20 in any suitable way. Support 62 may be provided intermediate

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its ends with the bearing 64 which slides on the guide member 66 disposed parallel to the charging plunger 20.

Thus the member 62 is moved back and forth with plunger 20 and the cam member 32 is similarly moved when the pin means 58 on arm 60 reaches one end or the other of the slot means 56 in member 32. I have found that this slot may conveniently be about 8 inches long, the pin and slot connection then providing lost motion linkage sufficient to render the cam and valve plunger inoperative during a first portion of the charging stroke of plunger 20, during which a charge of material is moved by the plunger from receptacle 18 through conduit 16 and gate 19 a sufficient distance to substantially fill cavity 14, and during a first portion of the return stroke of plunger 20 during which the cast material is hardening in cavity 14 prior to the separation of the die members. The stroke of plunger 20 may desirably be controlled as described in my copending application Serial No. 596,364, filed July 6, 1956, and a vacuum pump of known kind attached to the air conduit 48, shown (see Figure 3) attached to bore 50 in block 44, to exert negative pressure on cavity 14 until it is closed by valve member 30 actuated as described above in timed relation to the movements of plunger 20.

For greater flexibility in application of the means described herein the valve plunger 30 is made in two parts 30a and 30b with part 30b screwed into part 30a so that its length may be adjusted to ensure effective closing of vent channel 22, and arm 60 is screw threaded at one end and received into a grooved bearing 61 provided in support 62 so that its effective length in the linkage comprising it and cam member 32 may be adjusted as required to position the cam slots 40 for operation of valve plunger 30.

In Figure 4 a modification of Figure 1 is shown in which support 62, guide 66 and arm 60 are eliminated and replaced by support member 70, mounted in any suitable way on plunger 20, the arm 72 and the bell crank 74 which is pivoted at 76. Because the bell crank causes cam member 76 to move in a direction opposite to the direction of movement of plunger 20 the cam slots 78 have inclined portions 80 which are inclined oppositely to those in cam slots 40 shown in Figures 1, 2 and 3.

There has been provided apparatus useful for attachment to many existing die-casting machines or incorporation in such machines by which the objects set forth above are achieved in a simple and effective manner.

What I claim is:

1. An assembly adapted for attachment to a die casting machine of the kind having a stationary die part and an opposed movable die part which when closed together define a die cavity, an exhaust conduit leading from the die cavity to the exterior surface of the die, a receptacle for material to be cast, a reciprocable die charging plunger, conduit means through which material to be cast is moved from the receptacle into the cavity by said plunger, and means for reciprocating said die-charging plunger, which comprises, a slideway disposed on the machine frame in parallel with the charging plunger, a slide reciprocable within the slideway, means including lost motion linkage for connecting the slide to said die charging plunger, a member adapted to rest on the stationary die part having a main bore extending through it and a branch bore extending to the exterior of said member from said main bore, means for positioning said member on the stationary die plate with its bore communicating with the discharge end of the cavity exhaust conduit, a valve plunger extending into said main bore, a cam track on said slide, and cam follower means on the valve plunger engaged in said cam track and responsive to movement of the slide to reciprocate said valve plunger in said main bore and thus open and close said branch bore.

2. In combination with a die casting machine of the kind having a two part die including a stationary die part

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and a movable die part which when closed together define a die cavity, an exhaust conduit leading from the die cavity to the exterior surface of the die, a receptacle for material to be cast, a reciprocable die charging plunger, conduit means through which material to be cast is moved from the receptacle into the cavity by said plunger, and means for reciprocating said plunger, the assembly which comprises, a block with a first bore extending through it, means for positioning the block on the stationary die part with its main bore in communication with the cavity exhaust conduit outlet, a branch bore extending from said main bore to a point outside the block, a slideway adapted to be mounted on the frame of said machine with its forward end extending over the main bore in said block and having a port in its wall aligned with said main bore, a valve plunger the lower end of which extends into said main bore and the upper end of which extends through said port into said slideway, a slide reciprocable in said slideway and having a horizontally bifurcated forward end, a longitudinal slot in the lower arm of the bifurcated end through which the upper end of said valve plunger extends, and pin means projecting laterally from the upper end of said valve plunger into the slots defined by and between the bifurcated upper and lower arms of the slide, said slots including an intermediate inclined portion, sloping from the front to rear, and means for interconnecting said slide and the die charging plunger including lost motion linkage such that after the die charging plunger moves forward a predetermined distance the slide is moved forwardly in said slideway thus causing the valve plunger to move downwardly as its said pin means ride down on the inclined portion of said slots, thereby closing said branch bore in said block.

3. An attachment for die casting machines of the kind having, a stationary die plate and an opposed movable die plate which when closed together define a die cavity, an exhaust conduit leading from the die cavity to the exterior surface of the die assembly, a receptacle for material to be cast, conduit means between the receptacle and the die cavity, a reciprocating die charging plunger, and means for reciprocating said plunger means, which attachment comprises, a tubular slideway adapted to be mounted on a flat surface of the frame of a die casting machine of the said kind with one end projecting beyond the frame over the exhaust conduit outlet, said slideway being cut away on top for a distance adjoining its forward end and having an aperture through its bottom wall opposite the said cut-out, a valve block having a passage extending through it, said block being adapted to be positioned on one of said die plates with its said passage communicating with the exhaust conduit outlet and also aligned with the said aperture in the slideway, a branch passage leading through the block from said passage to a point outside said block, a slide having, a body portion adapted to reciprocate within said slideway, a forward portion parallel with the body portion but offset with respect to the body portion, and an inclined interconnecting portion, the front end of said slide being slotted with a plurality of longitudinal slots spaced apart around the slide by a rotary angle of 90°, a valve plunger the lower end of which extends into and is reciprocable in the passage in the block and the upper end of which extends through the said aperture in said slideway and through one of said slots in the slide member and has cam follower pin means projecting radially into other of said slot means which has an intermediate inclined portion between two end portions, and means including lost motion linkage for connecting the slide to the die charging plunger for movement with said plunger, the amount of inclination of said interconnecting portion of the slot means being sufficient to cause the lower end of the plunger to move downwardly within said passage sufficiently to close off said branch passage as the slide moves forward with said die charging plunger

and after the plunger has moved forward independently the distance permitted by said lost motion linkage.

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