March 3, 1942. N. LESTER 2,274,800

PRESSURE CASTING MACHINE NOZZLE SHUT-OFF

Filed Jan. 4, 1938 2 Sheets-Sheet 1

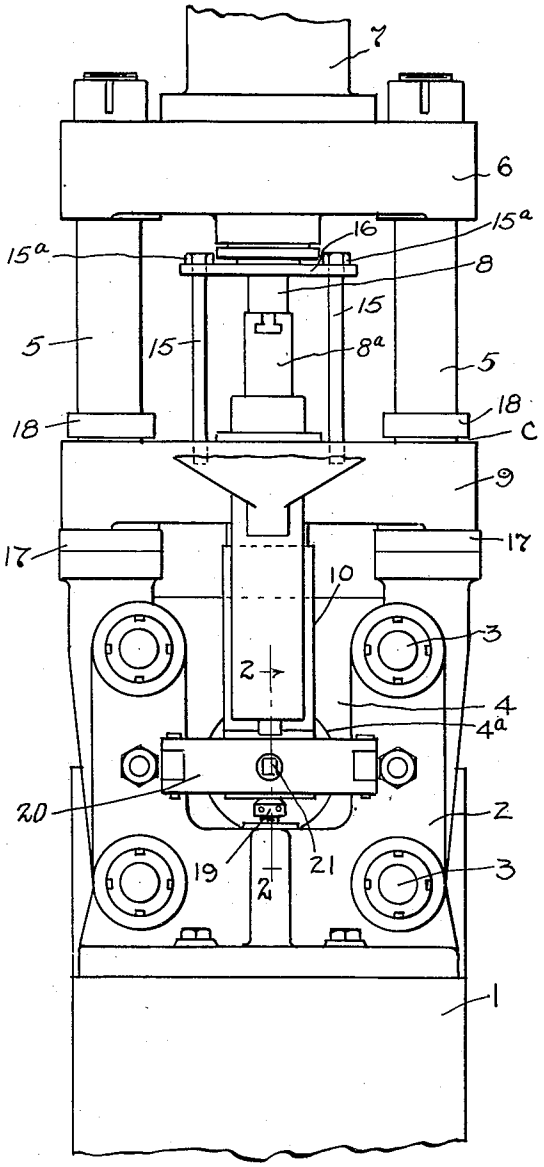



Fig. 1.

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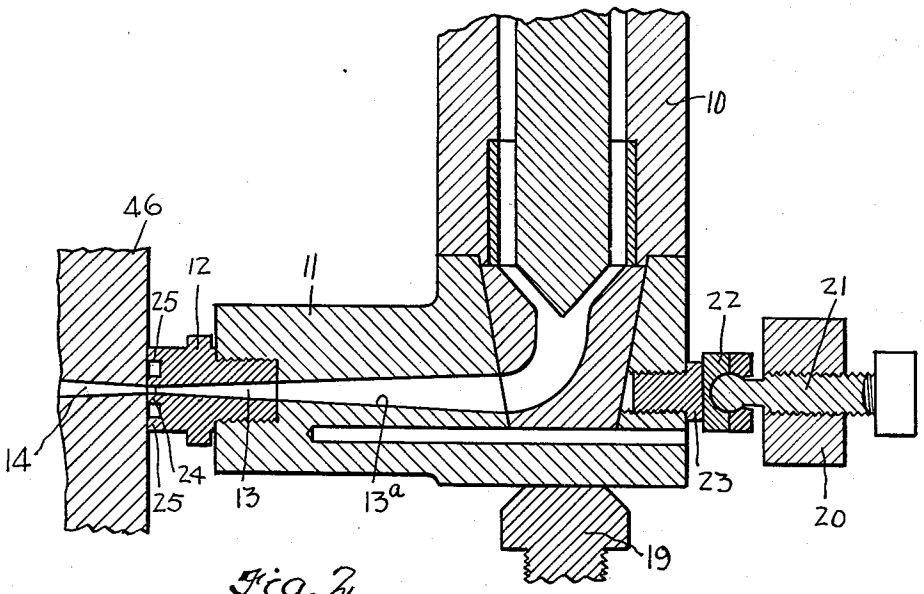



Fig. 2

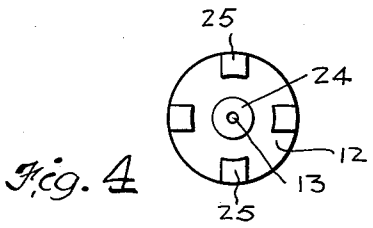



Fig. 4

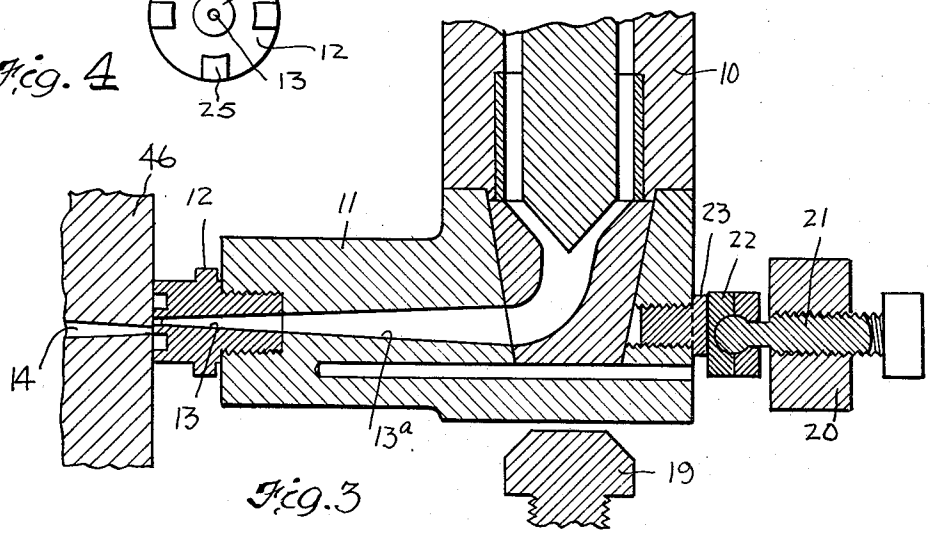



Fig. 3

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# UNITED STATES PATENT OFFICE

2,274,800

## PRESSURE CASTING MACHINE NOZZLE SHUT-OFF

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Application January 4, 1938, Serial No. 183,335

4 Claims. (Cl. 18—30)

The present invention relates to the novel means for valving, or alternately opening and closing the communication passage between the injection nozzle of a pressure casting machine and the die cavity or mold. The invention also includes in combination, means for automatically operating such injection nozzle shut-off means in timed sequence with the operation of the material casting or injection means.

In a pressure casting machine, whether adapted for the casting of a metallic material, such as non-ferrous alloys, or a non-metallic material such as plastics, there exists an excess amount of material which remains in the communicating passage between the die cavity and the pressure casting means or casting cylinder after each casting or "shot" is made. The gate and sprue of the die cavity, usually located in one of the die blocks, and the injection nozzle form this communicating passageway. When the die cavity is opened, by moving apart the die blocks, for the purpose of ejecting the casting from the machine, a portion of the material in this passageway, being solidified, will be removed with the casting; but another portion of the material in this passageway, not being of a solidified nature, but usually in a liquid or semi-plastic form, due to the higher temperature of the surrounding walls of the passageway, will leak out or tend to run into the occupied portions of the die cavity end of the gate. Such "leaking" material will then tend to cool off or solidify and thereby interfere with the uniformity and desired structure of the next casting. Since the line of demarcation between the solidified material and the non-solidified material usually occurs at the point where the injection nozzle contacts the outer wall of the die block, viz., the sprue or gate opening, my invention provides means for closing off the injection nozzle passage at such point, thus preventing the possibility of any leakage or running out of the material contained therein and remaining "between shots" or subsequent to the making of one casting and prior to the making of the next.

Briefly outlined, my invention for accomplishing the above stated result, consists in providing a flat, or plane surface joint between the end of the injection nozzle and the exterior wall of the die block adjacent the gate opening, and means for moving the injection nozzle laterally, so that the communicating passageway between the nozzle and the die cavity is opened and closed, much in the manner of a slide valve. By connecting such lateral movement of the injection nozzle, with the movement of the injection plunger, it is possible automatically to time the opening and closing of this passageway, in coordination with the opening and closing of the die blocks.

To the accomplishment of the foregoing and related ends, said invention, then, consists of means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is an end elevational view of a pressure casting machine to which my present invention has been adapted; Fig. 2 is an enlarged detailed cross-sectional view taken upon a plane normal to Fig. 1 and substantially along the line 2—2 thereof; Fig. 3 is a view similar to that of Fig. 2, but showing the injection nozzle in closed or shut-off position; and Fig. 4 is an exterior view of the end of the nozzle.

Now referring more particularly to the drawings, I have shown my invention as applied to a type of pressure casting machine such as more fully illustrated and described in my co-pending application Serial No. 174,175, filed Nov. 12, 1937. The pertinent parts of such a machine, for the purpose of describing the present invention, consist of the base 1 mounting the vertical end member or tie plate 2, which in turn carries the horizontal tie rods 3. The die plates are carried by the tie rods 3 and only one of them, viz., the fixed die plate 4 is shown in Fig. 1. The die plate 4 has an opening 4a through which the injection nozzle (subsequently to be described) extends and communicates with the die block 4b.

A pair of vertical frame members or supporting bars 5 extend upwardly from the end member 2 and carry the tie plate 6 which in turn mounts a hydraulic pressure cylinder 7. The piston rod 8 of the hydraulic cylinder 7 is connected to the casting plunger 8a, and for the purpose of the present invention the piston rod 8 and the plunger 8a can be considered as a single unit, namely, the pressure casting plunger. A second tie plate 9 is movably mounted upon the vertical supporting members 5 and carries the "injection assembly" consisting of the material casting or injection cylinder 10 and the injection nozzle body 11. The end of the injection nozzle is in the form of a removable tip 12 which has a passageway forming a part of the passageway 13a of the nozzle body 11. As shown in Fig. 2, the passageway 13 communicates with the gate 14 in the die block 4b.

A pair of connecting rods 15 connect the movable tie plate 9 with the plate 16 carried by the hydraulic piston rod 8. The plate 16 is slidable upon the connecting rods 15, and its movement with respect thereto is limited only by the nuts or heads 15a on the upper end of the rods 15. Thus, there is a lost motion connection between

the movable tie plate 9 and the piston rod or plunger 8.

Fixed collars 17 and 18 are provided upon the supporting bars 5 at either side of the movable tie plate 9 and are spaced apart a slightly greater distance than the width of the tie plate 9, thus leaving a clearance space C through which the tie plate 9 is permitted to move.

An adjustable screw jack 19 is mounted in the end member 2 and normally bears against the under side of the nozzle body 11, as shown in Figs. 1 and 2. The adjustment of the screw jack 19 pre-locates the nozzle body and the remainder of the injection assembly, consisting of the tie plate 9 and the cylinder 10, with respect to the die block 4b.

A hinge plate 20 carries an adjusting screw 21 which in turn has the block 22 mounted on its inner end by means of a ball and socket joint. The block 22 slidably bears against the head 23 of a bearing screw mounted in the nozzle body 11. Adjustment of the screw 21 determines the position and tightness of the fit of the nozzle tip 12 against the surface of the die block 4b.

The end of the nozzle tip 12 consists of the annular flat surface 24 surrounding the interior passage 13 and the radially and circumferentially spaced apart legs 25. The latter serve as means for properly maintaining the space 24 in planular alignment with the surface of the die block 4b and prevent any rocking motion between the nozzle tip 12 and the surface of the die block 4b which would disturb a tight and proper sealed fit between such surfaces.

The operation of the above described apparatus is as follows:

At the beginning of the casting operation, the parts are in the position as shown in Figs. 1 and 2, at which time the piston 8 and the plunger 8a travel in a downward direction on the casting or injection stroke, thus forcing the material out of the cylinder 10, through the passages 13a, 13 and 14, into the die cavity (not shown). The piston 8 and plunger 8a next start on their return stroke in an upward direction, and as they near the end of their stroke, the plate 16 bears against the connecting rod heads 15a, and through the connecting rods 15 raises the tie plate 9 up against the collars 18 and thus moves the injection assembly including the cylinder 10 and the nozzle 11 to the position as shown in Fig. 3 where the passage 13 is out of registry with the passage or gate 14, thus closing off the injection nozzle from communication with the gate and the die cavity.

At this time, as is customary in pressure casting machine operations, the die blocks are opened and the casting ejected or removed. The machine is then ready to make another casting, and as the piston 8 and plunger 8a begin on their downward stroke, the plate 16 is accordingly moved downwardly slightly and through the connecting rods 15, and permits the tie plate 9 and the injection assembly, including the injection nozzle body 11 and nozzle tie 12 to re-assume the position as shown in Fig. 2.

The material which has been retained in the nozzle passages 13 and 13a, due to the relatively high temperatures existent in these passages, will be in substantially the same condition as the new material which has been delivered to the machine and forced down through the casting cylinder 10, so that the structure of the resultant casting is of a uniform nature.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a pressure casting machine including a die block having a gate opening, the combination of a flat surface on said block adjacent said gate opening, a material injecting cylinder and plunger therein, a nozzle leading from said cylinder and having a flat end surface abutting said first-named flat surface, said cylinder, plunger and nozzle being movable as a unit in a direction laterally of said die block, and lost motion means connecting said nozzle to said plunger so arranged as to move said nozzle across the surface of said block upon movement of said plunger at the beginning of its casting stroke and at the end of its return stroke.

2. In a pressure casting machine, the combination of a die block having a gate opening in one surface, a frame and a cylinder supported on said frame, a material injecting plunger movable in said cylinder, a nozzle fixedly assembled with and leading from said cylinder and contacting said die block surface, said cylinder and nozzle assembly being movably mounted on said frame so that said nozzle is laterally movable into and out of registry with said gate opening, means on said frame for limiting the amount of movement of said cylinder and nozzle assembly, and lost motion means connecting said cylinder and nozzle assembly to said plunger.

3. In a pressure casting machine, the combination of a die block having a gate opening in one surface, a frame and a cylinder supported on said frame in a plane parallel to said die block surface, a nozzle fixedly assembled with and leading from said cylinder at right angles thereto so that its end abuts said die block surface, a material injecting plunger supported by said frame and movable in said cylinder, said cylinder and nozzle assembly being movably mounted on said frame so that said nozzle end is movable into and out of registry with said gate opening, means on said frame for limiting the amount of movement of said cylinder and nozzle assembly, and lost motion means connecting said cylinder and nozzle assembly to said plunger.

4. In a pressure casting machine, the combination of a die block having a gate opening in a flat exterior surface, a frame and a cylinder supported on said frame in a plane parallel to said die block surface, a nozzle fixedly assembled with and leading from said cylinder at right angles thereto, the end of said nozzle having a flat surface abutting against said die block surface, a material injecting plunger supported by said frame and movable in said cylinder, said cylinder and nozzle assembly being movably mounted on said frame so that said nozzle end is movable into and out of registry with said gate opening, means on said frame for limiting the amount of movement of said cylinder and nozzle assembly, lost motion means connecting said cylinder and nozzle assembly to said plunger, and slidable means for holding said nozzle end in abutting relationship against said die block surface.

NATHAN LESTER.