Feb. 17, 1970 G. PERRELLA 3,495,650

DIE CASTING MACHINE WITH TRIMMER

Filed May 3, 1967 5 Sheets-Sheet 1

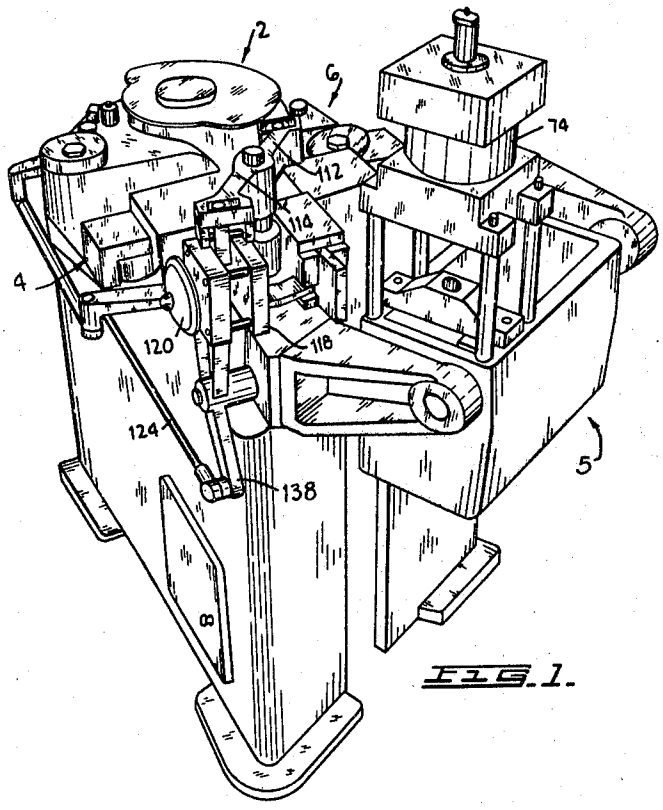


FIG. 1.

Inventor
Guido Perrella
By Cushman, Darby & Cushman
Attorneys

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DIE CASTING MACHINE WITH TRIMMER

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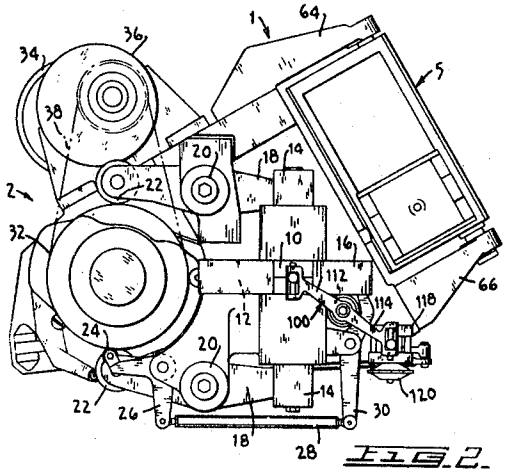


FIG. 2.

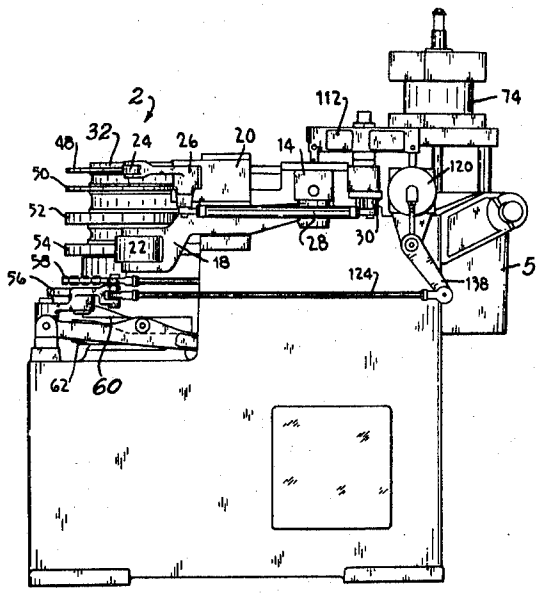


FIG. 3.

Inventor
Guido Perrella
By Cushman, Darby & Cushman
Attorneys

Feb. 17, 1970 G. PERRELLA 3,495,650

DIE CASTING MACHINE WITH TRIMMER

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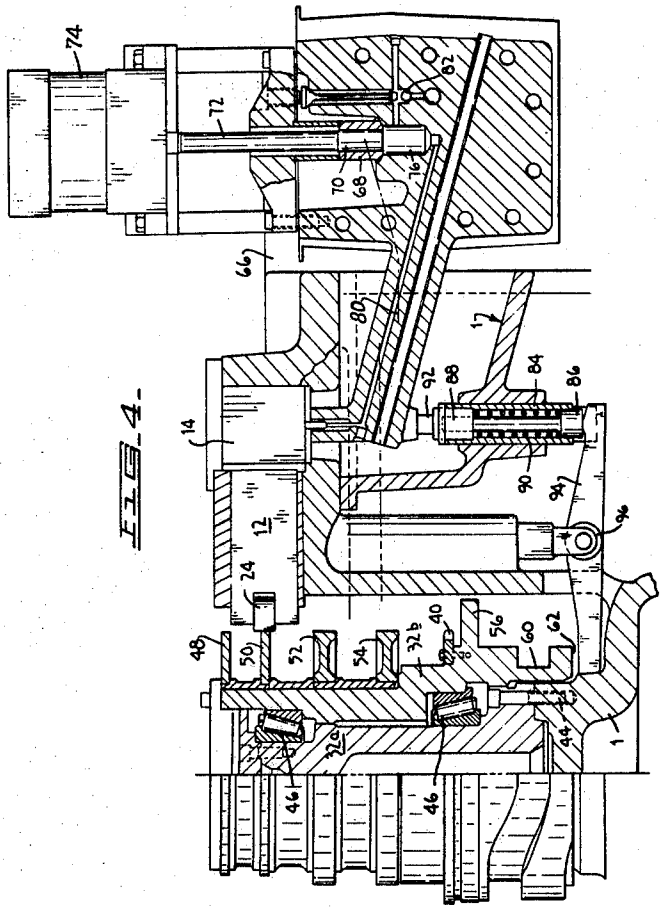


FIG. 4.

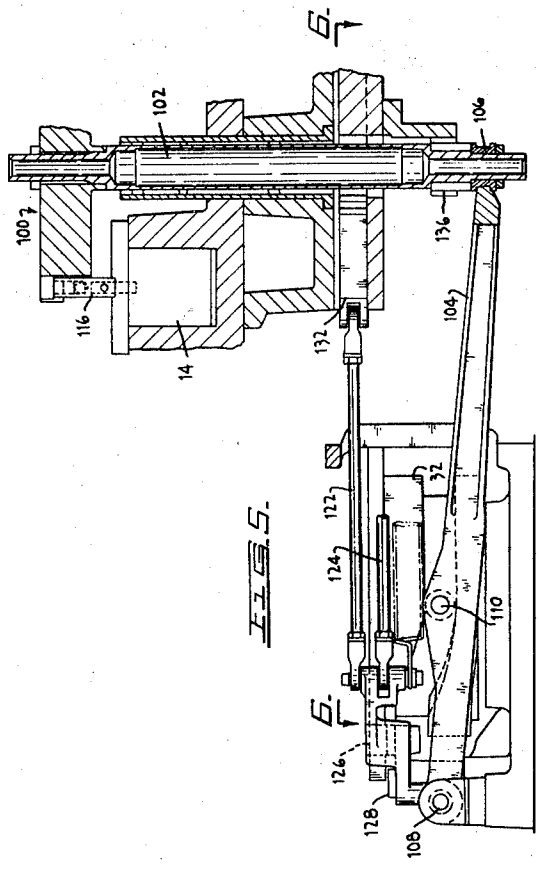
Inventor
Guido Perrella
By Cushman, Darby & Cushman
Attorneys

Feb. 17, 1970 G. PERRELLA 3,495,650

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FIG. 5.



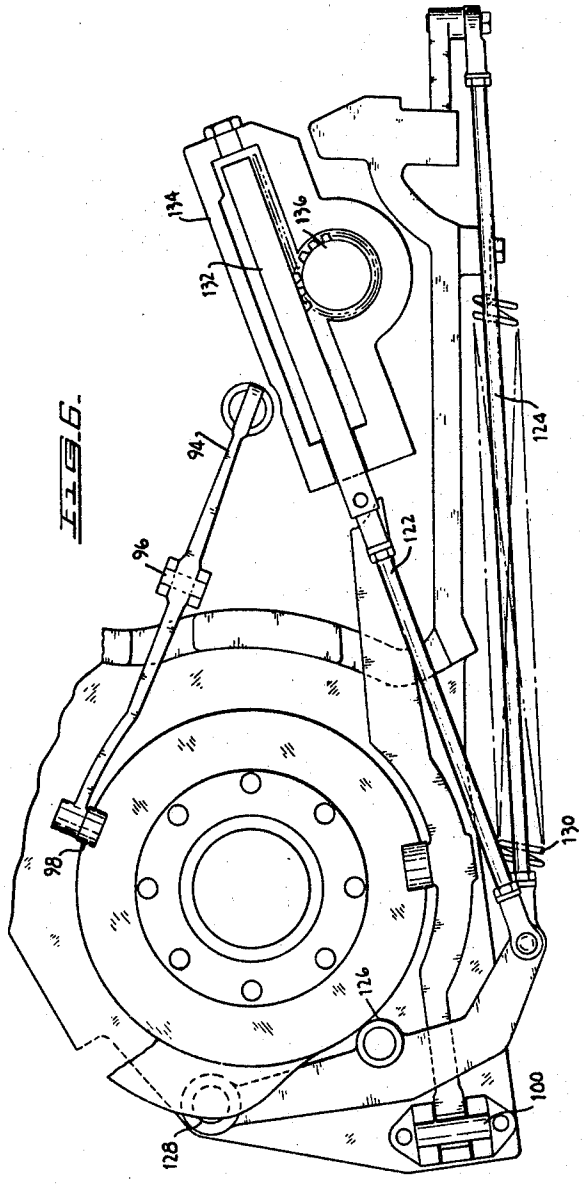
Inventor
Guido Perrella
By Cushman, Darby & Cushman
Attorneys

Feb. 17, 1970 G. PERRELLA 3,495,650

DIE CASTING MACHINE WITH TRIMMER

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FIG. 6.



Inventor
Guido Perrella
By Cushman, Darby & Cushman
Attorneys

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3,495,650

DIE CASTING MACHINE WITH TRIMMER

Guido Perrella, Montreal, Quebec, Canada, assignor to Dynacast Limited, Montreal, Quebec, Canada

Filed May 3, 1967, Ser. No. 635,860
Claims priority, application Canada, Feb. 14, 1967, 982,860
Int. Cl. B22d 17/00
U.S. Cl. 164—262 3 Claims

ABSTRACT OF THE DISCLOSURE

A die casting machine having a valve structure integrated with the zinc furnace or pot and being mechanically operated by a rocker arm and cam lobe system. The machine includes a trimming device that consists of a second pair of dies that operate on the casting after it is removed from the forming dies so as to remove any flashing from the casting. This obviates the necessity of tumble trimming and similar operations.

This invention relates to die casting machines and in particular to a die casting machine that is both mechanically operated and which includes means for trimming flashing and sprue from a cast piece, such trimming being effected during the operation of the machine.

The trimming of die castings, especially precision castings, is normally a subsequent and costly operation of the die casting process. With miniature or sub-miniature castings especially, trimming is a costly step inasmuch as such castings are made in relatively high numbers and the trimming normally has been carried out with a barrel tumbling type of operation to remove gates and like flashing. The material removed is then remelted for recasting.

The object of the present invention is to provide a die casting machine incorporating an operative trimming element in its structure and which is actuated from the same drive means that actuates the other elements of the die casting machine. In effect, the machine includes two sets of dies, one for casting and one for trimming. In accordance with the invention then, a die casting machine comprises a frame, means for supporting and guiding dies and cores on the frame and a pot pivotally secured to the frame. There is also provided means for injecting a casting metal such as zinc into the dies, with the injection means being integrally formed with the pot. Finally, there is also provided trimming means for displacing a casting from the dies and then removing flashing and the like from that casting. The apparatus includes drive mechanism for actuating the dies and cores, pivoting the pot and its injection means into operative engagement with the dies, and operating the trimming means.

The invention will now be described by way of example with reference to the accompanying drawings wherein:

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

FIGURE 2 is a plan view of the machine shown in FIGURE 1;

FIGURE 3 is a side elevation view of the machine of FIGURES 1 and 2;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary, sectional view of the trimming mechanism shown in full elevation in FIGURE 3; and

FIGURE 6 is a sectional view of the trimming mechanism taken along the line 6—6 of FIGURE 5.

Referring to FIGURE 1, the die casting machine comprises drive means generally illustrated at 2; a die and

core arrangement at 4; a combined pot and injection system shown at 5; and a trimming device generally indicated at 6. Shown in FIGURE 2, the machine includes a frame 1 supporting a pair of dies 10 and cores 12. Dies 10 and cores 12 are secured to their respective shanks 14 and 16, respectively. The dies 10 are brought into face-to-face engagement with one another by means of rocker arms 18 pivotally connected to the frame 1 as at 20 and operated by the drive means 2 through cam followers 22. Similarly, the cores 12 are operated vie cam followers 24, one of the cores being remote from the drive means 2 and being actuated through the intermediary of a bell crank 26 and connecting rods 28 and 30. The drive means, in this case a rotated cam shaft, actuates the dies and cores by means of cam lobes to bring the members into engagement with one another and the followers such as 22 and 24 are maintained in contact with their respective lobes by means of springs, not shown.

DRIVE MEANS

Referring to FIGURES 3 and 4, the drive means comprises a cam shaft 32 having a plurality of lobes thereon, with the lobes driving all elements of the die casting machine. The cam shaft 32 is rotated, for example, from electric motor 34 (FIGURE 2) through a reduction gear box 36, chain 38 and sprocket 40 illustrated in section in FIGURE 4. The cam shaft 32 as shown in FIGURE 4 comprises two main sections, an inner stationary member 32*a* which is secured by cap screws 44 to the frame member 1 and an outer portion 32*b*. The outer portion is rotatable with respect to the inner portion and the mounting between the two portions is effected by roller bearings 46.

As shown in FIGURES 3 and 4, the shaft 32 carries two upper lobes 48 and 50 which operate the cores 12 of the machine. The next lowermost lobes 52 and 54 are adapted to operate the dies 10 through the rollers 22 and rocker arms 18. Following on down on the cam shaft, the chain sprocket 40 is then secured to a flange portion of the shaft and this is adjacent to a further lobe 56 for operating one portion of the trimmer mechanism to be described further on in the specification. All of the above-mentioned lobes are situated transverse to the rotational axis of the cam shaft and these are followed by a first cam slot 60 which operates a further portion of the trimmer mechanism and lastly, a surface lobe 62 for actuating the means to pivot the pot and injector mechanism 5.

POT AND INJECTION SYSTEM

As shown in FIGURE 2, the pot 5 is suspended by and pivoted from two arms 64 and 65. Turning to FIGURE 4, the pot includes an injection system comprising a sleeve 68 having a piston 70 slidable therein by means of a connecting rod 72 that is actuated in a vertical manner by an air cylinder or the like 74. The lower end of the piston 70 terminates at a compression chamber 76 which is interconnected to a nozlle 78 by means of a conduit 80. The inflow of molten zinc from the pot into the chamber 76 is governed by a single ball valve 82 as shown or by a valve system of the type shown in copending application Ser. No. 682,146 filed Nov. 13, 1967. The nozzle 78 is brought into and out of engagement with a channel (not shown) in the dies 10 by means of a rocker shaft connected operatively to the cam shaft 32.

The frame 1 of the machine is provided adjacent the nozzle portion of the pot with a sleeve type bushing 84 which contains a bolt and socket 86 and 88, respectively, the bolt being maintained away from the socket by means of a spring 90. The upper end of the socket bears against a buffer 92 adjacent the nozzle 78. The head of the bolt 86 bears against one end of a rocker 94 that is pivoted

about a point **96**, the operative end of the rocker **94** being held in engagement with the lobe surface **62** of the cam shaft. See FIGURE 6. The surface **62** of the cam is engaged by a roller **98** on the end of the rocker **94**. It will be appreciated that as the operative end or the roller **98** of the rocker shaft **94** is moved downwardly by the cam surface **62**, the opposite end will be moved upwardly against the bolt head **86** to therefore push upwardly on the buffer **92** and bring the nozzle **78** into engagement with dies for an injection of zinc therein.

TRIMMING DEVICE

Turning to FIGURE 5, the trimming device **6** shown generally in FIGURE 1 includes a T-shaped cross head **100** secured to a vertically slidable post **102** mounted in the frame of the machine. The lower end of post **102** is connected to an actuating arm **104** by means of a yoke **106**. The other end of arm **104** is pivotally secured at **108** to the machine frame adjacent the base of the cam shaft **32** and intermediate the length of the arm **104** there is provided a roll-type follower **110** which runs into the cam groove **60** shown in FIGURE 4. It will be obvious from FIGURE 5 that as the cam **32** rotates and the follower **110** travels within the groove **60** the post **102** will be raised up and down in a vertical orientation by the arm **104**.

It will be appreciated from FIGURES 5 and 2 that the cross head **100** includes a pair of diametrically opposed arms **112** and **114** each supporting a gripping member **116** which is adapted to be connected to the casting between the two dies through the means of a gate in the die face. While arm **112** and its gripping member **116** is in such a position, for example that shown in FIGURE 2, its opposing arm **114** having an identical gripper **116** is disposed between a pair of identical dies **118** which are adapted to remove any flashing and sprue from the casting by being actuated through a pneumatic device **120**. After an injection is made, the post **102** is raised up, the arms **112** and **114** are moved 180° so that the casting is dropped downwardly into position and the dies **118** are then brought over the casting and the actuation of the device **120** trims the casting.

In addition to the arm **104** for raising and lowering of the post **102**, there is also provided a first arm **122** for turning the cross head 180° and a second arm **124** which pivots the dies **118** and vacuum **120** from inoperative to operative positions as shown in FIGURE 2. The arms **122** and **124** have a common connection to a cam follower **126** which is pivoted to the frame of the machine at **128**. Cam follower **126** is maintained in contact with its associated cam lobe **56** (FIGURE 3) by a spring **130**. FIGURES 5 and 6 show that arm **122** is connected at its end remote from the follower **126** to a rack **132** which is slidably mounted in a sleeve **134**. A pinion gear **136** is provided on the lower end of the post **102** and slidably mounted thereon. It will be appreciated that when the arm **104** is actuated to a raising position by the follower **110** and the cam groove **60**, the yoke **106** and the adjacent pinion gear **136** will be raised upwardly till the pinion engages or is in a position to be engaged by the rack **132**. Subsequently, the cam follower **126** is engaged by its associated lobe **56** to draw on the arm **122** and thereby rotate the pinion **136** by drawing outwardly on the rack resulting in turning of the post **102**, 180°. This is subsequent to the operation of the post **102**, its cross head **106** and the gripper **116** being raised upwardly. As shown in FIGURE 3, arm **124** is connected to a pivoting arm **138** which is adapted to swing the pneumatic device **120** and its associated dies **118** to the inoperative position shown in FIGURE 2.

OPERATIONAL SEQUENCE

In operation, actuation of the drive means **34**, through the working of the chain **38** and sprocket **40**, brings the dies **14** in engagement with one another and, if utilized, the cores **12**. This is effected through the action of the rocker arms **18** and their associated roller type followers **22** acting on the cam lobes **52** and **54**. At this position, the trimming device **6** is in the position shown in FIGURE 2 with the gripper on one of the arms **112** in position over the dies and in communication with the cavity therein. Further rotation of the cam shaft brings the pot into operative position through the arrangement of the cam lobe **62**, arm **94** and nozzle **78**. An injection is then made by means of the pneumatic device **74** and piston **70** acting in the chamber **76**. The arm **94** is then pivoted so that the nozzle **78** is drawn away from the dies, the dies **14** and cores **12** are pulled apart by spring means (not shown), cam groove **60** actuates arm **104** to raise the post **102** and the cross head **100** thereby lifting the casting from the cavity of the dies and cam follower **126** actuates arms **122** and **124** to rotate the post **102** and the cross head arms **112** and **114**, 180° with respect to one another. These arms are then dropped downwardly as the cam follower **110** progresses along its groove **60** and the secondary dies **118** are then brought into operative position over the casting and actuated by the device **120**.

It will be appreciated that the apparatus of the present machine provides an economical manner of trimming castings inasmuch as such trimming is accomplished during the production of the casting itself and does not constitute a separate operation.

I claim:

1. A die casting machine comprising a frame; at least a pair of dies and means for supporting and guiding them on said frame; a pot for retaining a molten casting metal pivotally secured to said frame; means for injecting a portion of said casting metal from said pot into said dies, said injecting means being integrally formed with said pot; trimming means for removing a casting from the cavity of said dies and for removing flashing and the like from said casting; and a drive mechanism with

(a) means for actuating said dies to operative and inoperative positions,

(b) means for pivoting said pot and its associated injection means into operative and inoperative engagement with said dies, and

(c) means for operating said trimming means.

2. A die casting machine according to claim **1**, wherein said drive means comprises a shaft having a plurality of lobes and cam grooves thereon, a first pair of lobes adapted to actuate cores, a second pair of lobes being adapted to actuate said dies; a further lobe for actuating said trimming means; a first groove for actuating a portion of said trimming means and a second groove for pivoting said pot.

3. A die casting machine according to claim **2**, wherein the trimming device includes a post member mounted for vertical sliding movement in said frame, a cross head on the upper end of said post having a pair of arms with depending gripping members at each end of said arms; a yoke and actuating arm operating on the lower end of said post responsive to one of said cam grooves; and means for rotating said post in said frame whereby said gripping members are rotated 180° with respect to said post; and a pair of secondary dies mounted on said frame for removing flashing and the like from said castings.

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J. SPENCER OVERHOLSER, Primary Examiner

ROBERT D. BALDWIN, Assistant Examiner

U.S. Cl. X.R.

164—318, 340