

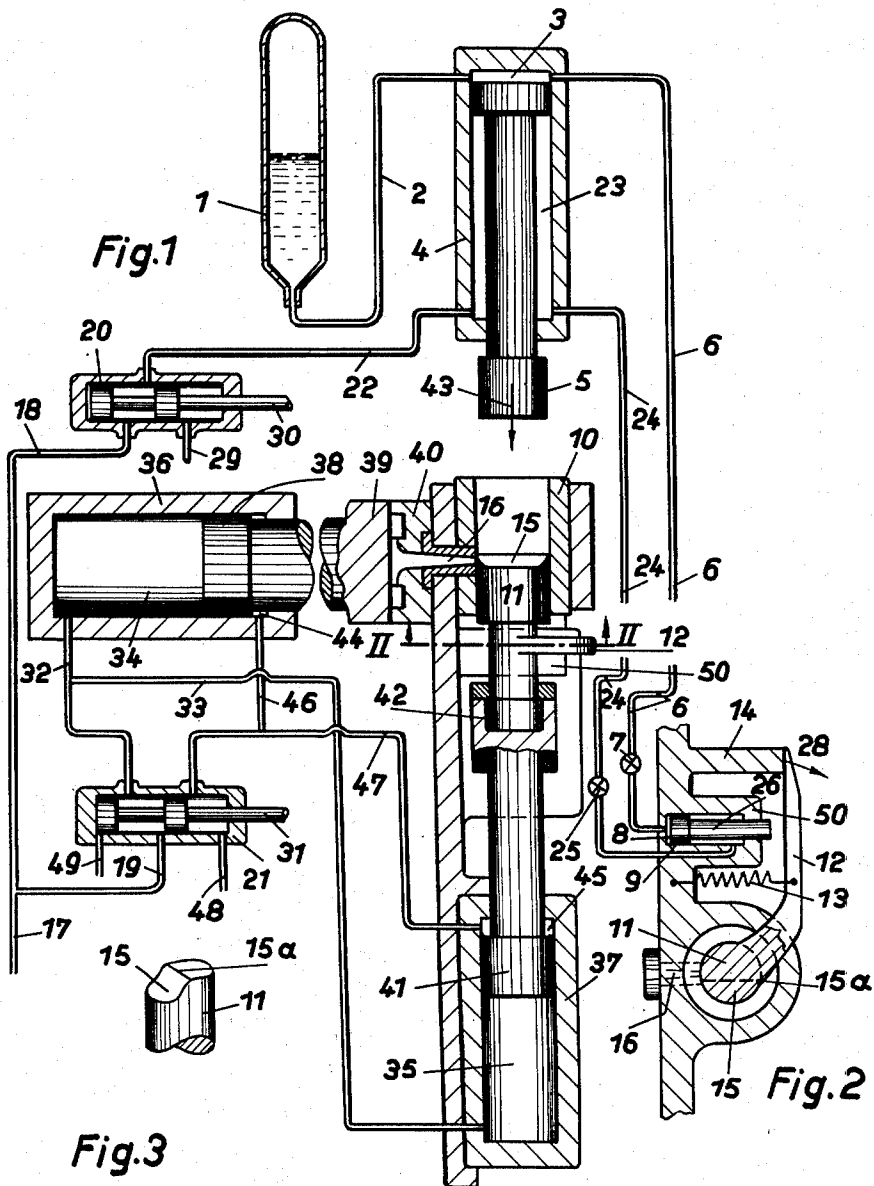
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W. VENUS

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DIE OR PRESS CASTING MACHINE

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Inventor
Wilibald Venus
By Young, Emery & Thompson
Attys.

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DIE OR PRESS CASTING MACHINE

Wilibald Venus, Munich, Germany, assignor to
Hahn & Kolb, Stuttgart-N, Germany

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For the processing of heavy and light metal alloys, press casting machines with unheated press chambers and press moulds attached laterally thereto are known, in which the press pistons serve as ejectors for the press residues and there are provided as the bases of the press chambers counter-pistons which act as control slides for the nozzle mouths leading to the press moulds.

In its inner end position (i. e., its end position located within the press chamber) the counter-piston of such a casting machine is held by a supporting spring, and the nozzle mouth is opened by the action of the press piston forcing the counter-piston downwards, by way of the casting material, against the action of the supporting spring. Here, however, considerable constructional difficulties are involved in causing the nozzle to be opened exactly at the right moment during the injection stroke.

Removable abutments are usually provided for the counter-piston, against which the piston bears during the injection stroke. Removal of these abutments, which must necessarily take place for ejecting the casting residue from the path of movement of the counter-piston, also involves great difficulty.

Further, machines are known in which the counter-piston is supported on the stationary base of the press chamber, and in which the nozzle-mouth is opened not by an axial movement of the counter-piston but by a rotary movement thereof. Here, however, the counter-piston serves as the ejector, and has to force the casting residue out upwardly through the press chamber along its entire filling height. The press chamber and the counter-piston are thereby subjected to heavy wear. In addition, a press chamber must necessarily be in the form of a cylinder open at one end only, which not only necessitates a difficult and expensive manufacture, but is also difficult of access when fitting or removing the counter-piston.

According to the present invention, there is provided a die or press casting machine including or comprising an unheated tubular press chamber, having one or more press moulds laterally connected thereto, a press piston also serving as the ejector for the press residue, and a counter-piston, which counter-piston forms the base of

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the tubular press chamber and acts as the control slide for one or more nozzle mouths leading to the press moulds when in its inner end position located within the press chamber, in which the counter-piston, in its said inner end position, may be protected against longitudinal displacement by controllable supporting means, but can be axially rotated in the manner of a rotary control slide for the purpose of opening the nozzle mouth and which is longitudinally displaceable in the direction of the press stroke into its outer end position only after the release of said supporting means.

In order to open the nozzle opening at the right moment, the rotary movement of the counter-piston is preferably positively coupled with the press stroke of the press piston in such a manner that this rotary movement occurs directly before the impinging of the press piston upon the casting material.

Particularly suitable as the controllable supporting means for the counter-piston is a hydraulic piston, which can be loaded against the direction of the press stroke in such a manner that it does not yield to the pressure exerted by the press piston on its press stroke, until termination of the casting process, and which is only displaced after the filling of the mould. This displacement is advantageously such that the counter-piston supported by the hydraulic piston can be displaced longitudinally in the direction of the press stroke into an extreme position located outside the press chamber.

Constructionally, it is expedient to connect the counter-piston with the hydraulic supporting piston so as to be capable of rotary or axial movement relative thereto and to have a hydraulic auxiliary piston acting on the counter-piston, which auxiliary piston is connected to the hydraulic network which operates the press piston and is adapted to axially rotate the counter-piston so as to open the nozzle mouth.

Where it is desired to govern the hydraulic pressure both to the press piston and to the auxiliary piston from one control in the simplest manner it is advantageous to install in that section of the pressure fluid pipe which leads to the auxiliary piston, a throttle which can be adjusted in such a way that the auxiliary piston rotates the counter-piston just before the press piston impinges upon the casting material.

The invention will be further described with reference to the accompanying drawings, in which—

Fig. 1 shows a vertical section through a press casting machine, according to the present invention, the details of the hydraulic plant being shown diagrammatically,

Fig. 2 is a horizontal section, substantially on the line II—II in Fig. 1, and

Fig. 3 is an oblique view of the head of a counter-piston for a press casting machine, according to the invention.

1 is a hydraulic pressure accumulator to the outlet of which is connected a pressure pipe 2 which leads to a working chamber 3 of a cylinder 4 in which may reciprocate a double-acting press piston 5. From the working chamber 3 a pipe 6 leads via an adjustable throttle 7 to a working chamber 8 of an auxiliary double-acting piston 9 reciprocable in a cylinder 10.

10 is a cylindrical press chamber and 11 is a counter-piston which forms the base of the press chamber 10. Projecting from the counter-piston 11 is a substantially radially outwardly directed lever 12 which, in the position shown, bears under the influence of a spring 13, against a stop 14. The lever 12 is located in the movement path of the auxiliary piston 9 when the counter-piston is at its upper end position as illustrated.

The head of the counter-piston 11 bears a recess 15, as can best be seen from Fig. 3. When the counter-piston 11 occupies its upper end position within the press chamber 10, the recess 15 is located at the same level as a nozzle mouth 16 (see Fig. 1). Nevertheless, in this position the recess 15 is not adjacent to the nozzle opening 16. This may be most clearly appreciated from Fig. 2 in which a dotted line 15a indicates the position of the recess 15. Connection between the nozzle mouth 16 and the recess 15 occurs only if the lever 12 is displaced in the arrow direction 28 against the action of the spring 13, and the counter-piston 11 is at its upper end position as shown.

17 is a hydraulic pressure pipe, the pressure in which is preferably produced, in known manner, by coupled low pressure and high pressure pumps. The high pressure pipe 17 leads via pipes 18, 19 to two control devices generally indicated at 20 and 21. In the drawing, the control device 20 is so adjusted that pressure fluid can pass via a pipe 22 to a return stroke chamber 23 of the cylinder 4 and from there via a pipe 24 and an adjustable throttle 25 to a return stroke chamber 26 of the auxiliary piston 9. Further, the pressure in the network 17, 18, 22, 23 and therefore the pressure on the return stroke face of the press piston 5, is so selected in relation to the pressure on opposite face of said piston that the press piston 5 must be displaced upwards, into the upper end position shown, against the pressure prevailing in the pressure accumulator 1, when slide 30 of the control device 20 has the position shown. If, on the contrary, the control slide 30 is moved to the right, the pressure supply to the return stroke chamber 23 is interrupted, and the return stroke chamber 23 is connected via the pipe 22 with a discharge pipe 29, at atmospheric pressure so that the press piston 5 can move downwards under pressure from the pressure accumulator 1 and thereby carry out its working or press stroke.

The other control device 21, in the position shown of its control slide 31, connects the pipe 75

19 with the pipes 32, 33 which lead to a working chamber 34 of a mould closing cylinder 36 and to the working chamber 35 of another cylinder 37. A mould closing piston 38 is disposed in the closing cylinder 36, and the shaft of this piston 38 carries a movable half 39 of a casting mould 39, 40. The stationary half 40 of the mould is laterally connected via the nozzle mouth 16 to the tubular press chamber 10. The right-hand end position shown of the closing piston 38 corresponds to the closed position of the casting mould 39, 40.

In a cylinder 37 there is disposed a supporting piston 41, onto the shaft of which is located at 42 the counter-piston 11, which is axially rotatable relative to the supporting piston but is not longitudinally displaceable relative thereto. The pressure which may be exerted from the high pressure pipe 17 in the working chamber 35 upon the comparatively large lower face of the supporting piston 41 is substantially greater than the pressure exerted from the pressure accumulator 1 upon the upper face press piston 5 in its press stroke direction 43.

The return stroke chambers 44, 45 for the return strokes of the two pistons 38, 41 are connected to the control device 21 by way of pipes 46, 47. In the position shown of the control slide 31 the return stroke chambers 44, 45 are in connection with a pressure-less discharge pipe 48. If the control slide 31 is moved to the right out of the position shown, the discharge pipe 48 is cut off. Further, the supply pipes 17, 19 for pressure fluid to the pipes 46, 47 is opened, and the work chambers 34, 35 of the closing cylinder 36 and of the supporting cylinder 37 are connected with a pressure-less liquid discharge pipe 49. In this case, the supporting piston 41 moves downwards and the closing piston 38 moves to the left. Here the return stroke faces in the annular return stroke chambers 44, 45 are so dimensioned in relation to the piston faces facing the working chambers 34, 35 that at first the supporting piston 41 performs its downward movement and only after that does the closing piston 38 perform its stroke movement to open the casting mould 39, 40.

The press casting machine, with its control devices 20, 21 is located in the position shown when molten casting material is charged into the press chamber 10. The counter-piston 11, which, in its upper end position, projects into the press chamber 10, cuts off in the manner of a rotary control slide the nozzle mouth 16 leading to the mould 39, 40.

After the casting material has been introduced, the slide 30 of the control device 20 is moved to the right. The pipe 22 is then connected with the discharge pipe 29 whereby relieving the pressure in the return stroke chamber 23, and also, by way of the throttle 25, relieving the pressure in the return stroke chamber 26 of the auxiliary piston 9. The pressure accumulator 1 is now able to move the press piston 5 downwards and also to move the auxiliary piston 9 to the right via the throttle 7. The throttle 7 is so proportioned or adjusted that the auxiliary piston 9 bears against the lever 12, and thereby rotates the counter-piston 11 in time relation to the working stroke of the press piston 5, such that the recess 15 abuts the nozzle mouth 16 shortly before the press piston 5 bears upon the casting material present in the press chamber 10. The press piston 5 now bears upon the casting material, without the latter

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having undergone excess cooling on the walls of the press chamber, and forces the material in its molten state through the nozzle mouth 16 into the casting mould 39, 40 which is kept firmly closed by the hydraulically loaded closing piston 38. During this press casting operation, the counter-piston 11 cannot yield downwards, because the force acting upwardly in the working chamber 35 upon the supporting piston 41 is substantially greater than the hydraulic and kinetic forces which act upon the press piston 5 in its movement in the direction 43 by pressure from the accumulator 1.

Now, as soon as the casting material in the mould 39, 40 has solidified, the control slide 31 of the control device 21 is automatically or manually displaced to the right so that the working chambers 34, 35 are connected by way of the pipes 32, 33 to the discharge pipe 49 and the return stroke chambers 44, 45 are connected to the high pressure pipe 17 via the pipes 46, 47. Due to suitable dimensioning of the piston faces in the chambers 35, 45 in relation to the piston faces in the chambers 34, 44, supporting piston 41 moves downwards first. The press piston 5 which bears on the casting residue follows the downward movement of the counter-piston 11, since it is still under pressure from the accumulator 1. In so doing, the disc-shaped casting residue, which has remained in the press chamber, is sheared from the metal residue which has solidified in the nozzle mouth. The piston 5 then continues its movement and comes to rest, according to the length of the return pressure chamber 23, shortly below the lower end of the press chamber 10. The supporting cylinder 37 is so dimensioned that when the supporting piston 41 is at its lower end position within said cylinder, there occurs a gap between the casting residue and one of the two pistons 5, 11, which makes it possible to remove the casting residue from the other piston in simple known manner.

In this position, the press chamber is open at both ends and easily accessible for cleaning.

As the casting residue no longer holds together the two pistons, 5, 11, the spring 13 pulls the lever 12 back against the stop 14. The counter-piston 11 and its control edge 15a therefore return to their original axial positions relative to the supporting piston 41.

After the supporting piston 41 has reached its lower end position within the cylinder 37, the pressure in the return stroke chamber 44 of the mould closing cylinder displaces the closing piston 38 to the left and thereby, opens the casting mould 39, 40. The control slide 30 is now returned to the position shown in the drawings, and pressure is introduced into the return stroke chamber 23. The press piston 5 moves upwards into the top initial position shown, against the weaker pressure exerted on it by the accumulator 1. Pressure is also transmitted into the return stroke chamber 26 of the auxiliary piston 9 by way of the pipe 24 and the throttle 25. By this means, the auxiliary piston 9 is moved back into its initial position, also against the pressure exerted by the accumulator 1.

Now after the work piece, together with the metal residue lodged in the nozzle spring 16, is removed from the casting mould 39, 40, the control slide 31, of the control device 21, is returned to the position shown. By this means, pressure is again introduced into the working chambers 34, 35 whilst the pressure in the return stroke

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chambers 44, 45 is relieved via the pipes 46, 47, 48. The mould 39, 40 now closes under the pressure in the working chamber 34 and the counter-piston 11 moves under the pressure in the working chamber 35 into its upper end position, so that its head is located within the press chamber 10. This position is shown in the drawings. The lever 12 here moves upwards with the piston, and is held by the action of the spring 13 against the stop 14. The auxiliary piston 9 is already in its left hand end position, so the movement of the lever is not hindered thereby.

As soon as the counter-piston 11 has reached the inner end position shown, the machine is again ready for casting, and the cycle of operations described can be repeated.

It may be seen from the construction described, that the casting residue is ejected from the press chamber by the shortest route and with the minimum of friction and at the same time, the movement which leads to the release of the nozzle opening is derived in simple, reliable manner from the driving network of the machine without having to revert to movement of a closing organ in the manner of a rotary or slide control by resilient means, itself disposed within the filling chamber which method, as practical experience shows, is uncertain in operation.

I claim:

1. A die or press casting machine, comprising an unheated open-ended cylindrical press chamber, at least one mold laterally connected thereto, a press piston and cylinder, a counter-piston reciprocating within the press chamber, said pistons being adapted to extend from opposite ends into said press chamber, means including a supporting piston connected to the counter-piston to axially adjust the counter-piston in two opposite end positions, in the lower position of which the counter-piston will be clear of the press chamber and permit the press piston to follow it below the press chamber and thereby to act as a casting material residue ejector, the upper end position being such as to form the bottom of the press chamber, the upper end of the counter-piston having at least one lateral recess therein, and means connected to the press piston cylinder for rotating the counter-piston in its upper end position to bring the recess into alignment with the respective mold in which position of the recess the press piston may effect an injection of casting material from the press chamber into said mold, said last-mentioned means including an auxiliary piston engaged in dependence of the working stroke of the press piston to effect an axial rotation of the counter-piston by engaging an outward extending arm of said counter-piston.

2. A die or press casting machine, comprising an unheated open-ended cylindrical press chamber, at least one mold laterally connected thereto, a press piston and cylinder, a counter-piston reciprocating with the press chamber, said pistons being adapted to extend from opposite ends into said press chamber, means including a supporting piston connected to the counter-piston to axially adjust the counter-piston in two opposite end positions, in the lower position of which the counter-piston will be clear of the press chamber and permit the press piston to follow it below the press chamber and thereby to act as a casting material residue ejector, the upper end position being such as to form the bottom of the press chamber, the upper end of the counter-piston having at least one lateral recess therein, and means connected to the press piston cylinder for

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rotating the counter-piston in its upper end position to bring the recess into alignment with the respective mold in which position of the recess the press piston may effect an injection of casting material from the press chamber into said mold, said last-mentioned means including an auxiliary piston and cylinder in pipe communication with the press piston cylinder and throttle means in the pipe communication connected to control the auxiliary piston with respect to the press piston.

WILIBALD VENUS.

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