July 27, 1948. R. BOURRET ET AL 2,445,995

AUTOMATIC DIE CASTING MACHINE

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Fig.1

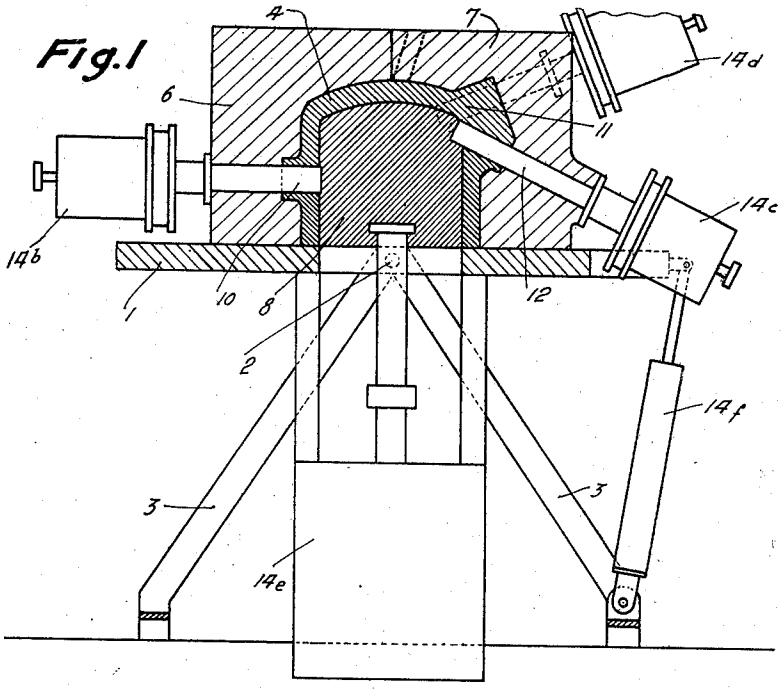

Fig.2

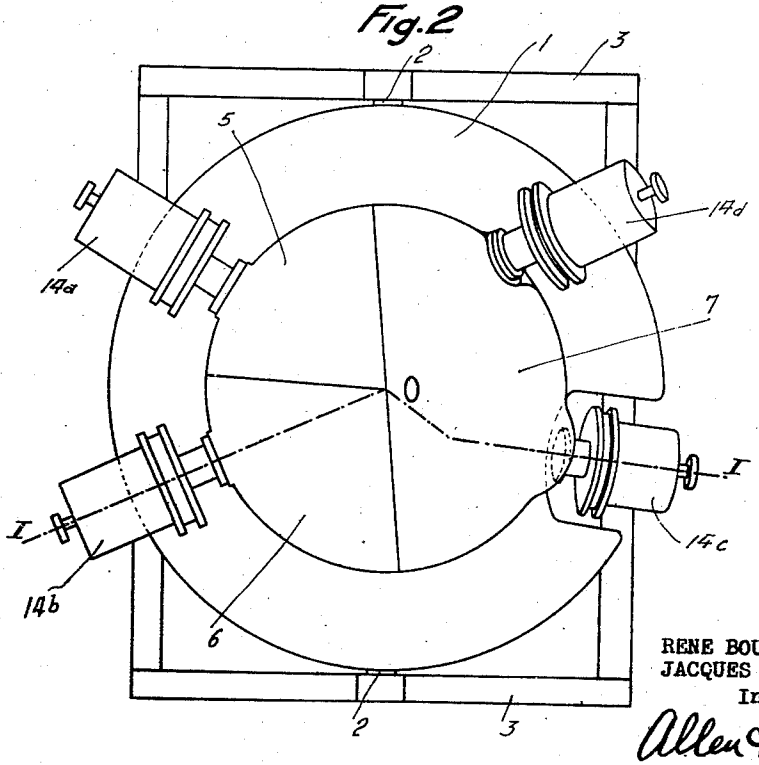

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Fig. 3

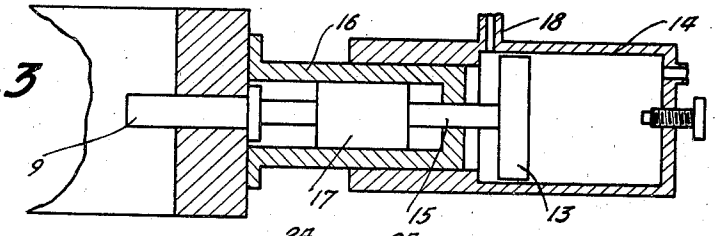


Fig. 4

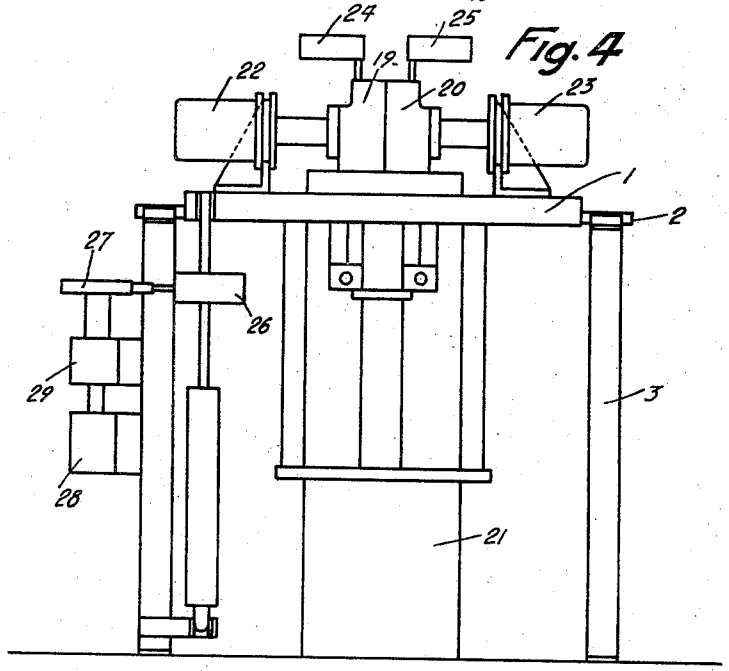
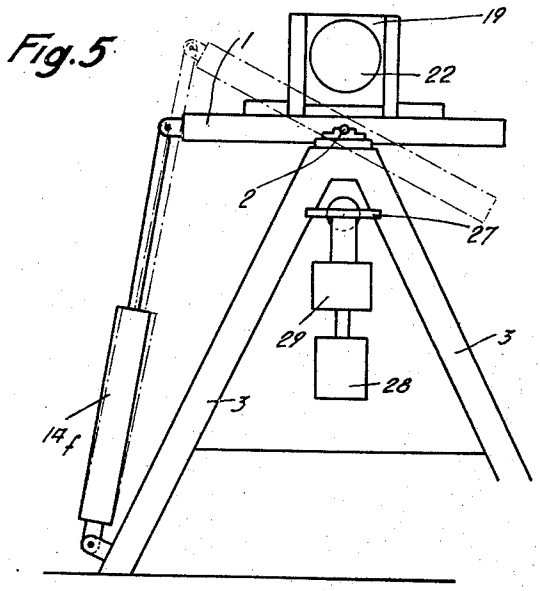


Fig. 5



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UNITED STATES PATENT OFFICE

2,445,995

AUTOMATIC DIE CASTING MACHINE

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In France November 7, 1945

1 Claim. (Cl. 22—92)

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In operations for casting metal pieces and, more particularly, in operations for die casting it is essential that the extraction of the cores be effected according to a fixed time schedule for each shape of casting, in order to avoid certain casting accidents due to shrinking phenomena. It has been proposed to make this schedule of extraction more precise by putting at the disposal of the foundry workman an apparatus which, through emitting a series of signals spaced in a predetermined manner, indicates the moments at which he is to remove each core or spindle and separate the die elements.

The present invention has for its object to provide a machine which does away with the inconveniences which the intervention of the personal coefficient of the operator may offer, by ensuring the operations of core extraction and the removal of the casting from the die in an entirely automatic manner, thus executing the whole casting cycle without any intervention of the workman.

In said machine each core or spindle and each outer element of the chill is fast with a piston actuated by a compressed fluid, the distribution of said compressed fluid to the various pistons taking place by a single slide valve controlled by the rotation of a cam preferably rotating at a constant speed, the respective shapes and arrangements of said slide valve and said cam being determined in a manner known per se within the reach of any man skilled in the art.

It is thus possible by using a cam with a predetermined profile chosen according to the operation to be effected to ensure the sequence of the operations for extraction of the cores and the removal of the castings from the mould through the rotation of the cam at a constant speed without the operator having to intervene from the moment when the machine has been started.

According to a preferred form of execution of the invention the pistons actuating each outer element and the core or spindle which passes through the same, as the case may be, are combined into a single one which is arranged so that the die element is displaced only after the core has been entirely released from the casting.

Finally, the tilting movement of the casting table after the withdrawal of the casting from the mould is preferably ensured in the same manner through a compressed fluid actuated piston controlled by the same distribution slide valve.

The appended drawings show examples of execution of die casting machines according to the invention. In these drawings, in which for avoiding complication of the figures the conduits for the distribution of the fluid have not been shown:

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Fig. 1 is a diagrammatical view, partly in elevation and partly in section through line I—I of Fig. 2, showing a casting machine for a pattern comprising four spindles or side cores and one central core;

Fig. 2 is a top plane view of the same machine;

Fig. 3 is a diagrammatical view showing the combination of the controls of the outer die element and of the core which passes through the same;

Figs. 4 and 5 show a particular example of application of such a machine to the casting of pistons made of a light alloy.

The machine shown in Fig. 1 fundamentally comprises a casting table 1 rockingly mounted about axes 2 fast with a frame 3. The moulding die comprises, for the piece 4 being cast, three outer elements 5, 6, 7, a central core 8 and four lateral spindles 9, 10, 11, 12. Each of said spindles is fast with a piston 13 (Fig. 3) and forms, as it were, the rod of the latter which is mounted in a cylinder 14 fast with the table 1; the piston rod proper 15 of said piston passes through a second piston 16 which forms the bottom of said cylinder and which is fast with the die element; furthermore, the rod 15 comprises a shoulder 17.

When compressed air is introduced into the cylinder 14 through the piping opening at 18 the pressure first exerted on the faces of the pistons 13 and 16 tends to separate them and the piston 13 moves alone carrying with it the core 9; when the shoulder 17 comes to strike against the wall of the piston 16 the latter is rendered fast with the piston 13 and the whole moves further, thus carrying with it the die element.

The central core 8 is fast with the rod of a piston moving in a cylinder 14e. On the other hand, the table 3 is maintained by the rod of a piston moving in a cylinder 14f. The compressed fluid is distributed to the various cylinders 14a, b, c, d, e, f by a single slide valve known per se and not shown, actuated by a cam the shape of which is determined, also in a manner known per se, in function of the schedule according to which the successive operations of extraction of the cores and of withdrawal of the castings are to be effected, said cam being driven at a constant speed for instance by an electric motor.

A casting operation is carried on in the following manner. On the beginning of the operation the table 3 is sloped towards the left of the figure. At the moment when he effects the casting

proper of the metal, the operator starts the motor actuating the cam. The latter actuates the slide valve which first determines the supply of compressed fluid to the upper part of the cylinder 14f. The table 1 returns progressively to a horizontal position, which determines a correct distribution of the molten metal in the die. After a time which is determined by the profile of the cam the various spindles and the central core are extracted at the required moments and the casting 4, which is withdrawn from the mould, can be removed from the table 1. The cam moving further, the slide valve determines the simultaneous operation of the cylinders in the reverse direction with respect to the preceding one and the various organs resume their starting position, the machine thus being ready for a new operation.

The machine shown in Figs. 4 and 5 is designed for casting pistons made of a light alloy. The die is formed of two elements 19 and 20 and the casting is effected on three cores, viz. a central core with counter-delivery and two side spindles providing the recesses for the axis for the small end of the connecting rod. The above mentioned core primarily comprises a central element having no projections in its part which is to be engaged in the casting and one or more, preferably two, side elements between or against which the central element can slide and which are linked about axes perpendicular to the direction of displacement of the latter. The latter is provided with sloping surfaces co-acting with stops carried by the side elements for determining the rocking movement of the latter about their axis of articulation while moving nearer to the central element when the latter yields back between the said side elements which are recessed inwardly for permitting this rocking movement. Said core is fast with a piston located in a cylinder 21 while the side spindles are fast with pistons located in cylinders 22 and 23 and mounted, as explained previously, so that the die element is carried along after the core has been extracted.

The machine is provided, furthermore, with vibrators 24 and 25 mounted on the die elements and adapted for being started just before the withdrawal of the casting from the mould in order to facilitate said operation. The table 1 is rockingly mounted on axes 2 carried by a frame 3 and a cylinder 14f controls the rocking movement of said table.

All the cylinders are supplied with compressed fluid by a single slide valve 26 actuated by the rotation, at a constant speed, of a cam 27 driven by an electric motor 28 provided with a speed-reducing gear 29. Cam 27 controls the starting and the stopping of the vibrators also in a manner known per se.

Said machine operates as follows. At the beginning of the casting operation the operator starts the motor 28, the table 1 being sloped. As mentioned for the machine shown in Figs. 1 and 2, the cam determines the return of the table by means of the cylinder 14f and after a time determined by the shape of the cam the side spindles are extracted and then, the vibrators 24 and 25 having been started, the die elements are separated and finally the central core is extracted; the casting can then be removed. The cycle terminates by the return of the core, the spindles and the die elements to their initial position as well as by the rocking of the table.

It has been supposed above that the motor which drives the cam runs at a constant speed, but this condition of simplicity is not absolutely necessary. The speed of the motor may be rendered variable at will, a rheostat being interposed, for instance, in the supply of the electric motor.

What we claim is:

An automatic die casting machine having cores and dies, a compressed fluid piston and cylinder device for controlling each of said cores and its corresponding die, said piston and cylinder device comprising a cylinder having two sections of different cross-sectional area, a piston in each section, the larger of said pistons being beyond the smaller with respect to said die, said smaller piston being hollow, and said larger piston having a rod passing through said smaller piston and secured to said core, said smaller piston being secured to said die, means for supplying compressed fluid to said cylinder between said pistons, said piston rod being provided with a stop within said smaller piston to limit the relative displacement of said pistons to the approximate length of the said core.

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