

Oct. 20, 1936.

H. GASTROW

2,057,945

HEATABLE MASS CYLINDER OF DIE CASTING MACHINES FOR PLASTIC MASSES

Filed Dec. 6, 1933

2 Sheets-Sheet 1

Fig. 1

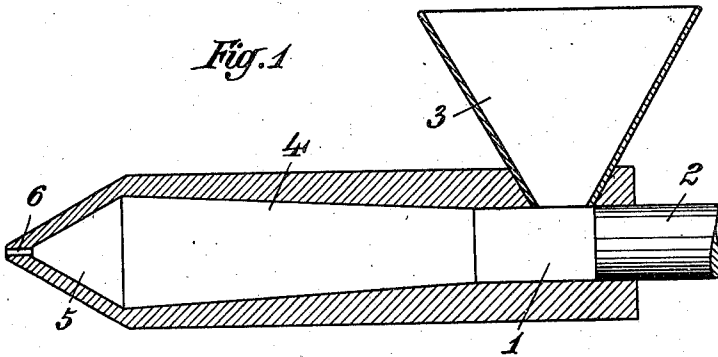


Fig. 2

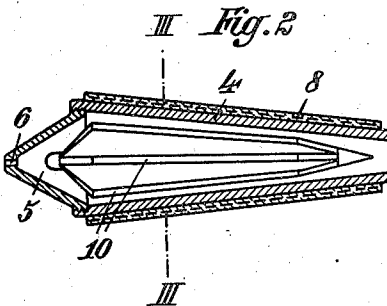


Fig. 3



Fig. 4

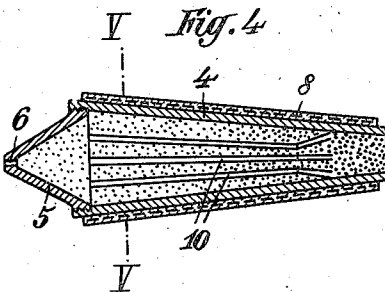
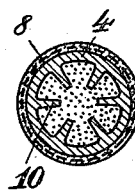


Fig. 5



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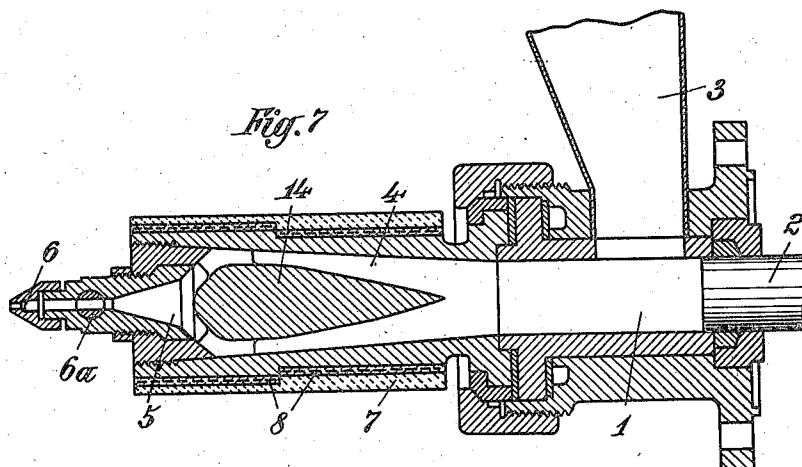
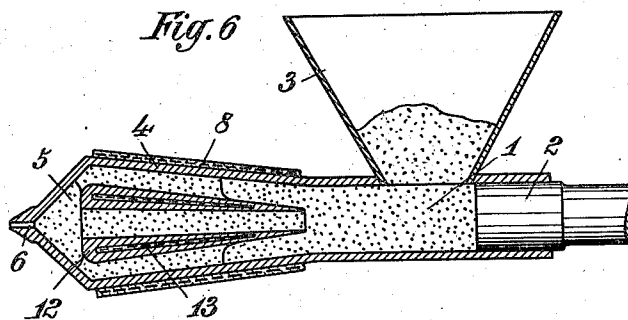
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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HEATABLE MASS CYLINDER OF DIE CASTING MACHINES FOR PLASTIC MASSES

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In Germany December 10, 1932

6 Claims. (Cl. 18—12)

The invention relates to apparatus for die casting plastic materials, especially artificial resins, formed by heating a pulverulent initial substance and more particularly to the type of die casting machines in which a solid cylindric piston moves in a cylinder which it can occupy completely, and feeds the powder into an adjacent chamber in which it is brought into the plastic or liquid condition by external heating, while at the same time an equal amount of the plastic or liquefied material is injected through a nozzle at the other end of the chamber into the die casting mold.

It is a well-known fact that the friction of the powdered material is excessively high within the cylinder and chamber, and thus extremely high pressures are required for forcing the cold material into the chamber and for injecting the liquefied material at the same time into the die casting mold. These conditions become the more difficult, the smaller the diameter of the cylinders are and the smaller the pistons are, since the area of the wall diminishes linearly as the diameter while the volume conveyed varies as the square of the same diameter. The adverse frictional resistance thus grows very sensibly when the cylinder diameter is reduced. As the diameter must be kept comparatively small owing to the mass having to be heated up rather quickly and the low heat conductivity thereof, it has been suggested to use annular cylinders which, it is true, improve the heating conditions for the mass but do not account for the friction resistance. Moreover the annular cross section of the mass cylinder results in difficulties as to the feed of the material.

It is an object of the present invention to substantially reduce the friction resistance of the material not yet brought into the plastic condition. To this end the walls of the heating chamber are made gradually enlarging in the feeding direction from the plane of the end of the working stroke of the piston, and then convergent towards the nozzle orifice. With this arrangement the enlarged portion is heated from the outside either directly or by means of an interposed jacket filled with a heating liquid. As starting from the end of the piston stroke the chamber gradually diverges any jamming of still unliquefiable material is avoided and consequently the friction resistance is extremely reduced.

The accompanying drawings diagrammatically show several embodiments of the invention in Figs. 1 to 6 while a practical instance of execution is represented by Fig. 7. Particularly—

Fig. 1 shows a coaxially arranged cylinder and

heating chamber the internal space of which is adapted to be completely filled with the mass to be worked.

Fig. 2 shows an embodiment in which the internal walls of the heating chamber gradually diverge as far as the nozzle base and houses a core which thermally communicates by ribs with the heated wall of the chamber.

Fig. 3 shows a section on line III—III of Fig. 3.

Fig. 4 shows an embodiment similar to Figs. 2 and 3 but the central core is replaced by ribs integral with and radially extending from the chamber wall, which ribs leave a free space along the center line as is obvious from

Fig. 5 which is a section on line V—V of Fig. 4.

Fig. 6 shows another embodiment in which the internal core of the enlarged portion of the heating chamber is designed as a hollow annular body provided with a cylindric passage of constant diameter so that the mass pressed through the chamber is divided into a solid cylindric portion and a portion of annular cross section enclosing the first named portion. The said hollow core is provided with a separate electric heating appliance and radial ribs thermally connect it to the wall of the chamber.

Fig. 7 shows a practical form of execution in which the divergent portion of the heating chamber is provided with a core diverging in the same direction and which at the place of the largest diameter is connected to the chamber wall by several short ribs. While the diameter of the internal core increases in the same direction as that of the chamber wall, the gradual increase of the two diameters concerned is so proportioned that the gap left between the core and the said outside wall gradually diminishes in width from the inlet opening for the plastic mass towards the nozzle so that the thickness of the layer of the said mass correspondingly decreases down to a minimum amount.

In the drawings, 1 designs the cylinder in which a solid cylindric piston 2 reciprocates in order to push into the heating chamber 4 powdered material dropping from the funnel 3 into the said cylinder. The gradually enlarging internal space of the heating chamber merges into a nozzle body 5 the diameter of which gradually decreases towards the nozzle orifice 6, while a cock 6a is provided for closing this orifice. About the chamber is disposed heat insulation 7 and an electrically heated jacket 8. The embodiments shown by Figs. 2, 3, 4, and 5 are provided, between the heating appliance and the chamber, with a chamber 9 containing a liquid, such as

oil or the like, uniformly heated by the electric heaters and intended for uniformly transmitting its heat to the wall of the chamber. The ribs 10 transmit heat from the jacket as quickly and as deeply as possible to the interior portion of the mass to be heated. The central core 11 connects these heating ribs with one another in the embodiment shown by Fig. 6 this central core 12 is hollow and has an annular cross section and a separate electric heater 13 in its wall. In the embodiment represented by Fig. 7 the central core 14 is of double-conical shape and is so dimensioned that starting from the point where the mass enters the heating chamber the width of the gap between this core and the outside wall of the cylinder gradually decreases so that at the largest diameter thereof the layer of the mass shows the minimum thickness.

20 What I claim as my invention, and desire to secure by Letters Patent, is—

1. Apparatus for die casting plastic materials formed by heating a pulverulent initial substance comprising a cylinder, means for feeding the substance 25 therinto, a piston movable in the cylinder, a chamber adjoining said cylinder, and heating means associated with the chamber for converting into a plastic condition the substance forced therinto by the piston, the walls of the heating chamber diverging gradually from their junction with those of the cylinder to reduce the frictional resistance of the substance which is not yet in a plastic condition and then converging sharply to a nozzle orifice. 30

35 2. Apparatus for die casting plastic materials formed by heating a pulverulent initial substance comprising a cylinder, means for feeding the substance therinto, a piston movable in the cylinder,

a chamber adjoining said cylinder, said chamber having heat conducting ribs extending inwardly from its walls, and heating means associated with the chamber for converting into a plastic condition the substance forced therinto by the piston, the walls of the heating chamber diverging gradually from their junction with those of the cylinder to reduce the frictional resistance of the substance which is not yet in a plastic condition and then converging sharply to a nozzle orifice. 5

3. Apparatus for die casting plastic materials formed by heating a pulverulent initial substance comprising a cylinder, means for feeding the substance therinto, a piston movable in the cylinder, a chamber adjoining said cylinder, a core in the chamber, and heating means associated with the chamber for converting into a plastic condition the substance forced therinto by the piston, the walls of the heating chamber diverging gradually from their junction with those of the cylinder to reduce the frictional resistance of the substance which is not yet in a plastic condition and then converging sharply to a nozzle orifice. 15 20 25

4. Apparatus according to claim 3, in which heating means are provided in the core. 25

5. Apparatus according to claim 3, in which the cross-section of the chamber and the cross-section of the core gradually increase towards the nozzle, the width of the space between the chamber wall and the core gradually decreasing to the end of the divergence while the cross-section of the approach to the nozzle orifice decreases up to said orifice. 30 35

6. Apparatus for die casting plastic materials according to claim 3, in which the core is annular. 35

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