Nov. 18, 1930. K. F. WAGNER 1,782,248

PRESSURE DIE CASTING APPLIANCE

Filed Feb. 17, 1928

Fig. 2.

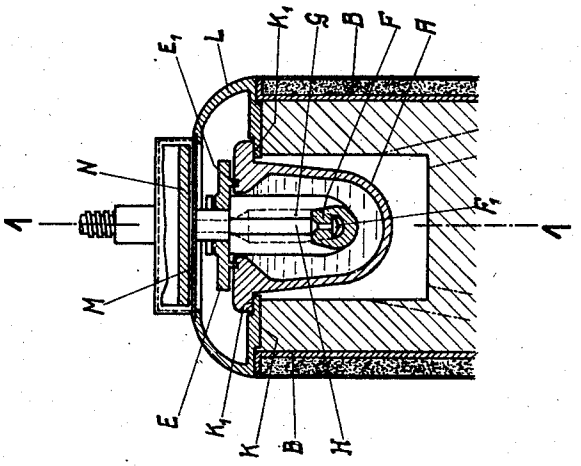
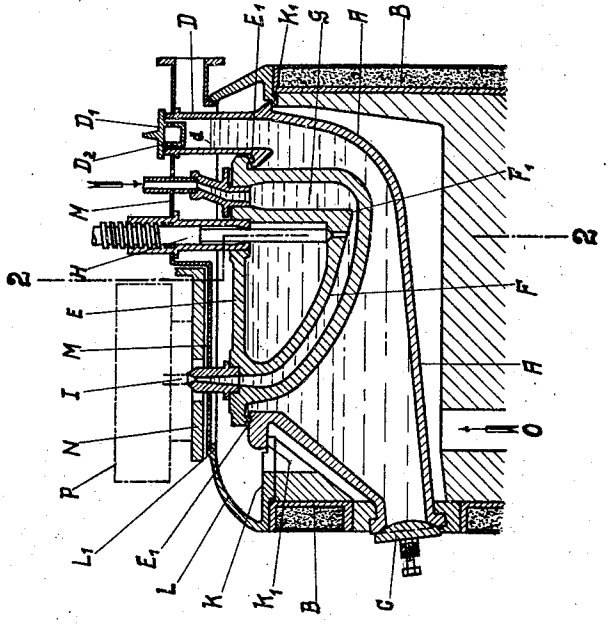


Fig. 1.



Inventor
Karl Friedrich Wagner
By Hauff-Haarland
Attorneys

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KARL FRIEDRICH WAGNER, OF FEUERBACH, NEAR STUTTGART, GERMANY, ASSIGNOR TO ELEKTRONMETALL G. M. B. H., OF CANNSTATT-STUTTGART, GERMANY

PRESSURE DIE-CASTING APPLIANCE

Application filed February 17, 1928, Serial No. 255,093, and in Germany February 19, 1927.

This invention relates to a pressure-die-casting appliance for casting magnesium and its alloys and other easily oxidizable metals.

In the attempts hitherto made, to cast magnesium and its high percentage alloys, such as the so-called Elektron metal, in pressure die-casting appliances the apparatus employed for example in connection with aluminum have been found unsuitable. This has been found due in the first place to the fact that these appliances do not take into account the great readiness with which magnesium oxidizes. If a large supply of an alloy of magnesium is kept in a molten state, and freely exposed to the air, the continuous slight oxidation of the magnesium on its surface causes the formation of films of oxide which owing to the internal movement of the melt, mingle therewith. In course of time not only does the metal become thickened but, in addition, the quality of the castings deteriorates because the oxide films taken up by the metal lower the internal cohesion of the latter and thereby impair the mechanical strength of the products.

My present invention aims at providing a pressure-die-casting appliance which overcomes the aforesaid specific difficulties for magnesium alloys. To this end, the appliance consists essentially in three main parts:—

(1) The furnace casing through which the combustion gases are passed, and its cover upon which the pressure-die-casting mould is placed and which is provided with the auxiliary members such as metal inlet valve and compressed-air valve;

(2) The melting crucible which is kept quite full through the superimposed charging shaft, and which itself contains

(3) The casting vessel which is filled with more than the amount of metal to be injected for the time being.

In order more clearly to explain the invention, reference is made to the accompanying diagrammatic drawing which illustrates an embodiment of the invention constructed in accordance with the principles above set forth, and in which Figure 1 is a longitudinal, vertical section of the apparatus and Figure 2 a transverse, vertical section taken along line 2—2 of Figure 1.

The iron melting crucible A displays the characteristic feature of a slanting bottom the one end of which merges into a tube which projects through the partially lined furnace casing B and is there provided with a seal C. This arrangement serves to tap the metal in the event of stoppages and to remove impurities, if any.

The characteristic feature in the operation of this crucible is that in its normal function it is always kept completely filled by means of the charging shaft D and that normally the metal stands sufficiently high in the shaft to exert a hydrostatic pressure on the metal in the crucible. For this purpose the charging shaft D which is mounted upon the crucible A is continuously kept nearly full (up to level *d*). The horizontal part E of the casting vessel acts directly at the upper limit of the charge of metal, the escape of metal round the edge of E being prevented by sealing means arranged between E and A or D. In this manner, the molten metal is out of contact with the atmosphere except over a small surface in the charging shaft, so that by this means, and also by virtue of the fact that this portion of the metal is at a temperature only slightly above the melting point, the opportunity for oxidation is restricted to a minimum. For further protection against the access of air, the lid D_1 of the charging shaft D is arranged to form a receptacle for protective substances, the vapours of which can escape through the small openings D_2 into the shaft. The preferred protective substances are those (for example sulfur), whose vapours—whether in themselves or after oxidation by atmospheric oxygen—act as protective gases. In the same manner small amounts of the protective substances can be introduced into the nozzle shortly before placing the mould in position, by which means the protective gases pass into the mould, partly automatically and partly under the pressure of the oncoming metal.

The iron casting vessel consisting of a single casting exhibits the peculiarity that

the lower portion F is tubular while the flat upper portion E is provided with a flange by means of which it is suspended in the top of the crucible with the aid of sealing fillets and grooves and metallic or ceramic packing means at E_1.

The casting vessel F comprises a substantially cylindrical chamber G for introducing a fluid under pressure (compressed air for instance) and a substantially cylindrical duct connecting the bottom end F_1 of said chamber with the nozzle for squirting out the liquid metal, in such a manner that the wall of the said chamber G turned towards the said duct joins to the latter with a sharp edge at F_1. At this point the circular cross-section of the duct of the casting vessel preferably turns into a flattened, elliptical or semi-circular cross-section of the same superficial area.

The pressure chamber is essentially circular in cross-section and is preferably not too small in dimension so that, independently of the amount of metal discharged into the mould P in position for the time being, the admitted pressure air cannot, in any circumstances, penetrate as far as the point F_1. In close proximity to this point is the valve H for admitting metal into the casting vessel. On opening said valve the metal passes from the melting crucible into the casting vessel and into the pressure chamber (the pressure having been released) and into the nozzle duct and mounts therein up to the level of the metal in the charging shaft; that is to say until a short distance below the mouth of the nozzle.

The upper cover of the appliance is formed by a plate K which is a single casting with a vaulted top L. The plate is provided with an aperture corresponding to the circumference of the crucible so that the crucible A can be inserted into the plate K and lies on the edge K^1 thereof. The vault is provided with a corresponding aperture which is covered at L^1 by a superimposed additional lid M through which the members controlling the appliance pass, and which is covered in places by heat-insulating plates B. By means of the hollow space between the furnace plate and vault, the heating gases which enter into the bottom of the furnace casing at O, can be passed through the hollow furnace casing in such manner that, not only is the melting crucible A heated, but also the upper side of the casting vessel, surrounding the seating of the nozzle J, the upper part of the metal inlet valve H, the pressure chamber G, and the charging shaft D of the crucible in the proximity of which the heating gases pass out of the casing. In other respects the machine is operated in the same manner as the usual machines.

Although, according to the foregoing the casting appliance is primarily intended to be applied to magnesium and its alloys, it proves to be useful too in the employment for other easily oxidizable metals or alloys.

I claim:

1. In a pressure die-casting apparatus a melting and charging device comprising, in combination, a closed crucible serving as a metal container, a feeding shaft extending upwards from said crucible, a substantially U-shaped casting vessel suspended by and within said crucible, means for introducing a fluid under pressure into one end of said casting vessel, a nozzle for discharging molten metal from the opposite end of said casting vessel and a valve connecting the interior of said casting vessel with the interior of said crucible.

2. In a pressure die-casting apparatus a melting and charging device comprising, in combination, a closed crucible serving as a metal container, a furnace casing surrounding said crucible and provided with a detachable cover, said crucible being suspended by said cover, a feeding shaft extending upwards from said crucible, a substantially U-shaped casting vessel suspended by and within said crucible, means for introducing under pressure a fluid into one end of said casting vessel, a nozzle for discharging molten metal from the opposite end of said casting vessel, the feeding shaft, fluid inlet and discharging nozzle passing through said cover of said furnace casing, and a valve connecting the interior of said casting vessel with the interior of said crucible.

3. In a pressure die-casting apparatus a melting and charging device comprising, in combination, a closed crucible consisting of a pot and a detachable cover and serving as a metal container, a furnace casing surrounding said crucible and provided with a hollow detachable cover, said crucible being suspended by the cover of said furnace casing, ducts for passing the heating gases from the furnace casing into the interior of said furnace casing cover, a feeding shaft extending upwards from said crucible, a substantially U-shaped casting vessel, both ends of said casting vessel being passed through the cover of said crucible and rigidly connected therewith in a gas-tight manner, and means for rendering gas-tight the contacting rims of said crucible cover and said crucible pot.

4. In a pressure die-casting apparatus, in combination, a closed crucible serving as a metal container, a feeding shaft extending upwards from said crucible, a lid covering the opening of said shaft and a perforated receptacle attached to the bottom of said lid.

5. In a pressure die-casting apparatus comprising a metal container and a casting vessel within said container, a casting vessel comprising a substantially straight chamber connected at one end with a pressure inlet, a

duct connecting the other end of the chamber with a discharging nozzle, said duct issuing from said chamber at a definite angle, and a valve in the proximity of said chamber connecting said duct with the interior of the metal container.

6. In a pressure die-casting apparatus comprising a metal container and a casting vessel within said container, a casting vessel comprising a substantially straight chamber connected at one end with a pressure inlet, a duct connecting the other end of the chamber with a discharging nozzle, said duct issuing from said chamber at a definite angle, and a valve connecting said duct with the interior of the metal container in the proximity of said chamber actuated by a stem in a direction substantially parallel to said chamber.

7. In a pressure die-casting apparatus comprising a metal container and a casting vessel within said container, a casting vessel comprising a substantially straight chamber connected at one end with a pressure inlet, a duct connecting the other end of the chamber with a discharging nozzle, said duct issuing from said chamber at a definite angle, the cross section of said duct being narrowed in the proximity of its point of issue from the end of said chamber without being materially reduced in area and a valve connecting said duct with the interior of the metal container in the proximity of said chamber, actuated by a stem in a direction parallel to said chamber.

In testimony whereof I have hereunto set my hand.

KARL FRIEDRICH WAGNER.