June 23, 1964 L. PÉRAS 3,137,902

APPARATUS FOR FORMING SEMI-PERMANENT CASTING MOULDS

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Fig-2

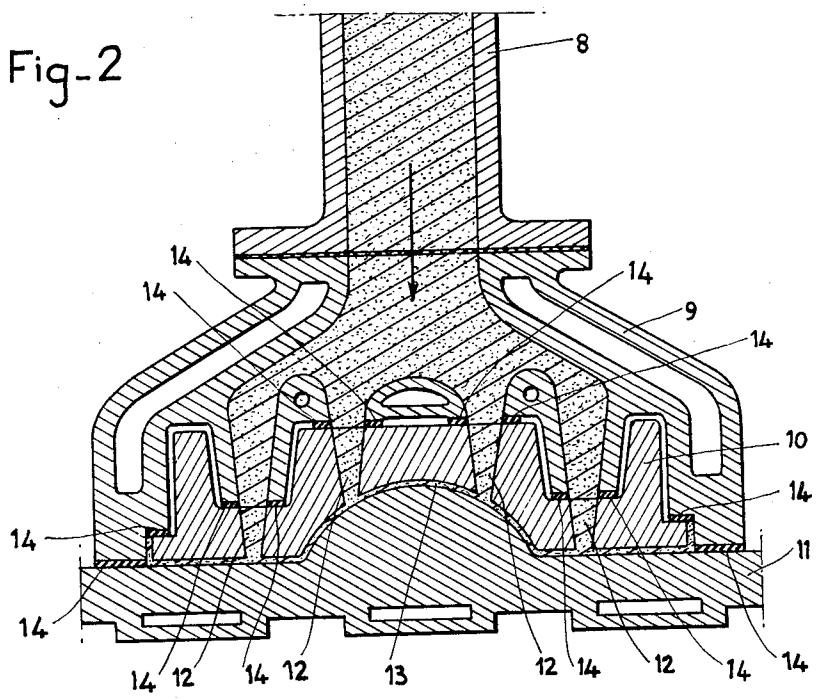
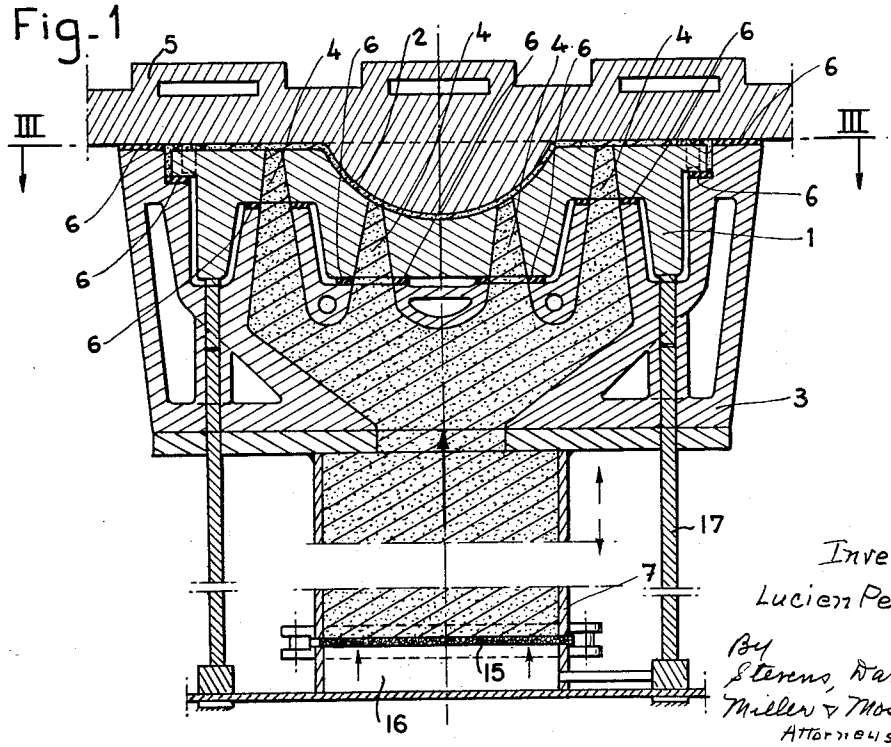


Fig-1



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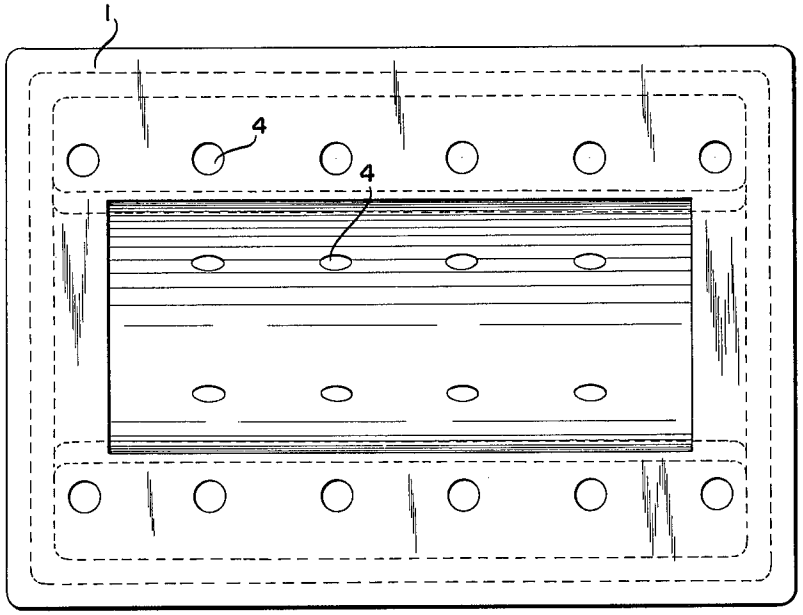

Fig. 3

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APPARATUS FOR FORMING SEMI-PERMANENT CASTING MOULDS

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The present invention relates to the casting, in semi-permanent moulds, by gravity or under low pressure conditions, of metals as currently used in industry, notably those having a high melting point or a high casting temperature.

Various methods of causing the sand to set on hot models are already known, such as:

The shell moulding method utilizing a sand and phenolic resin mixture,

The so-called "hot box" method utilizing glucose and sand mixtures, resin-urea-formol-sand mixtures, or other products.

Methods are also known wherein the sand is caused to set on cold models by using for example a mixture of silicate and miscellaneous oils which is caused to set by either blowing carbon dioxide or using electronic heating.

These various methods require a large quantity of sand or reinforcements of the back of the moulds on metal members, or the clamping of granulated metal on the back of the moulds.

Moreover, in these various known methods the moulds are frequently subjected to distorsion when stripping the castings therefrom.

It is the essential object of the present invention to provide improvements in the preparation of semi-permanent moulds, whereby the drawbacks set forth hereinabove are avoided while increasing considerably the precision of the casting operations by providing rigid moulds coated with a sand and binder layer.

The mould portion consists of a shell of cast iron or other suitable material, of which rough cast, formed, pressed or otherwise prepared but non-machined form is provided with a difference of 1/8" to 3/16" with respect to the final form.

The coating may consist of sand-resin mixture or any other products adapted to set more or less rapidly, according to the methods currently used and described hereinabove in the state of the art. Thus, a kind of protective coating is obtained which can be renewed after each casting operation.

This coating of moderate thickness (1/8" to 3/16", according to the shell drawing) may be formed by using conventional blowing means.

Thus, for instance, in the case of mixtures consisting of sand and powdered resin, the usual procedure consists in blowing from beneath with the introduction of air through filter means or sintered metal according to the known method.

In the case of moist sand blowing with the use of resins, silicates or other products as binders, and in the case of dry sand and resin mixtures utilizing lipped nozzles, normal blowing may be resorted to. In this case the nozzle is located above the rough shell, the model-plate being disposed on the press of the conventional blowing machine. When the press is lowered the shell is released upon completion of the curing step.

The method of this invention is characterized by the advantage of a highly reliable adherence of the sand-and-resin layer on the shell due to the roughness of the shell surface and to the fact that the sand-and-resin mixture remains in the blowing orifices and constitutes an anchoring means for the coating. Thus, any possibility of

distortion when stripping the casting is precluded since there is actually no stripping of the sand-and-resin layer.

The gases may escape through the blowing orifices.

The initial distortions of the rough shell are immaterial as far as the precision of the inner contours of the shell is concerned, after the shell has been coated.

If for mass-production purposes a turnstile or round-about is used, the increase in the number of shells will not impair the precision, for the castings have exactly the same shape and dimensions since it is the same model-plate that gives the final contour to the casting cavities.

The more or less pronounced thickness of the sand-and-resin layer permits of varying the rate of cooling after the casting operation and therefore of varying the structure of the castings. At the limit it is even possible to have heat-conducting (metallic) parts if it is contemplated to have hardened or fine-grained portions. These mould portions may be interchangeable, provided that lap-joints are made through the sand-and-resin coating.

As the mould portions are closed by forming sand-on-sand joints, the resulting accuracy is very satisfactory and the removal of burrs reduced to a minimum.

With this method it is possible to contemplate installations for mass production at an advantageous industrial cost (for both equipment and installation). It is also possible to obtain a high degree of precision in installations designed according to the conventional means for manufacturing limited quantities of parts.

The invention will now be described with reference to the attached drawing showing diagrammatically by way of example two typical forms of embodiment of the invention. In the drawing:

FIGURE 1 is a vertical section showing a mould preparing apparatus constructed according to a first form of embodiment of the invention, the protective coating consisting of a mixture of sand and resin powder which is introduced by blowing from beneath, and

FIGURE 2 is a vertical section showing another form of embodiment of this invention, wherein the protective coating consists of moist sand with resins, silicates or other substances as binders, or a dry mixture of sand and resin, with the combined use of a lipped nozzle, the blowing being directed in the usual manner with the nozzle located above the rough shell.

FIG. 3 is a top plan view taken along the line III—III of FIG. 1.

According to the first form of embodiment of this invention (FIG. 1), a device for preparing semi-permanent moulds consists of a hot shell **1** bearing on a water-cooled blowing nozzle **3** through the medium of silicon-containing rubber gaskets **6** and of a hot model-plate **5**.

The coating **2** of protective substance interposed in a space available between the model-plate and the hot shell is injected through orifices **4** by blowing upwardly through a blowing duct **7**. This device operates as follows:

The resin-and-sand mixture mounted in the nozzle **3** is injected through the orifices **4** into the gap formed between the shell **1** and the model-plate **5**. This model-plate **5** and the shell **1** are heated at the temperature necessary to melt the resin throughout the heated gap. The cold sand flows downwards when the air is vented. The fluid-tightness between the nozzle **3**, shell **1** and model-plate **5** is obtained through the aforesaid gaskets **6**. When the resin is cured, the coating **2** of shell **1** adheres strongly thereon due to the surface roughness and also to the fact that the sand-and-resin mixture remains in the flowing orifices **4**.

In the other form of embodiment of the invention (FIG. 2), the device is reversed and comprises from top to bottom a conventional duct **8** connected to a water-cooled nozzle **9**, a hot shell **10** and a heated model-plate

11. As in the preceding case, the hot shell **10** is formed with holes or orifices **12** for injecting the protective layer forming the coating **13**, and gaskets **14** ensure the necessary fluid-tightness between the nozzle, the shell and the model-plate.

In this case, conventional downward blowing is used, and the shell is released, upon completion of the curing operation, by the downward movement of the press.

I claim:

1. An apparatus for forming mould members comprising a nozzle having a plurality of spaced orifices disposed therein, a mould member disposed within said nozzle, further orifices disposed within said mould member in correspondence with the orifices in said nozzle, a model plate disposed over said mould member and juxtaposed with respect to said nozzle, means to maintain said model plate disposed with respect to said nozzle to form a space between said model plate and said mould member, and means in communication with said nozzle for introducing a mixture of sand and resin into said nozzle through said orifices thereof and said further orifices in said mould member into said space to form a coating on said mould member which is maintained in communication with said mixture of sand and resin contained in said orifices, whereby to constitute an anchoring means for the coating.

2. An apparatus according to claim 1 in which said nozzle is water cooled.

3. An apparatus according to claim 1 in which said means to maintain said model plate disposed with respect to said nozzle comprises silicone gaskets.

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