Patented Apr. 28, 1931

1,802,946

UNITED STATES PATENT OFFICE

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CASTING MAGNESIUM AND ALLOYS THEREOF

No Drawing. Application filed January 11, 1927. Serial No. 160,519.

While the present improvements relate more particularly to the casting of magnesium and so-called light metal alloys, in which magnesium is the predominant constituent, it will be understood that the improved method and apparatus involved may also be found adaptable for the casting of other similar readily oxidizable metals. The difficulties encountered in melting and handling, in molten state, magnesium or an alloy largely composed of this metal are well known and these difficulties are still present when it is attempted to introduce such metal into a mold in any process of casting. For example, when sand castings are made in the ordinary way by simply pouring the molten magnesium or light alloy metal into the sand mold not only is there a pronounced tendency for the metal to burn in the sprue, but the surface of the casting formed by contact with the complementary surface of the mold tends to become pitted due to the formation of a powder (presumably an oxide or a nitride of the metal) or else blistered, the formation of such blisters being somewhat obscure. Even if such impairment of the surface is not serious enough to prevent the cast article from being properly finished when removed from the mold, the casting has an unsightly appearance and a certain loss of metal is of course involved, while the cleaner the casting, the more easily may the finishing operation be carried out.

It has heretofore been proposed to overcome these difficulties, specifically in casting magnesium and alloys containing the same, by dusting the mold prior to casting the metal with sulphur or equivalent material capable of giving off in contact with the molten metal a vapor which is more easily oxidizable than magnesium. This procedure, however, has the objection that it is obviously difficult correctly to gauge the amount of sulphur or equivalent material thus used, and particularly if an excess is applied to the surface either of the mold proper or the core, so much vapor may be generated that some of it becomes entrapped during the period that the metal is solidifying, the result being blow holes or surface shrinks in the casting.

I have now discovered that unexpectedly satisfactory results in the way of producing a casting with an unimpaired surface and having a bright metallic finish, may be obtained by intermixing with the molding sand or by superficially coating such sand in the mold after the mold is formed with substances distinctly different from sulphur both in their character and apparent behavior. Specifically certain mineral acids or salts of such acids may be thus employed with strikingly advantageous results.

To the accomplishment of the foregoing and related ends, the invention, then, consists of the steps and means hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but several of the various ways in which the principle of the invention may be used.

The mold which may be formed to produce a casting of any desired shape or size, e. g. a piston for an internal combustion engine or like article, may have both parts made of sand or one part, e. g. the core, made of sand and the other part of metal, constituting a so-called permanent mold.

If to the sand employed in making either or both such mold parts approximately 3 per cent. of common salt (NaCl) be intermixed, a very satisfactory result in the way of a casting is obtained upon pouring the metal into the mold in the usual manner; and whereas otherwise when at the critical temperature range of molten light metal, such metal tends to flash-oxidize, in accordance with the present invention the light metal may be safely brought into contact with the treated surfaces notwithstanding such temperature. A casting with an improved surface is likewise obtained by the intermixture of sulphuric acid in approximately the same amount with the sand whereof the mold parts are composed. It is not necessary, moreover, to mix the salt or sulphuric acid with the sand, but substantially equally satisfactory results are

obtained by spraying the surface of the finished mold or core with aqueous solutions of these chemicals.

It is entirely feasible where the mold parts are treated, as hereinbefore described, to use therein ordinary green foundry sand. The use of addition agents such as those described in or on the sand does not preclude the use of sulphur or equivalent material, particularly in the sprue, if found desirable in order to prevent the molten metal from burning.

It is somewhat difficult to state just how these addition agents function and why they give the bright metallic finish to the casting. In contradistinction to sulphur, for example, they do not apparently decompose and give off a gas on being heated on coming in contact with the incoming metal. Furthermore, they are readily soluble in water.

In addition to the particular salt and acid named above as suitable for use in my improved method of treating molds for casting light metals and alloys thereof, other alkali metal or alkaline earth metal halides have been found suitable as well as alkali metal and alkaline earth metal sulphates and sulphites; and for conciseness all of such agents are designated hereinafter as oxidation-inhibitors. Furthermore, there is no limitation implied to any particular percentage of the added ingredient employed, e. g. 3% of salt, NaCl, as hereinbefore specified. On the contrary, the amount of salt or other equivalent ingredient may vary widely from the figure given and castings of superior character still be secured.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any one of the following claims or their equivalents be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A method of inhibiting burning of a readily oxidizable light metal in casting, which comprises incorporating in a sand mold part an oxidation-inhibitor agent selected from the group consisting of sulphuric acid and sulphates, sulphites, and halides of alkali and akaline earth metals, whereby such agent is in surface exposure, and is adapted to prevent burning of cast metal.

2. A method of treating a sand mold part to eliminate excessive burning of a readily oxidizable metal such as magnesium or its alloys when cast in contact therewith, which comprises incorporating in surface exposure in such mold part a liquid embodying an oxidation-inhibitor agent selected from the group consisting of sulphuric acid and sulphates, sulphites, and halides of alkali and alkaline earth metals, whereby said agent is adapted to prevent burning of the cast metal.

3. A method of inhibiting burning of a readily oxidizable light metal in casting, which comprises incorporating in a sand mold part an alkali metal halide, whereby such halide is in surface exposure and is adapted to prevent burning of the cast metal.

4. A method of inhibiting burning of a readily oxidizable light metal in casting, which comprises incorporating sodium chloride in the surface of a sand mold part with which the metal will contact, whereby to prevent burning of the cast metal.

Signed by me, this 7th day of January, 1927.

JOHN E. HOY.