

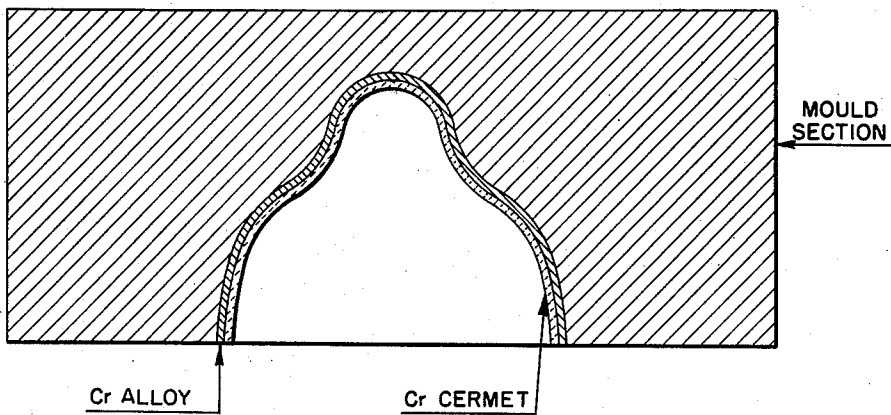
Sept. 8, 1959

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2,903,375

METHOD OF COATING A MOULD FOR USE IN A FOUNDRY

Filed July 9, 1957



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METHOD OF COATING A MOULD FOR USE IN A FOUNDRY

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Application July 9, 1957, Serial No. 670,643

Claims priority, application France August 8, 1956

5 Claims. (Cl. 117—5.3)

The invention relates to a method of preparation of foundry moulds.

The casting of ferrous alloys, steels or cast-iron, in metal chill-moulds or permanent metal moulds, whether the casting is carried out by gravity, by centrifuging or by injection under pressure, encounters serious difficulties arising from the tendency of welding of the cast alloy to the metallic chill-mould, especially in the regions of highest temperatures, that is to say at the point where the jet of metal comes in contact with the mould or at the parts of the mould which form a ridge or projection in the interior of the moulding.

A further difficulty arises from the very intense thermal shock to which the mould is subjected, and from the high temperature reached over the whole surface of contact between the chill-mould and the liquid metal; for that reason, it is the general rule, as in the case of ingot moulds in steel works, to apply a coating to the surface. When however it is necessary to work at a high rate of production, the pourings follow each other regularly at very short intervals into the same mould, and the usual techniques of coating do not give satisfactory results. The application of a refractory coating has a powerful cooling effect on the surface of the mould at each application by brush or by spraying gun as a result of the evaporation of the dispersive liquid. Projection by a spraying gun of a molten refractory product such as alumina on the mould, before it is put into service, does not give a satisfactory adhesion and resistance to thermal shock of the coating on the mould, especially in those parts of the moulds which form projections.

The method forming the object of the invention does not have any of the drawbacks referred to and enables a large number of successive mouldings to be effected without deterioration of the coating and, in consequence, ensures a long life in service of the metal mould for the pouring of ferrous alloys such as cast-iron, but this process is equally applicable to the moulding of any metal or alloy with a high melting point, such as aluminium bronze, stainless steel, refractory alloys with a base of nickel, etc. This process consists in applying successively, before the moulds are put into service, at least two different coatings, the first of which has intermediate properties between the metal mould and the last refractory coating.

The first coating is formed, starting from rods prepared either by rolling or by drawing, or by melting and moulding, or by moulding a powder which is then sintered. This coating is constituted by a relatively refractory metallic alloy, or of a cermet or a mixture of refractory oxide and metallic alloy rich in metal; in both cases, the alloy is rich in chromium (18% to 80% for example) and is used in wire or in rods and projected by means of a projection blow-pipe at a sufficiently high temperature to melt the alloy and to project it in very small drops on the surface of the metal mould on which the spray condenses to give a highly ad-

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herent fine film. For this first coating there may be employed:

Either a ferritic steel having 15 to 30% of chromium,
Or a nickel chrome austenitic steel having 15 to 30%

5 of chromium;

Or an alloy of the type 80% Ni, 20% Cr (1 to 2% Mn approximately); all these steels and alloys may be used in roll or drawn rods;

10 Or an alloy of the type Cr 15 to 30%, Fe 5 to 20%, W or Mo 0 to 5%, Si and Al 0 to 2%, Co the remainder, used in the form of cast rods;

Or an alloy or a cermet of the type: 10 to 30% of one of the metals such as: molybdenum, tungsten, nickel, cobalt, iron, 0 to 20% of alumina, the remainder being chromium. These rods may be made by moulding from powder and sintering at about 1700° in hydrogen or an inert gas.

The second coating, also projected by means of a blow-pipe gun is formed by a cermet rich in alumina, the metallic portion of which is rich in chromium and can be constituted by one of the following alloys:

Cr 80%—Mo 20%

Cr 80%—Ni 20%

Cr 80%—Co 20%

25 or any other alloy containing more than 70% of chromium.

In this cermet, the proportion of the metallic part to the alumina may be comprised between 10% and 50% by weight of metal to 90% to 50% of alumina respectively.

The alloy can be previously prepared and then reduced to powder, mixed intimately with the alumina and with an organic agglomerating product in an aqueous or alcoholic medium, so as to obtain a paste which is moulded or drawn into rods which are then dried, baked and sintered at high temperature in an inert atmosphere such as hydrogen. The alloy can be obtained by effecting the mixture directly of the pure metals in powder form with alumina, compressing the powdered mixture into the form of rods, and then sintering at high temperature in an inert atmosphere.

In the majority of cases, the coating of the mould is limited to the two coatings described; in the case of a greater number of coatings, the intermediate layers may be of the same nature as either of the two others or again they may be of an intermediate nature or composition.

When so desired, the layers thus formed on the mould may be covered with a purely refractory coating of the usual type. This can be applied either once and for all before the mould is put into service, or periodically from time to time, or before each pouring. This coating may be projected in the molten state by means of a blow-pipe, it may be a liquid or an emulsion applied with a spray gun or with a brush, or finally it may be a solid projected in the state of a cloud of dust, for example by means of a small blower or a sooty flame. This solid may be alumina, silica, a silico-aluminate, or any other refractory product, graphite, lamp-black, or acetylene black; it may contain an organic material such as tar or lac.

In the accompanying drawing there is shown diagrammatically in cross section a mould section having its cavity coated in accordance with the above-described method.

I claim:

1. A method of protecting the surfaces of metallic moulds for casting metals and alloys, which comprises the application in succession to said surfaces before said moulds are put in service, of a plurality of coatings including a first coating and a last coating, with said last coating comprising a cermet containing 50 to 90% of

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alumina and 10 to 50% of a metal component containing 70 to 100% chromium and said first coating being different from said last coating and comprising an alloy containing at least 15% chromium, said first and said last coatings being applied by projection in molten form.

2. A method of protecting the surfaces of metallic moulds for casting metals and alloys, which comprises the application in succession to said surfaces before said moulds are put in service, of a plurality of coatings including a first coating and a last coating, with said last coating comprising a cermet containing 50 to 90% of alumina and 10 to 50% of a metal component containing 70 to 100% chromium, and said first coating being an alloy containing 15 to 30% chromium, said first and said last coatings being applied by projection in molten form.

3. A method of protecting the surfaces of metallic moulds for casting metals and alloys, which comprises the application in succession to said surfaces before said moulds are put in service, of a plurality of coatings including a first coating and a last coating, with said last coating comprising a cermet containing 50 to 90% of alumina and 10 to 50% of a metal component containing 70 to 100% chromium, and said first coating being an alloy containing 10 to 30% of a metal selected from the group consisting of molybdenum, tungsten, nickel, cobalt and iron, the balance being chromium, said first and said last coatings being applied by projection in molten form.

4. A method of protecting the surfaces of metallic moulds for casting metals and alloys, which comprises the application in succession to said surfaces before said

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moulds are put in service, of a plurality of coatings including a first coating and a last coating, with said last coating comprising a cermet containing 50 to 90% of alumina and 10 to 50% of a metal component containing 70 to 100% chromium, and said first coating being a cermet containing 10 to 30% of a metal selected from the group consisting of molybdenum, tungsten, nickel, cobalt and iron, and up to 20% of alumina, the balance being chromium, said first and said last coatings being applied by projection in molten form.

5. A method of protecting the surfaces of metallic moulds for casting metals and alloys, which comprises the application in succession to said surfaces before said moulds are put in service, of a plurality of coatings including a first coating and a last coating, with said last coating comprising a cermet containing 50 to 90% of alumina and 10 to 50% of a metal component containing 70 to 100% chromium, and said first coating being a cermet containing up to 20% of alumina and at least 80% of an alloy containing 70 to 90% of chromium, said first and said last coatings being applied by projection in molten form.

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