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MOLD COATING

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The invention relates to mold coating, and more specifically to the formation of carbonaceous films on mold surfaces. It is particularly concerned with improved carbon film coatings for molds, and a new method of applying or depositing such films from a smoky flame of acetylene or other hydrocarbon materials.

The need for, and the advantages of, a protective coating over a mold surface in contact with a cast material has long been recognized in the metal and other arts employing casting and molding processes, and a great variety of substances and compositions have been proposed for this purpose. Carbon in various forms, either alone or in admixture with other materials, has been of prominent use for mold coating purposes, and deposition of carbon films by applying smoky flames of acetylene or other hydrocarbons has produced very satisfactory results in many industries. The finely divided soot particles so deposited form a dense and uniform film which produces a better finish on the molded article, and the improved heat insulating characteristics of such a coating maintain a better fluid flow of molten material to all parts of the mold, with improvement in the casting surface and detail. These and other advantages known to the art have established substantial value and importance in mold coatings formed by acetylene smoking.

It is an object of the present invention to provide further improvements in mold coatings formed by smoking, which will promote and increase the value and use of such coatings in the casting art. A further object is to provide improvements in the method of depositing a carbon film coating by incomplete combustion of acetylene or other smoke producing gases, whereby the coating has greater adhesion to the mold surface with increased permanency and durability. Another object is to improve the toughness and permanency of the carbon film, thereby economically providing a more uniformly satisfactory finish on casting surfaces.

In accordance with the invention we propose to use a binder material in conjunction with the smoke producing flame, said binder being applied in liquid form to the mold surface and decomposed or burned thereon by the heat of the flame from which the carbon film is deposited. Suitable binding mediums include oils, or materials of oily nature such as the higher organic acids, in mixture with a solution of coal tar pitch, or condensed benzene ring compounds derived from coal tar.

bustion will leave a gummy residue on the mold surface tenaciously binding the deposited carbon film. The binder can be applied by brushing or spraying immediately prior to contacting the carbon depositing flame with the mold surface, or the flame may be applied both before and after wetting the surface with the liquid binder. In a third, and preferred, procedure a spray of the binder composition is applied simultaneously with the application of the acetylene or other flame, as the best mold coating is obtained by burning the binder liquid coincidentally with the carbon soot deposition. It is essential to proper adherence, by any of the methods indicated, that the carbon be deposited before the binder medium is entirely decomposed, and that the applied liquid mixture ultimately be burned sufficiently to produce an apparently dry, hard coating.

Acetylene is preferred for producing the sooty deposit and no special technique is required over that shown in the prior art to accomplish satisfactory smoking. Acetylene, burned in the atmosphere from a hand torch or other apparatus under pressures varying from about 3 to 15 pounds per square inch, is usually employed for this purpose, with the flame adjusted so that the luminous part strikes the mold. In this manner the incandescent carbon particles are chilled and condensed on the mold surface, forming the carbon deposit without noticeable escape of smoke into the air. The liquid binder can be applied simultaneously with the carbon deposition, by any suitable means, such as by aspiration under the pressure of the acetylene gas, or by a separate spray head under compressed air. The particular apparatus employed forms no part of the present invention, and the new process is operable with many apparatus embodiments which will be obvious to those skilled in the art.

As suitable oils in the binder liquid, kerosene, turpentine, linseed oil and light motor oils have been used successfully, as have also oily solutions of higher organic acids, such as oleic acid and lactic acid. Additive solutions, miscible with these oils, which have proven satisfactory include naphthalene, anthracene, phenanthrene, and coal tar pitch, dissolved in a benzene solvent. A particularly preferred binder composition consists of a good grade of light motor oil diluted or mixed with a benzene solution of naphthalene, in about equal proportions by weight of the oil and naphthalene solution. The actual amount of naphthalene in the mixture can be varied to suit specific conditions, within the limits of its

solubility in the benzene or other solvent. At normal room temperatures about 40 grams of naphthalene in 100 c. c. of benzene is the approximate saturation point, but in proportions as low as a 9.5% solution very satisfactory results have been obtained. The total amount of liquid necessary to provide a suitable binding action can be determined readily by test, and will vary with the thickness desired in the carbon coat, but it should preferably be used sparingly, and in thin films which upon partial combustion will provide proper coating adherence without leaving an oil-wet surface. A most satisfactory coating is hard, dry and tough, and of a uniform gray appearance. It will resist rubbing by the finger, and is not destroyed by dropping globules of molten metal onto the smoked surface.

With but slight variation the process is applicable to provide improved coatings on almost any type of mold, and a wider field of use of smoke-formed coatings is indicated by the present invention. Satisfactory coatings can be produced on "permanent" or "chill" molds of either cast iron or steel, cured sand molds, and some green sand molds, in the latter instance with the exercise of care to avoid destruction of the mold by the heat and force of the flame. In the casting of iron and steel, alloys, non-ferrous metals including lead, aluminum and brass, and in glass molding, the coating will serve its required function. The vulcanizing and curing of rubber goods, and the molding of plastics are other fields in which the invention has substantial merit. By many tests the heat insulating and mold surface protecting properties of this coating have proven to be substantially better than the carbon film formed by acetylene alone, and this provides improved casting surfaces, and improved fineness of detail. The durability and toughness of the coating is represented by its ability to withstand several casting operations, whereas acetylene soot alone often requires renewal after each use.

Numerous modifications in the procedure described will be evident to those skilled in the art. As a suitable binder liquid a wide scope of selection is presented, and the direct factors causing decomposition of the binder to a gum-like residue are not limiting to the invention. This has been indicated as due to a partial combustion, but a partial oxidation, polymerization, or some other action probably also occurs under the conditions of carbon deposition, and where partial combustion or burning is referred to herein, it is intended to include any associated decomposition reactions. Suitable smoking may be accomplished with gases other than acetylene, and the invention should not be limited other than as defined by the appended claims.

This application is in part a continuation of our prior application Serial No. 297,364, filed September 30, 1939.

We claim:

1. A method of coating molds which comprises applying to the mold surface a liquid mixture composed of an oil and a solution of a condensed benzene ring compound derived from coal tar, and burning said liquid mixture with a carbon depositing flame.

2. A method of coating molds which comprises

applying to the mold surface a liquid mixture composed of an oil and a solution of a condensed benzene ring compound derived from coal tar, and simultaneously depositing a carbon film from a smoke-producing flame adapted to effect partial combustion of said liquid mixture.

3. A method of coating molds which comprises applying to the mold surface a liquid mixture composed of an oil and a solution of a member of the group consisting of naphthalene, anthracene, phenanthrene and coal tar pitch, and subjecting said liquid mixture to partial combustion with a carbon depositing flame of acetylene.

4. A method of coating molds which comprises applying to the mold surface a thin film of a liquid mixture composed of motor oil and a benzene solution of a member of the group consisting of naphthalene, anthracene, phenanthrene and coal tar pitch, and simultaneously applying a carbon deposit and effecting partial combustion of said film by means of an acetylene flame.

5. A method of coating molds which comprises applying to the mold surface a thin film of a liquid mixture composed in about equal proportions by volume of a light motor oil and a benzene solution of naphthalene, and simultaneously applying a carbon deposit and effecting partial combustion of said film by means of an acetylene flame.

6. A method of coating molds which comprises applying to the mold surface a thin film of a liquid mixture composed in about equal proportions by volume of a light motor oil and a benzene solution of naphthalene containing about 9.5 grams to 40 grams of naphthalene per 100 c. c. of benzene, and simultaneously applying a carbon deposit and effecting partial combustion of said film by means of an acetylene flame.

7. A mold having a tough, durable coating thereon, said coating comprising a carbon film deposited by a smoke-producing flame, and an adhesive binding said film to the mold surface, said adhesive constituting the partial combustion residue formed by said flame, while depositing the carbon coating, from a film of a liquid mixture composed of an oil and a solution of a condensed benzene ring compound derived from coal tar.

8. A mold having a tough durable coating thereon, said coating comprising a carbon film deposited by a smoke-producing flame of acetylene, and an adhesive binding said film to the mold surface, said adhesive constituting the partial combustion residue formed by said flame, while depositing the carbon coating, from a film of a liquid mixture composed of an oil and a solution of a member of the group consisting of naphthalene, anthracene, phenanthrene and coal tar pitch.

9. A mold having a tough durable coating thereon, said coating comprising a carbon film deposited by a smoke-producing flame of acetylene, and an adhesive binding said film to the mold surface, said adhesive constituting the partial combustion residue formed by said flame, while depositing the carbon coating, from a film of a liquid mixture composed of a light motor oil and a benzene solution of naphthalene.

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