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PROTECTIVE COVERING FOR MOLTEN METAL

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U.S. Cl. 75—96 2 Claims

ABSTRACT OF THE DISCLOSURE

A very finely divided protective cover for molten metals, produced from easily handleable granules of a protective material such as carbon and a material such as vermiculite which, under the action of the heat of the molten metal, intumesces to disintegrate the granules.

This invention relates to the casting of metals and more particularly to the provision on molten metal of a protective covering and to new compositions for use in the provision of such protective coverings.

It is a well-known practice to apply powdered materials to the surface of molten metal at various stages in its handling for such purposes as fluxing, protection and heat-insulation. The practice is common, for example, in handling non-ferrous metals where the molten metal in the ladle is provided with a protective covering. Such a layer, which may be of a carbonaceous character, serves a number of useful purposes; in particular it serves as a heat-insulating layer to delay the loss of heat from the surface metal and it provides over the metal and atmosphere of a chemically reducing nature so that surface oxidation of the metal is reduced or curtailed.

In the continuous or semi-continuous casting of molten non-ferrous metal the layer is commonly extended to cover the metal in the launder and in the casting die and it serves an additional purpose as a lubricant for the continuously cast billet.

The carbonaceous materials commonly employed for the foregoing purposes include such materials as lamp black, carbon black, micronised graphite and similar materials which are employed in a very fine state of subdivision. It accordingly arises that in the provision of the covering, and later if the covering is disturbed, there are formed clouds of black dust which are both inconvenient and unpleasant to the operatives. An attempt to overcome this objection by granulating the carbonaceous material with the aid of a conventional binding agent, e.g. a gum, dextrin or like material, proves unsatisfactory because the granules tend to retain their granular structure and their heat-insulating properties, and particularly their lubricating properties, are very largely lost.

It is an object of the present invention to provide an improvement in the methods referred to above, and to provide new materials for such uses, whereby the covering material though initially of a granular character is converted in use to a finely divided powder material.

According to the present invention there is provided a granular composition for use in the provision of a covering for molten metal which comprises granules of surface-treating materials as known per se, each granule comprising very finely divided treating material and a substance which on heating will intumesce or generate a gas. When such a composition is put to use the initial granular form of the material avoids the formation of clouds of powdered material. On the other hand, by reason of the presence of the gas-generating or intumescent substance the granules, under the influence of the heat of the molten metal become disintegrated to provide the pulverulent material in the highly desirable very finely divided condition.

The compositions may contain a conventional binder such as dextrin provided that the binding effect of the binder is not so great as to prevent the disintegration effect of the gas generated by the gas-generating additive or of the intumescence of the intumescent additive.

Any substance which, on heating to the temperature of the molten metal, will generate a gas, preferably in large volume, may be employed and it is possible to work with the aid of water alone as the additive present in the granules. In this case the resulting steam affords the disintegrating effect although, for some metals, the atmosphere created is undesirable. Therefore, it is generally preferable to employ dry chemical substances which volatilise or decompose to generate gases which do not contain constituents deleterious to the molten metal. Particularly useful materials are the metal carbonates, e.g. calcium carbonate, urea or any of the gas-generating substances known per se for use as "blowing" agents in the foamed plastics industry e.g. bicarbonates, ammonium nitrate, azo and nitroso compounds. The gas-generating agent should be selected with regard to the desirability of maintaining a suitable atmosphere over the molten metal when the granular composition is put to use.

Suitable additives which intumesce on heating, i.e. which swell or expand, and which may be used in the present invention include materials which exfoliate on heating such as vermiculite and materials which swell such as perlite and powdered sodium silicate. The invention is not, however limited to these substances, and any substance of which the particles will expand substantially on heating may usefully be employed.

The proportion of the gas-generating or intumescent additive in the granules will vary with the particular substance and with the particular substance and with the degree of "explosive" effect sought to be obtained by the gas-generation or intumescence. Generally, in the manufacture of the granular composition, a proportion of gas-generating or intumescent agent not exceeding 50% will be used, the quantity necessary for satisfactory results usually being up to 15% e.g. 0.5 to 10% by weight.

Other materials may be included in the compositions of the present invention for specific purposes. For example it is sometimes desirable to include a slag-forming agent, e.g. a fluoride such as fluorspar.

The following examples will serve to illustrate the invention:

EXAMPLE I

A mixture of 50 parts by weight of carbon black and 5 parts by weight of finely divded chalk was granulated with the aid of 50 parts by weight of water. The granules obtained were dried and applied to the surface of molten copper in a ladle.

It was observed that the granules gently disintegrated to form a layer of very finely divided carbon over the surface of the molten copper without generating clouds of black dust and the resulting cover was found to have heat-insulating properties similar to those of a layer of carbon black of equal thickness conventionally applied.

EXAMPLE II

A mixture of 92 parts by weight of ground charcoal (graded −16+150 B.S.S. mesh). 8 parts by weight of unexfoliated vermiculite (graded −22+60 B.S.S. mesh) and 3 parts by weight of pregelatinised starch was mixed with an equal weight of water and granulated, e.g. by passage through a conventional meat-mincing machine. The granulated product was dried at about 120° C., care being taken not to allow the temperature to exceed 130° C.

The granules were applied to the surface of molten copper as in Example 1 and analogous results were obtained.

The present invention includes both the new compositions herein described and the method of protecting the surface of molten metal by the use thereof, also as herein described.

I claim as my invention:

1. In a treatment of molten metal wherein there is applied to the surface of the molten metal a very finely divided particulate protective covering therefor, the step which comprises adding to the molten metal, to generate such covering, granules each containing a portion of very finely divided carbon, and as a substance which on heating will intumesce, vermiculate, whereby the granules are disintegrated by the heating supplied by the molten metal, said vermiculate being of a size sufficient to pass through a 22 mesh but be retained on a 60 mesh.

2. A protective material for application to the surface of a molten metal, the said protective material being in a granular form in which each granule comprises very finely divided carbon and, as a substance which on heating will intumesce to thereby disintegrate the granule, vermiculate, said vermiculate being of a size sufficient to pass through a 22 mesh but be retained on a 60 mesh.

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HENRY W. TARRINGTON II, Primary Examiner

U.S. Cl. X.R.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,516,821 Dated June 23, 1970

Inventor(s) MAX GERHARD NEU

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Heading, column 1, line 4, after the word England, insert the words --assignor to Foseco International Limited, Birmingham, England, a company of Great Britain. --

SIGNED AND
SEALED
OCT 20 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents