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PROCESS OF PRODUCING POWDERED OR GRANULAR METALLIC MATERIAL

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The present invention relates to a process of bringing metals or metal alloys (hereinafter and in the claims hereof called "metallic material") to the powdered or granular state, and it concerns that process wherein the powdered or granular material is produced directly from the melt. This process is particularly advantageous since it permits of cheap production of powders for mass production purposes. The known process may be carried out by atomizing the melt by means of fluid under pressure, usually by means of compressed air, steam or water under pressure, and atomization may be accompanied by mechanical impact action; or alternatively by causing the melt to run into water and form a granulate, the granular material being further comminuted when a greater degree of fineness is required.

The process according to the present invention has the object of improving the quality of the products manufactured directly from the melt in such manner that they can be used directly for mass production purposes or for obtaining a good quality intermediate product. This applies more particularly in those cases where the metallic material to be reduced to the finely divided solid state is readily oxidisable or contains readily oxidisable constituents, since it has been hitherto impossible or very difficult to prevent a surface oxidation of the individual particles of the finely divided product of the melt. Oxide skins on the powder particles make the powder completely unusable for many purposes; in other cases the power is usable only if its oxygen content can be tolerated or does not cause any decisive impairment of the final product.

According to the present invention it is proposed to add boron to the melt which is then brought directly to the finely divided solid condition, as by atomizing the melt. The boron can be introduced into the melt for example, in the form of a key alloy. Thus if an iron melt is used for producing iron powder or if the melt is of an iron-aluminium alloy for producing a powder of this alloy ferroboron may be added to the melt. Where iron-free melts are employed, the boron may for example be added as a boride of the metal, or of a metal contained in the melt.

The boron addition to the melt may also be in the form of any other suitable chemical compound of boron, for example as borax. It is furthermore permissable to introduce the boron in the form of so-called amorphous boron.

The quantity of boron to be added to the melt is determined according to the particular case in question and need not always be such that the boron is discernible in the manufactured powder since it is has been found that the desired effects of the boron can be obtained even if noticeable quantities cannot be traced in the finished powder. It is of particular importance to have a boron content in the starting powder for producing sintered bodies and in this case such a quantity of boron will generally be used that the presence of the boron is ascertainable in the final product. Use of the process is particularly advantageous when the melt contains readily oxidisable alloy elements such as, for example, chromium, aluminium, silicon and the like, whose oxides cannot be reduced by hydrogen.

The process is of particular importance, for example, for producing powders of rust-resistant and acid-resistant iron or steel alloys, for example, of rust-resistant and acid-resistant chromium-nickel steels having 18% chromium and 8% nickel or alloys of similar composition.

The following embodiments of specific ways of carrying out the invention are given by way of example.

(1) A melt is produced of a rust-resistant and acid-resistant chromium-nickel steel having 18% chromium and 8% nickel. To this melt is added an amount of boron equal to 0.5% of the melt (by weight), the boron being added as a key alloy of ferroboron containing boron in sufficient quantity to give the desired percentage content in relation to the melt. This met is atomized by a blast of compressed air directed into a container so that the particles of the metallic material solidify and are collected. Atomization may be effected by means already employed for producing powdered metallic material by atomization. The powdered resulting metallic material may be sintered to form a desired article.

(2) An iron-free melt consisting of 40% aluminium, 60% nickel. To this melt was added nickel-boride NiB with 15.6% boron in an amount equal to 5% of the melt (by weight). The melt is then atomized by a blast of compressed air into a container so that the particles of metallic material solidify and are collected.

The boron is preferably added in an amount of from 0.5 to 1% of the weight of the melt. Small quantities of from 0.1 to 0.5% of this weight have been found to give good results.

Borides which we have found suitable are nickel-boride, cobalt-boride, and a suitable amount is from 0.5 to 2% of the weight of the melt. Suitable amounts of borax are from 1 to 3%.

What I claim is:

1. In the preparation of a pulverized product from at least one metallic material selected from the group consisting of ferrous metals, ferrous alloys and aluminum and nickel alloys by a process involving the steps of melting said metallic material and atomizing the melt into the finely divided state, the improvement which comprises adding boron to the said melt prior to atomizing same, in the form of material selected from the group consisting of elementary boron, a boron alloy and a boron compound, in an amount from 0.1% to 3%.

2. The improved process of claim 1 wherein said boron is added in an amount from 0.1% up to 0.5%.

3. The improved process of claim 1 wherein the melt is an iron-containing melt and the boron is added in the form of ferroboron.

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