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NITRIDED FERROUS ARTICLE

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3 Claims. (Cl. 148—31)

This invention relates to a new nitrided ferrous article.

Heretofore, so far as I am informed, in preparing a ferrous article for surface nitrogenization, all the metal in the article has been made of the same mixture or alloy. In other words, to get a surface suitable for nitrogenization, the entire piece has been made of a nitridable alloy or of the same composition throughout its mass.

This generally is a disadvantage, first because of the cost, and second because the elements included in the article to make it nitridable are usually detrimental to the texture of the article and often interfere with or prevent heat treatment.

My improved article is made by impregnating the surface thereof to a suitable depth with a metal or alloy having affinity for nitrogen. The article thus treated is then subjected to the action of nitrogen so that a hard nitrided surface will be obtained on the article, and whereby the core or center of the article will be practically untreated and will retain the characteristics due to its original composition or alloy.

In this way almost any ferrous alloy having good properties of strength and that will be insensible to tempering brittleness can be used, thus ensuring better castings, forgings and permitting heat treatment of ferrous articles having nitrided surfaces.

The impregnation of the ferrous article with the metal or alloy having affinity for nitrogen is preferably obtained by bringing the article while very hot into contact with the metal or alloy having affinity for nitrogen in a molten condition. This can be done by immersing the ferrous article while hot in a molten bath of the metal or alloy as shown and described in an application filed by me December 17th, 1931, Serial No. 581,701 on a Method of nitriding ferrous articles.

During this immersion the bath of molten metal having affinity for nitrogen may be subjected to hydrostatic pressure; it may be agitated; the air may be removed from the top of the bath and nitrogen may be applied to the surface of the bath; or an electric current may be passed through the molten bath and the ferrous article. Any one or more of these subsidiary steps may be used during impregnation as described in detail in said application for patent.

After the article has been subjected to this surface impregnation the same is exposed to free nitrogen, whereby the molten metal or alloy which has penetrated into the surface of the ferrous article will be nitrided or hardened.

The improved article also can be produced by bringing the molten metal or alloy into contact with the hot ferrous article and by causing impregnation by the pressure obtained by centrifu-

gal action by the method described and claimed in my application for patent filed December 24th, 1931, Serial No. 583,101.

As stated in the above mentioned application, a surface impregnation is obtained by the process disclosed therein to a depth sufficient to permit machining or grinding of the impregnated article prior to the nitriding step, while still leaving a coating thereon of a metal having an affinity for nitrogen. By proper adjustment of temperatures and speeds, a penetration of about one sixteenth of an inch may be obtained, which is sufficient so that the surface can be nitrided after the article is machined and finished. The impregnation is limited to the surface so that the texture of the core metal will not be changed. Centrifugal action is particularly effective in obtaining this degree of surface penetration.

This impregnated article thus obtained is nitrided as previously described.

The improved article can also be produced by heating the same and then by spraying the surface thereof with the molten metal or alloy having affinity for nitrogen, as by the method described and claimed in an application for patent filed December 24th, 1931, by John M. Collins, Serial No. 583,108, which application is owned by the assignee of this application. The impregnated article thus obtained is nitrided as before described.

As disclosed in the several applications mentioned above, suitable examples of metals having affinity for nitrogen and which may be used in the several processes described, are aluminum, zirconium, titanium, chromium, vanadium, magnesium, beryllium, silicon, nickel, molybdenum, manganese, or any desired combinations of these known to the art for alloying with iron to make up a nitridable alloy.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. A ferrous article having its surface impregnated to a depth of approximately a sixteenth of an inch with a metal or alloy having affinity for nitrogen, and which surface is hardened by nitrogenization.

2. A ferrous article having a surface of denser texture than its interior which surface is impregnated to a depth of approximately a sixteenth of an inch with a metal or alloy having affinity for nitrogen, and which surface is hardened by nitrogenization.

3. A ferrous article having its surface impregnated to a depth of approximately a sixteenth of an inch with aluminum and which surface is hardened by nitrogenization.

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