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STEEL ALLOY

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3 Claims. (Cl. 148—31)

This application is in part a division of my application for steel alloys, Serial No. 189,457, filed May 6, 1927; now Patent No. 1,835,151.

This invention relates to steel alloys susceptible of acquiring a nitride hardened case when subjected to nitriding treatment according to the process disclosed in my U. S. Patent, No. 1,487,554, and to nitride hardened articles made therefrom.

In my earlier patent above mentioned, I have disclosed a process for hardening in their marginal layers articles of manufacture made from steel alloys which contain, either separately or in any desired combination, various alloying elements having the property of promoting nitride hardness in the steel alloy containing them when such alloy is subjected to a nitriding treatment.

In my U. S. Patent No. 1,649,398, I have disclosed a group of steel alloys adapted for the manufacture of nitrided articles, such steel alloys containing a certain percentage of aluminium and one or more of the elements chromium, manganese, silicon, nickel, molybdenum, tungsten, vanadium, titanium and zirconium, the total percentage of the alloying elements other than aluminium being limited to a maximum of 4%.

The present invention has for an object to provide a group of quaternary or still more complex steels in which the proportions of the alloying elements above recited, other than aluminium, are above 4%, and in which aluminium is present in a proportion of from 0.5% to 2.0%. Such steels are characterized by superior mechanical qualities, particularly as regards the core strength and impact resistance. These alloys are easily produced and are well suited for heat treatment in large sections, having particularly good properties as regards toughness and insensitiveness towards temper brittleness. Moreover, the employment of such higher percentages of these special alloying elements permits the introduction into the steel of proportions of aluminium running as high as 2%.

Accordingly, this invention comprises steel alloys and nitride hardened articles made therefrom which contain aluminium in the proportions of from .5 to 2%, and from 4 to 8% of silicon, manganese, nickel, chromium, molybdenum, tungsten, vanadium, titanium or zirconium, either separately or in any desired combination, and up to .7% carbon. In other words, the proportion of either silicon, manganese, nickel, chromium, molybdenum, tungsten, vanadium, titanium or zirconium may amount to between 4 to 8% or any combination of these elements may be used so that the total of the alloying elements other than aluminium and carbon will amount to from 4 to 8%. In general, it is preferable to vary the proportion of aluminium directly with relation to the total percentage of the other alloying elements. When the total percentage of such other alloying elements is around the lower limit of the range specified it is recommended that the proportion of aluminium should be kept at or below about 1% in order not to detract from the mechanical properties and in particular the impact resistance of the product.

Steel alloys according to the invention may contain for example:

1. 0.30% carbon, 0.52% silicon, 1.16% manganese, 2.92% nickel, 1.66% chromium, 0.38% molybdenum and 0.90% aluminium. The Vickers hardness of this steel alloy after 50 hours nitriding at 500° C. was 1114.

2. 0.34% carbon, 0.32% silicon, 0.49% manganese, 1.4% chromium, 1.84% nickel, 0.38% molybdenum and 1.2% aluminium. The Vickers hardness after 96 hours at 500° C. was 950.

I claim:

1. An article of manufacture having a nitride hardened surface and consisting of a steel alloy containing up to .7% of carbon, .5 to 2% of aluminium and more than 4% but not exceeding about 8% of an element selected from the group consisting of silicon, manganese, nickel, chromium, molybdenum, tungsten, vanadium, titanium and zirconium, with the balance substantially all iron.

2. An article of manufacture having a nitride hardened surface and consisting of a steel alloy containing up to .7% of carbon, from .5 to 2% of aluminium and more than 4% but not exceeding about 8% of a plurality of elements selected from the group consisting of silicon, manganese, nickel, chromium, molybdenum, tungsten, vanadium, titanium and zirconium, with the balance substantially all iron.

3. An article of manufacture having a nitride hardened surface and consisting of a steel alloy containing up to .7% of carbon, .5 to 2% of aluminium and more than 4% but not exceeding about 8% of chromium, with the balance substantially all iron.

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