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SALT BATH FOR TREATING STAINLESS STEEL PRODUCTS

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3 Claims. (Cl. 148—15)

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The present invention relates to metallurgy and more especially to a heat treatment liquid salt bath for heat treatment of stainless steels.

Stainless steel of the 18% chrome-8% nickel type, which are known as austenitic stainless types of steel, and certain chrome types containing from 4% to 30% chrome with low carbon, may be descaled or annealed by this method. Some of the conventional steels known by their AISI steel numbers are types 130, 305, 306, 307, 312, 315, 320, 327, 343, and 418.

The present invention is designed for annealing and quenching of workpieces of stainless steel wherein the workpieces are thoroughly heated in a No. 1 bath from 1850° F. to 1950° F., are then quenched in a No. 2 bath at a temperature from 600° F. to 900° F., and are held at the lower temperature for a short time, dependent upon the size of the workpieces and the characteristics desired and are then quenched in cold water.

The first or No. 1 bath, adapted to be heated from 1850° F. to 1950° F., preferably comprises a molten salt bath of barium chloride, potassium chloride, calcium fluoride and barium fluoride, wherein the barium chloride is 80% to 90%, potassium chloride from 4% to 7%, barium fluoride 2% to 5%, and the calcium fluoride from 4% to 10%. The preferred bath comprises barium chloride 85%, potassium chloride 6%, barium fluoride 4%, and calcium fluoride 5%. The workpieces are submerged in this bath which is held at the temperature specified until the workpieces are entirely heated throughout to the temperature of the bath. In view of the high temperature of the No. 1 bath, it may be desirable to use any well-known preheating bath to raise the temperature of the stainless steel articles to from 1450° F. to 1600° F., before they are introduced into the No. 1 bath.

The No. 2 bath comprises preferably sodium hydroxide 30% to 65%, potassium hydroxide 30% to 65%, and sodium cyanide 2% to 10%. The preferred percentages are sodium hydroxide 47%, potassium hydroxide 47%, and sodium cyanide 6%. This bath is a quenching bath and is adapted to operate preferably at about 600° F. to 900° F. In bringing work over from the No. 1 bath into this No. 2 quenching bath, there may be a slight contamination from the No. 1 bath which adheres to the work during the transfer. There may also be a slight contamination of iron, usually a slight amount of iron oxide. The No. 2 bath may be rectified by slight additions of sodium cyanide which overcomes the effect of the iron oxide, thereby obviating stains on the work, and

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when the No. 2 bath is properly rectified, the work leaves this bath with a clean bright surface. The work is retained in the No. 2 bath for some period of time and in any event until it has reached the temperature at which the No. 2 bath is being operated. The time will be dependent on the size and character of the workpieces.

After the work is taken from the No. 2 bath, it may be quenched in cold water which washes the salts from the work, since these salts are soluble in water, but no oxidation occurs because the hot work is submerged in the water and the work is cold when it is removed from the water.

These two baths operate to produce a clean bright finish on the stainless steel parts which are being treated and to this end it is desirable that the parts be covered with the salts of a preceding bath during the time the parts are being transferred through the air from one bath to the other. This prevents direct contact of the air with the work and thus avoids oxidation. However, the baths are so constituted as to remove any very slight oxidation that might occur during this transfer. These baths remove all fluxes, welding scale, rubber particles, paints, lacquers, oxides or other coatings, thus leaving the work bright and clean.

The No. 1 bath is preferably heated in a ceramic pot using an electric electrode furnace. However, the No. 2 bath will be used in a metal pot and the electrodes may be made of chrome-iron 20% to 30% chromium, or of nickel-chrome 8% to 12% chromium. Either of these materials is suitable for electrodes, provided the sodium cyanide content is maintained at above 1% in the basic salt bath. A ceramic pot will not operate satisfactorily with this No. 2 bath because of the alkaline properties of the chemicals.

The use of sodium cyanide not only aids cleaning of the oxides but also aids in preventing the hydroxides from converting to carbonates in their reaction with the atmosphere.

What I claim is:

1. The method of heat treating parts of stainless steel of the 18% chrome-8% nickel type having surface scale, fluxes, oxides, paint or the like to clean and anneal the same and produce a non-oxide bright finish thereon, comprising: heating the workpieces in a No. 1 liquid salt bath operated at a temperature from 1850° F. to 1950° F., the No. 1 bath being barium chloride 80% to 90%, potassium chloride 4% to 7%, barium fluoride 2% to 5%, and calcium fluoride 4% to 10%; retaining the parts in the No. 1 bath until the parts are heated to the temperature of the No. 1 bath;

transferring the parts from the No. 1 bath to a No. 2 bath in a metallic pot and without substantial loss of temperature to the parts during said transfer, said No. 2 bath being sodium hydroxide 30% to 65%, potassium hydroxide 30% to 65%, and sodium cyanide 2% to 10%, and the No. 2 bath being operated at a temperature from 600° F. to 900° F.; retaining the parts in the No. 2 bath until the parts have acquired the temperature of the No. 2 bath; and quenching the parts to atmospheric temperature.

2. The method of heat treating stainless steel parts to produce a non-oxide bright finish thereon according to claim 1, and where the No. 2 bath comprises substantially 47% sodium hydroxide, 47% potassium hydroxide and 6% sodium cyanide.

3. The method of heat treating stainless steel parts to produce a non-oxide bright finish thereon according to claim 1, wherein the No. 1 bath comprises substantially barium chloride 85%, potassium chloride 6%, barium fluoride 4%, and calcium fluoride 5%.

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