

UNITED STATES PATENT OFFICE

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PROCESS OF CLEANING METAL

No Drawing.

Application filed August 14, 1930. Serial No. 475,374.

In the manufacture of Babbitt lined steel backed bearings it is customary to first shape the steel backs, then clean them, dip them in tin, and cast a lining of babbitt on the interior of the tinned back. It is essential that a good bond be formed between the back and the lining, otherwise the bearing will have short life. In order to get a good bond it is essential that the back be thoroughly cleaned so as to remove all oxide and other foreign material and it is also preferable that the back be slightly roughened. Ordinary methods used in cleaning metal have proven inadequate with the result that poor bonds are obtained.

The method of cleaning steel disclosed in this application fully satisfies the requirements above outlined and makes it possible to produce a bond which I believe is superior to any heretofore obtained. The method is not expensive and is being successfully used in production on a large scale.

The sheet steel, usually a commercial grade of carbon steel, is first cut and formed into the shape of half bearings, and is then washed in a hot alkali bath and rinsed in water. The piece is then cleaned in a hot alkali bath, electric current being passed through the bath, the iron tank serving as the anode, and the work as the cathode. I have found it best to use a current density around 50 to 60 amperes per square foot and to continue the operation for about two minutes. In this and the other baths the voltage applied is not critical. I have used from 4 to 8 volts in accordance with current practice. The piece is then again rinsed.

The above cleaning operations serve to remove the oil and grease from the surface of the piece.

The next step is electric pickling in hydrochloric acid. I have found it preferable to use a solution of 50% commercial hydrochloric acid (sp. gr. 1.18). The bearing backs are suspended in the bath in lead holders. The tank is rubber lined. The bearings serve as the anodes. Lead cathodes are used. I prefer to use a current density of about 100 to 200 amperes per square foot and to continue the pickling for about five minutes.

During this operation the oxide is removed from the surface of the metal, and there appears upon the surface a black carbonaceous deposit which I believe to be the carbon residue left when the iron goes into solution.

The bearings are then rinsed preparatory to the next electric pickling operation. In this operation a chromic acid solution is used containing of approximately the following composition.

CrO₃----- 200 grams per liter of solution
H₂SO₄----- 2 grams per liter of solution

This bath is preferably maintained at a temperature of about 100 to 130 degrees Fahrenheit by means of a steam coil. The bearings are supported on lead holders and serve as the anode. The iron tank is the cathode. I have found it best to use a current density of from 50 to 150 amperes per square foot and to continue the operation for about one minute. We have found it necessary to vary the temperature or current density at times to remove stain from the metal.

As a result of this operation the carbonaceous deposit is removed from the surface of the metal, and I think the carbon is dissolved in the bath, for it is well known that chromic acid is a strong oxidizing agent.

As a result of the described cleaning operations, the backs now present an etched appearance, and while bright, look gray by comparison with their previous condition.

The backs are then rinsed, immersed in a fluxing bath, tinned and babbitted.

The process described is capable of some modification. Sulphuric acid may be used in place of the hydrochloric acid, although I have found the latter preferable. It may be desirable to heat the hydrochloric or sulphuric acid bath, for in the use of the bath the iron from the bearings reduces the free acid and renders it less effective as time goes on and this would to some extent be counteracted by the use of heat. Fairly satisfactory results may be obtained by omitting the electrical treatment in the hydrochloric acid bath but this makes a longer period of treatment necessary.

I have described my cleaning process used

in the manufacture of bearings but it is obvious that it is of general utility for cleaning metals, for example, brass, nickel and iron.

5 I claim:

1. The method of cleaning carbon steel and analogous material which consists in immersing the metal in a bath of hydrochloric acid, to remove oxides and other foreign material from the surface of the metal and leaving a coating of oxidizable material thereon, and thereafter immersing the metal in a bath of chromic acid, and passing current through the bath with the metal acting as the anode to remove the oxidizable material.

2. The method of cleaning metal such as steel, iron, brass or nickel which consists in immersing the metal in a bath of hydrochloric acid, passing current through the bath with the metal acting as the anode to remove oxides and other foreign material from the surface of the metal and leaving a coating of oxidizable material thereon, and thereafter immersing the metal in a bath of chromic acid, and passing current through the bath with the metal acting as the anode to remove the oxidizable material.

3. The method of cleaning carbon steel and analogous material, which consists in immersing the material in a bath of hydrochloric acid, passing current through the bath with the metal acting as the anode to remove the oxide coating from the metal leaving a carbonaceous coating thereon, and thereafter immersing the metal in a chromic acid bath, and passing current through the bath with the metal acting as the anode, to remove the carbonaceous coating.

4. The method of cleaning steel and the like which consists in subjecting the object as an anode to the action of an electric current in a solution of approximately 50% HCl to remove the oxide coating, said bath leaving an oxidizable deposit on the metal, and thereafter subjecting the object as an anode to the action of an electric current in an aqueous solution containing approximately 200 grams of chromium oxide and 2 grams of sulphuric acid per liter.

5. The method of cleaning steel and the like which consists in subjecting the object as an anode to the action of an electric current having a density of approximately 100 to 200 amperes per square foot in a strong

solution of hydrochloric acid to remove the oxide coating, said bath leaving an oxidizable deposit on the metal, and thereafter subjecting the object as an anode to the action of an electric current having a density of approximately 50 to 150 amperes per square foot, in a strong solution of chromic acid, to remove the deposit.

6. The method of cleaning steel and the like which consists in subjecting the object as a cathode to the action of an alkaline electrolyte to remove grease and dirt, then subjecting the object as an anode to the action of hydrochloric acid to remove the oxide coating from the metal, said bath leaving an oxidizable coating on the metal, and thereafter subjecting the object as an anode to the action of an electrolyte having as its principal active constituent chromic acid.

7. The method of cleaning metal such as steel, iron, brass or nickel which comprises immersing the metal in a bath of hydrochloric acid and passing current through the bath with the metal acting as the anode.

8. The method of cleaning metal such as steel, iron, brass or nickel which comprises immersing the metal in a bath of hydrochloric acid and passing current through the bath by means of lead cathodes, the metal to be cleaned acting as the anode.

9. The method of cleaning metal such as steel, iron, brass or nickel which comprises immersing the metal in a solution of approximately 50% hydrochloric acid and passing current through the bath with the metal acting as the anode.

10. The method of cleaning metal such as steel, iron, brass or nickel which comprises immersing the metal in a solution of approximately 50% hydrochloric acid and passing current of the order of 100 to 200 amperes per square inch through the bath with the metal acting as the anode.

11. The method of cleaning metal such as steel, iron, brass or nickel which consists in immersing the metal in an alkaline electrolyte and passing current through the bath with the metal acting as the cathode, and then immersing the object in a bath of hydrochloric acid and passing an electric current through the bath with the metal acting as the anode.

In testimony whereof I affix my signature.

AUSTIN B. WILSON.