

UNITED STATES PATENT OFFICE

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ELECTROLYTIC CLEANING OF METAL

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This application is a continuation-in-part of my copending applications, Serial No. 548,792, filed August 9, 1944 (now abandoned), Serial No. 558,459, filed October 12, 1944 (now abandoned), and Serial No. 613,715, filed August 30, 1945, and relates to the art of treating metals and particularly of a method of treating metals electrolytically to clean the surface thereof, and a bath for such treatment.

In describing the invention of this application, I will relate it as an example to a work piece in the nature of a commercial gray cast-iron piece, partly coated with scale, and partly machined, to be immersed in the bath. Such pieces usually contain, in the surface, many ingredients which are impurities, and many which are not, but which, with the impurities, are to be removed by the bath hereof, in order to leave the surface a thin layer of pure ferrite.

In the bath, work pieces, deposited in a perforated metal basket, may be immersed. An electric current is then applied to that metal basket of such a nature that the work piece, or the basket, forms a cathode, with the bath receptacle or any other element forming the anode.

Thereupon the current is reversed so that the work pieces or the basket containing them is made the anode, and the receptacle or some other element is made the cathode.

Thereafter the current is reversed again so that the work pieces or the basket containing them is a cathode. This is the final step in the preparation of the work piece surface for the further processing.

The bath is of a molten salt type and contains a composition comprising a mixture formed by fusing or melting together a predominant or major proportion of a caustic alkali such as sodium hydroxide or potassium hydroxide in the proportion of 75% to 90% and minor proportions of 7% to 13% sodium chloride, sodium fluoride used in proportions 2% to 6% and sodium aluminate used in proportions of 0.5% to 5%, all proportions by weight.

The preferred bath is a molten salt bath consisting of about 85% of sodium hydroxide, about 10% sodium chloride, about 4% sodium fluoride, and about 1% sodium aluminate, by weight.

The sodium fluoride is used for purposes of removing sand inclusions from the metal surface. Where the metal has no sand as impurity the sodium fluoride may be omitted. For sand-free metal the bath may have a preferred composition 89% caustic soda, 10% sodium chloride and 1% sodium aluminate.

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As variations in the process, it is possible to repeat the steps of the process, as much as needed, without taking the work piece out of the bath, and merely by continued applications of current, reversing the current from time to time. This may be prolonged to any extent needed in order to continue the treatment of the metal and to attain a higher and higher degree of purity of the ferrite surface until the desired maximum is attained.

For other types of work pieces, other variations are possible. If the work piece is covered with scale, partly or wholly, the current is first applied with the work piece as a cathode; however, if there is no scale, this step may be omitted and the first application of current may be with the work piece as the anode.

If the casting has only sand on its surface, the sand may be removed by using the work piece as the cathode.

If the work piece contains nickel or other ingredients, which are insoluble in the bath, even with the electric current applied, then we first use the process hereof and thereafter immerse the work piece in a suitable acid to remove the nickel or similar ingredients and then we repeat the process hereof to the extent necessary to get the desired results.

The temperature of the bath may be between 600 and 1000 degrees Fahrenheit, but optimum results have been obtained at 850-900 degrees Fahrenheit.

The electrical current is slow alternating or successively reversed direct, of 4 to 6 volts, with a preferred intensity of 50 amperes per square foot. I have found that five minutes has proven satisfactory when the work piece is an anode and ten to thirty minutes when the work piece is a cathode.

Now having described the bath hereof, reference should be had to the claims which follow:

What is claimed is:

1. A composition for electrolytic cleaning of metal consisting essentially of a major proportion of caustic alkali and minor proportions of sodium chloride and sodium aluminate, said sodium aluminate being present in proportions of .5 to 5% by weight.

2. A composition for electrolytic cleaning of metal consisting essentially in approximate proportions by weight of 75-90% of caustic soda, 7 to 13% of sodium chloride, and 0.5 to 5% sodium aluminate.

3. A composition for electrolytic cleaning of metal consisting essentially in approximate pro-

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portions by weight of 75 to 90% caustic soda, 7 to 13% sodium chloride, 2 to 6% sodium fluoride and 0.5 to 5% sodium aluminate.

4. A composition for electrolytic cleaning of metal comprising in approximate proportions by weight 89% caustic soda, 10% sodium chloride and 1% of sodium aluminate.

5. A composition for electrolytic cleaning of metal comprising in approximate proportions by weight 85% caustic soda, 10% sodium chloride, 4% sodium fluoride and 1% of sodium aluminate.

6. An electrolytic process for transforming the surface of a ferrous metal work piece completely into a layer of pure ferrite comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions by weight of a major proportion of caustic alkali, a minor proportion of sodium chloride and 0.5 to 5% of sodium aluminate, and directing successively reversed direct currents from the work piece through the bath.

7. An electrolytic process for transforming the surface of a ferrous metal work piece completely into a layer of pure ferrite comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions by weight of 75 to 90% of caustic soda, 7 to 13% of sodium chloride, and 0.5 to 5% of sodium aluminate, and directing successively reversed direct currents from the work piece through the bath.

8. An electrolytic process for transforming the surface of a ferrous metal work piece completely into a layer of pure ferrite comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions by weight of 75 to 90% caustic soda, 7 to 13% of sodium chloride, 2 to 6% of sodium fluoride and 0.5 to 5% of sodium aluminate, and directing successively reversed direct currents from the work piece through the bath.

9. An electrolytic process for transforming the

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surface of a ferrous metal work piece completely into a layer of pure ferrite comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions by weight of 89% caustic soda, 10% of sodium chloride and 1% of sodium aluminate, and directing successively reversed direct currents from the work piece through the bath.

10. An electrolytic process for transforming the surface of a ferrous metal work piece completely into a layer of pure ferrite comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions of 85% sodium hydroxide, 10% sodium chloride, 4% sodium fluoride, and 1% sodium aluminate, by weight, and directing successively reversed direct currents from the work piece through the bath.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,731,269	Rich	Oct. 15, 1929
1,826,773	Grebe et al.	Oct. 13, 1931
2,261,744	Ostrowsky	Nov. 4, 1941
2,311,139	Tainton	Feb. 16, 1943
2,327,870	Coxe	Aug. 24, 1943

FOREIGN PATENTS

Number	Country	Date
442,859	Great Britain	Feb. 7, 1936

OTHER REFERENCES

"Iron and Steel," June 1944, pages 501 through 505.

"Zeitschrift fur Elektrochemie," vol. 7 (1901), page 723.