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PROCESS OF PRODUCING IRON SHEETS FOR LAMINATED ELECTRIC TRANSFORMER CORES

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1 Claim. (Cl. 148—4)

In the usual process of producing the sheets from which laminated electric transformer coils and dynamo armatures are built up the sheets are produced by hot-rolling, then pickled for removal of scale, washed and neutralized by treatment with lime, and washed and dried. These preliminaries are followed by cold-rolling for smoothing the surfaces, and this in turn is followed by annealing, which again produces scale necessitating treatment for removal thereof, generally by a bath of hydrochloric acid, after which the sheets are washed with water, treated with lime or soda, and finally polished and dried.

The second production of scale in the course of these operations, following the annealing by heat, not only involves the after-treatment described but results in some loss of material. To avoid this it has been proposed to give the sheets a protective coating before they are annealed, for example a coating of nickel, chromium, tin, zinc, aluminium or other metal, but in practice this method is not workable. An even metal coating suitable for the purpose can only be produced by an electrolytic process, which is too expensive, and the quality of the sheets from the electromagnetic point of view is deteriorated by the coating of another metal. Owing to the silicon content of the iron the metal coating tends to produce, on the surface, a mixture of silicic acid and metal oxide, which must be removed.

It has also been proposed to coat the sheets with water-glass or with a mixture of water-glass and powdered tin, but tests have shown that the water-glass tends to roughen the surfaces of the sheets, due to deposits left thereon, and the coating does not eliminate risk of rust. Moreover, the water-glass makes it more difficult to apply insulation between the sheets.

In some processes of manufacture articles which require annealing are first given a coating composed of a halogen salt of an alkali mixed with a base such as calcium fluoride or calcium chloride. This method is not suitable for transformer sheets, because a special cleansing process is necessary for removing the coating, and the surfaces of the sheet would thereby be damaged.

According to my invention the sheets produced by hot-rolling and then pickled and polished are, before or after being cold-rolled, given an alkaline coating, and then annealed. In this way very smooth surfaces can be obtained, and the transformer losses are low. Preferably the coating is applied before the cold-rolling.

The dipping of the sheets into an alkaline solution before they are annealed effectively prevents the formation of scale. A phosphate solution is particularly suitable, especially a solution of tri-sodium phosphate.

It will be seen from the above statement of my invention that the operatives involved may be carried out in the following order:

(*a*) Hot-rolling, following by pickling and polishing.

(*b*) Coating with tri-sodium phosphate or equivalent alkali, and drying.

(*c*) Cold-rolling for smoothing the sheets.

(*d*) Annealing.

If this order is varied by cold-rolling the sheets before applying the coating two drying operations are required, one after the pickling and polishing or cleaning and one after applying the coating. With the preferred order first stated there is only one drying operation.

The coating may be applied by dipping the sheets, but it is preferred to spray them with the solution. The sheets may for this purpose be caused to travel over or under a transverse series of sprayer tubes from which the solution is projected under pressure, a very even coating being thus obtainable.

An important advantage obtained by the process when the coating is applied before the cold rolling is that coating then acts as a smoothing agent.

Instead of phosphates I may use other agents precipitated from aqueous solution, e. g. sodium aluminate.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

A process for producing iron sheets with a silicon content for use in making electric transformer cores, which consists in hot rolling the iron to give it sheet form, pickling and cleaning the hot rolled sheets, applying a coating of tri-sodium phosphate, and then drying, cold rolling and annealing.

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