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METHOD FOR PREVENTING "AGING" IN SILICON STEEL SHEETS

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1 Claim. (Cl. 148—21.5)

My invention relates to magnetic material and more particularly to a method for preventing "aging" in annealed steel sheets.

If silicon steel sheets are subjected to a single sheet anneal, i. e. an anneal in which spaced sheets are passed through an annealing furnace, as disclosed for example in Ruder Patent No. 1,156,496, the resulting product has a low total watt loss when employed as core material for alternating current transformers and the like. The annealed sheets however do not retain their high magnetic qualities indefinitely. They have a tendency to "age" causing thereby an increase in the total watt loss of the material which varies from about 30 to 60%.

It is an object of the present invention to provide a method for treating annealed silicon steel sheets whereby subsequent "aging" of the sheets may be prevented. I am aware that processes for normalizing annealed silicon steel sheets have been devised, such processes involving the use of a heating cycle. It has been my experience however that such normalizing processes do not prevent subsequent "aging" in silicon steel sheets.

In accordance with the present invention, the silicon steel sheets to be annealed may contain up to about 7% silicon and may be pickled or unpickled as desired. The furnace atmosphere employed may be any usual atmosphere but preferably hydrogen. The annealing process is carried out by passing single or isolated silicon steel sheets through a furnace in which the sheets are heated to a temperature above 800° C. but preferably between 850° C. and 1100° C.

In accordance with the present invention when the sheets are removed from the annealing furnace they are slowly cooled to a temperature of 500° C. to 550° C. I prefer to cool the sheets at a rate of 4½° C. or less per minute. However, the cooling rate may be as high as 8° C. per minute but at the latter rate there is some danger that the sheets may subsequently "age". When the sheets have reached a temperature of about 500° to 550° C. they are air cooled to room temperature.

The cooling process may be carried out in any convenient manner. For example a long cooling furnace may be employed through which the sheets may pass continuously and in which the cooling zone is regulated to give the desired temperature drop. Also, a well insulated cooling pit may be employed to obtain the desired cooling rate. The pit when empty may be heated to the temperature of the anneal. The single sheets as removed from the annealing furnace may be quickly placed in the pit one on top of the other and as the load of the annealed sheets is increased the heating of the pit is decreased until finally the heat from the incoming annealed sheets is sufficient to prevent the remainder of the annealed load from cooling too rapidly. When the pit is full it may be covered until the sheets last placed in the pit have reached a temperature of about 500° C. The whole load may then be removed and cooled to room temperature.

I have found that annealed silicon steel sheets cooled in accordance with the present invention do not "age" and that they retain indefinitely the desirable magnetic properties developed by the single sheet annealing process.

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

The process of treating silicon steel sheets which comprises annealing single silicon steel sheets at a temperature above 800° C., cooling the sheets to a temperature of about 500 to 550° C. at a rate of about 4½° C. per minute, and then cooling the sheets from the latter temperature to room temperature.

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