MANUFACTURING PROCESS FOR MAGNET STEEL STRIPS WITH ORIENTED GRAINS

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2 Claims

ABSTRACT OF THE DISCLOSURE

Method of making generally cylindrical cores from magnetic steel wherein a rolled steel strip having grain orientation in the direction of rolling is, after the rolling process and preliminary heat treatment, severed transversely into sections of a length equal to the altitude of the cylindrical core, the sections being welded together laterally to form a strip with grain orientation in the direction of the width and being then coiled after further heat treatment or the like.

The present invention relates to a process for manufacturing strips with oriented grains of magnetic steel, employed for magnetic cores in power transformers and chokes.

Strips with oriented grains of cold-rolled magnetic steel are known to have much higher permeability than hot-rolled sheet but only in the rolling direction, that is in the direction of their length (major dimension), while in the transverse direction the permeability is about 3½ times lower, being thus less than that of hot-rolled sheet. Due to this shortcoming, these strips cannot serve for manufacturing coiled magnetic cores for magnetic circuit columns. In view of the fact that the plates—when used as components of transformer magnetic cores—require a much wider range of widths than of lengths, and that for each plate width it is necessary to provide a strip of corresponding width the number of band widths necessary is very large.

The known coiled magnetic cores of oriented-grain strip cannot be employed for transformer columns of cores because in such use the axis coincides with the band width and therefore with the unfavorable grain direction. For the columns of three-phase symmetrical magnetic circuits, cores of plates bent in to circular evolute are employed. Such cores are very complicated and their manufacture is expensive.

According to the present invention, the grains in the strip are directed in the sense of its width. This strip is obtained from an ordinary strip, whose grains are directed in the direction of its length, by cutting it into plates, the cut being directed crosswise, and by butt welding together the plates, along the edge resulting from the rolling, so that a strip with cross directed grains results.

Following examples of the embodiment of the invention: The steel strip with longitudinally directed grains, as manufactured at present, either as a finished product or as a half-finished product having undergone the rolling process, is cut—immediately after rolling or after having undergone any of the finishing operation or the heat treatment—in the direction of its width, into plates of a length equal to the desired width of the strip to be manufactured, but not longer than admissible for the welding set employed. The cut plates are rotated through 90° and butt welded. Thus a new strip results, but with cross directed grains. After welding, the strip undergoes all the other finishing and heat treatment processes, which are usual in manufacturing cold-rolled strip with directed grains. This strip is coiled over a mandrel of given diameter or else about the bolt designed to consolidate the magnetic circuit, until reaching the necessary diameter and, after having undergone the heat treatment prescribed for any flat cold-rolled product with oriented grains, constitutes a column for magnetic circuits. This column has a height equal to the width of the strip having served for its manufacturing. The welds being directed along the magnetic flux do not interfere with the reluctance of the magnetic core.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a diagrammatic view (plan) of the first magnetic steel strip of this invention;
FIG. 2 is a plan view showing the sections after severance from the first strip;
FIG. 3 is a plan view showing the sections upon their rotation;
FIG. 4 is a plan view showing the second strip after the butt-welding step; and
FIG. 5 is a perspective view representing the core as it is wound upon the mandrel.

In FIG. 1, I show a magnetic-steel strip 14 which is rolled from the crude band 10 and subjected to the normal cold-rolled steel processing used to produce a longitudinal grain orientation 11. The broken lines 12 represent locations at which the strip 10 can be severed to form sections 13 (FIG. 2) whose edges 15 are, upon rotation of the plates, butt-welded together at 41 in a contiguous manner to form the cross-oriented second strip 40. The latter is wound about a mandrel 51 (FIG. 5) such that the grain orientation is parallel to the axis of the core and so that the core diameter 52 reaches the desired level. The free end of the coil of the strip is represented at 53.

What is claimed is:
1. A method of making a generally cylindrical magnetic core from a magnetic-steel band, comprising the steps of:
(a) rolling said band of magnetic steel and heat treating same to form a first longitudinally extending strip with grain orientation in the longitudinal direction thereof and in the direction of rolling and a width equal substantially to the altitude of the cylindrical core;
(b) cutting said first strip transversely into a multiplicity of generally rectangular sections with lateral edges parallel to the direction of grain orientation;
(c) butt welding a multiplicity of said sections in contiguous relationship at said lateral edges to form a second magnetic-steel strip with transverse grain orientation; and
(d) coiling said second strip with the butt-welded edges and grain orientation parallel to the coil axis to form said core.
2. The method defined in claim 1, further comprising the step of:

(e) heat-treating said second strip prior to coiling same in step (d), the coiling of said second strip being effected about a mandrel.

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