Jan. 27, 1959 H. B. HANSEN ET AL 2,870,525

METHOD OF TRANSFORMER ASSEMBLY USING DIVIDED TANK AND BANDING PLATE

Filed Dec. 10, 1954 2 Sheets-Sheet 1

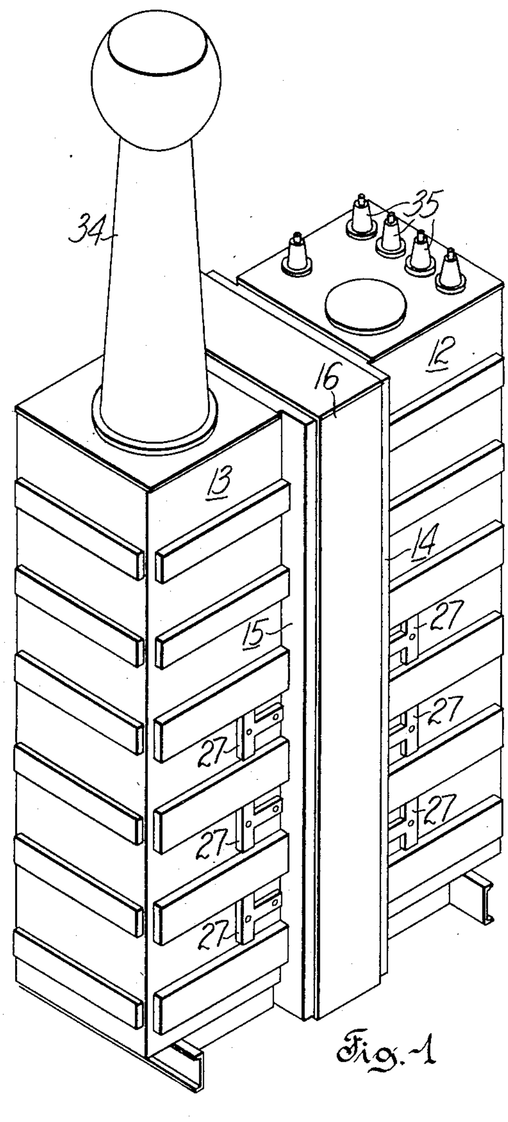

Fig. 1

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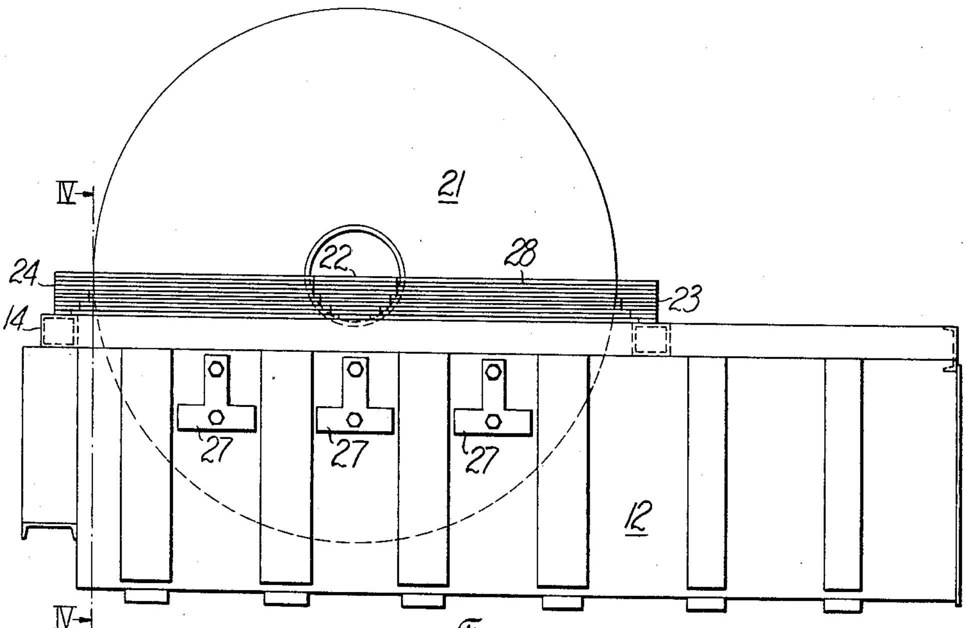

Fig. 3

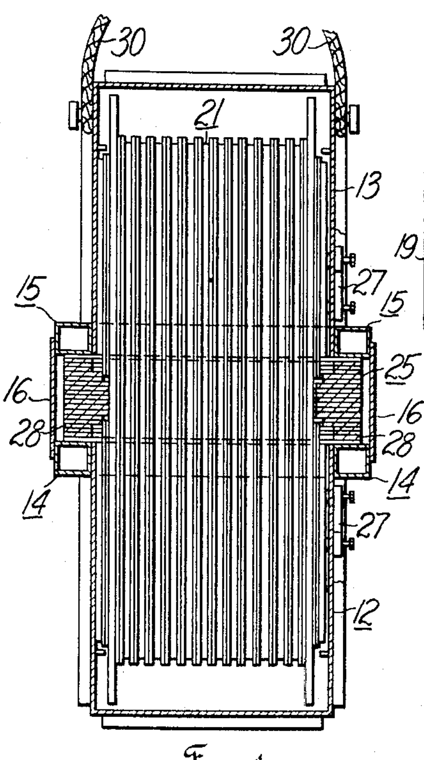

Fig. 4

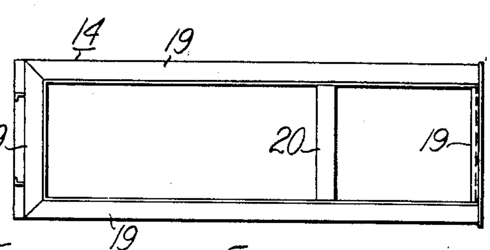

Fig. 2

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2,870,525
Patented Jan. 27, 1959

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METHOD OF TRANSFORMER ASSEMBLY USING DIVIDED TANK AND BANDING PLATE

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Application December 10, 1954, Serial No. 474,454

3 Claims. (Cl. 29—155.58)

This invention relates in general to transformers and in particular to an improved method of assembling a transformer in which the core and coil assembly forms an integral part of the transformer tank.

Laminated magnetic cores must of necessity be provided with some type of clamping means to hold the laminations firmly in place after the core is assembled so that they do not vibrate when the transformer is energized or do not shift with respect to each other when the transformer is moved.

Several methods have been suggested in the prior art for clamping the laminations but each of the methods has one or more disadvantages. One method disclosed in the prior art suggests the use of bolts which extend through the laminations at the corners of the core. While this method of clamping the laminations is mechanically adequate it requires accurate punching or drilling of each lamination. The use of the core bolts in the core also increases the losses in the core. In addition, each bolt which passes through the laminations requires suitable insulation between the bolt and the lamination to prevent the bolt from short circuiting together all of the laminations of the core.

Another suggested manner of clamping the laminations of the core comprises the use of separate end frames which are disposed on opposite sides of the core and are held together by bolts. This method has proved satisfactory for transformers of not too large ratings, however, the use of separate end frames adds to the size of the transformer tank and increases the total weight of the assembled unit.

In constructing relatively large transformers various size and weight limitations are imposed by shipping facilities which makes it impossible to use separate end frames for clamping the core.

According to the present invention the improved method provides for constructing a transformer without the use of core bolts or separate core clamps while still allowing the laminations of the core to be clamped to a predetermined pressure with a minimum of labor and time.

It is therefore an object of the present invention to provide an improved method of assembling an enclosed stationary induction apparatus having a laminated magnetic core.

Another object of the present invention is to provide an improved method of assembling a transformer having a laminated magnetic core to allow clamping the core laminations to a predetermined pressure without the use of separate clamping devices such as core bolts.

Objects and advantages other than those mentioned above will be apparent from the following description when read in connection with the drawing in which:

Fig. 1 is an isometric view of a transformer assembled in accordance with the improved method of the present invention;

Fig. 2 is a plan view illustrating the transformer shown in Fig. 1 during the initial steps of construction;

Fig. 3 is a view in elevation illustrating the transformer shown in Fig. 1 during the intermediate steps of the construction; and

Fig. 4 is a sectional view of the transformer shown in Fig. 1 taken along the line IV—IV in Fig. 3 illustrating the transformer during the final steps of construction.

As shown in Fig. 1 the transformer tank comprises two similar rectangular sections **12** and **13**, a pair of end frames **14** and **15** welded to the sections of the tank, and a banding plate **16** welded between the end frames to completely enclose the core and coil assembly of the transformer.

In constructing the transformer shown in Fig. 1 the two similar tank sections **12** and **13** are first constructed by any of the methods known in the art. Each section has a bottom plate and four side plates welded together to form a boxlike structure having a rectangular open end which is defined by the edges of the four side plates. The next step consists of providing a surface for stacking the laminations of the core. This is accomplished by welding suitable channel members **19** around the perimeter of the section adjacent the edges which define the rectangular open end, as shown in Fig. 2. Both sections **12** and **13** of the tank are provided with these channel members **19** which in addition to adding mechanical strength to the sections serve as the end frames **14** and **15** for the magnetic core of the transformer. If the magnetic core is not to extend the full length of the channels, then the end frames may be completed by providing a channel member **20** between the lengthwise sides of the section. The rectangular end frames **14, 15** are completed by welding this additional channel member **20**, transverse to the lengthwise direction of the section and in the same plane as the other channels.

One of the tank sections for example section **12**, is then disposed with the end frame **14** in a horizontal plane and the open end of the section disposed upward as shown in Fig. 3. With the section so disposed, the winding assembly **21** of the transformer is lowered into section **12** until the axis **22** of the winding is disposed horizontally a predetermined distance above end frame **14** and spaced equally from the portions of the end frames which support the outer legs **23, 24** of the magnetic core. When the winding assembly is suitably positioned it is clamped in this position by temporary clamps (not shown) or the permanent coil clamps **27** which extend through the tank walls.

With the winding assembly **21** suitably clamped, the magnetic core **25** is assembled by stacking the steel laminations **28** on the horizontally disposed end frame **14** until the correct height of core **25** is obtained.

After core **25** has been stacked to its correct height, the other section **13** of the tank is lowered by suitable lifting means **30**, as shown in Fig. 4, over the winding assembly **21** until sections **12** and **13** of the tank are in substantial registry and the upper section **13** is supported on the stacked laminations of core **25**. The weight of the upper section **13** on the stacked laminations causes a clamping pressure to be applied to the laminations. Any predetermined clamping pressure may be obtained on the laminations either by adding temporary weights to the upper section or by tending to raise the upper section from the laminations by lifting device **30**.

When the correct pressure is obtained on the laminations a banding plate **16** is welded between the end frames **14, 15** of each section completely around the perimeter thereof to maintain the correct pressure on the laminations and to complete the transformer tank.

After welding the banding plate **16** to the end frames the tank may be raised to its operating position as shown in Fig. 1 and the various accessories, such as the high voltage bushing **34** and low voltage bushings **35**, added. The internal electrical connections may also be made with the transformer in its vertical operating position.

The improved method thus provides for assembling a transformer with a minimum of time and labor, and also provides clamping of the core laminations to a predetermined pressure without the use of core bolts.

While only one embodiment of the present invention has been illustrated and described it will be apparent to those skilled in the art that modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. The method of assembling a stationary induction apparatus having a laminated magnetic core, a winding, and a tank comprising the steps of providing two separate sections of a tank each having a rectangular open end, welding channel members to each said section at the edges of said open ends to form end frames for said core, disposing one of said sections so that the edge of the end frame welded thereto is in a substantially horizontal plane, positioning said winding in said one section with the axis of said winding disposed in a horizontal plane a predetermined distance above said horizontally disposed end frame, stacking laminations on said horizontally disposed end frame to a predetermined height to define a magnetic core, positioning the other said section of said tank above said stacked core, lowering said other section over said winding until the end frame welded to said other section is positioned on said stacked laminations in registry with said horizontally disposed end frame to cause a clamping pressure on said laminations, adjusting to a predetermined value the pressure on said laminations caused by said other section being supported on said stacked laminations, and completing said tank by welding a banding plate between said end frames around the perimeter thereof to maintain said predetermined pressure on said laminations.

2. The method of assembling a magnetic core, a winding, and a tank to form a transformer comprising the steps of providing two separate sections of a tank each having a rectangular open end, welding channel members to each said section at the edges of said open ends to form end frames for said core, disposing one of said sections so that the edge of the end frame welded thereto is in a substantially horizontal plane, positioning said winding in said one section with the axis of said winding disposed in a horizontal plane a predetermined distance above said horizontally disposed end frame, stacking laminations on said horizontally disposed end frame to a predetermined height to define a magnetic core with the yoke portions resting on said end frame and a leg portion of said core disposed coaxial with said winding, positioning the other said section of said tank above said stacked core, lowering said other section over said winding until the end frame welded to said other section is positioned on said stacked laminations in registry with said horizontally disposed end frame to cause a clamping pressure on said laminations, adjusting to a predetermined value the pressure on said laminations caused by said other section being supported on said stacked laminations, and completing said tank by welding a banding plate between said end frames around the perimeter thereof to maintain said predetermined pressure value on said laminations.

3. The method of assembling a magnetic core, a winding, and a tank to form a transformer comprising the steps of providing two separate sections of a tank each having a rectangular open end, welding channel members to each said section parallel to the edges of said open ends to form rectangular frames for bracing said section, welding another channel member between the channel members forming the lengthwise sides of said rectangular frame to complete another rectangular frame providing end frames for said core, disposing one of said sections so that the edge of said end frame welded thereto is in a substantially horizontal plane, placing said winding in a position in said one section with the axis of said winding disposed in a horizontal plane a predetermined distance above said horizontally disposed end frame, clamping said winding in said position, stacking laminations on said horizontally disposed end frame to a predetermined height to define a magnetic core with the yoke portions resting on said end frame and a leg portion of said core disposed coaxial with said winding, positioning the other said section of said tank above said stacked core, lowering said other section over said winding until the end frame welded to said other section is positioned on said stacked laminations in registry with said horizontally disposed end frame to cause a clamping pressure on said laminations, adjusting to a predetermined value the pressure on said laminations caused by said other section being supported on said stacked laminations, and completing said tank by welding a banding plate between said end frames around the perimeter thereof to maintain said predetermined pressure on said laminations.

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