W. M. DANN.

TRANSFORMER.

APPLICATION FILED FEB. 21, 1914.

1,224,149.

Patented May 1, 1917.

2 SHEETS—SHEET 1.

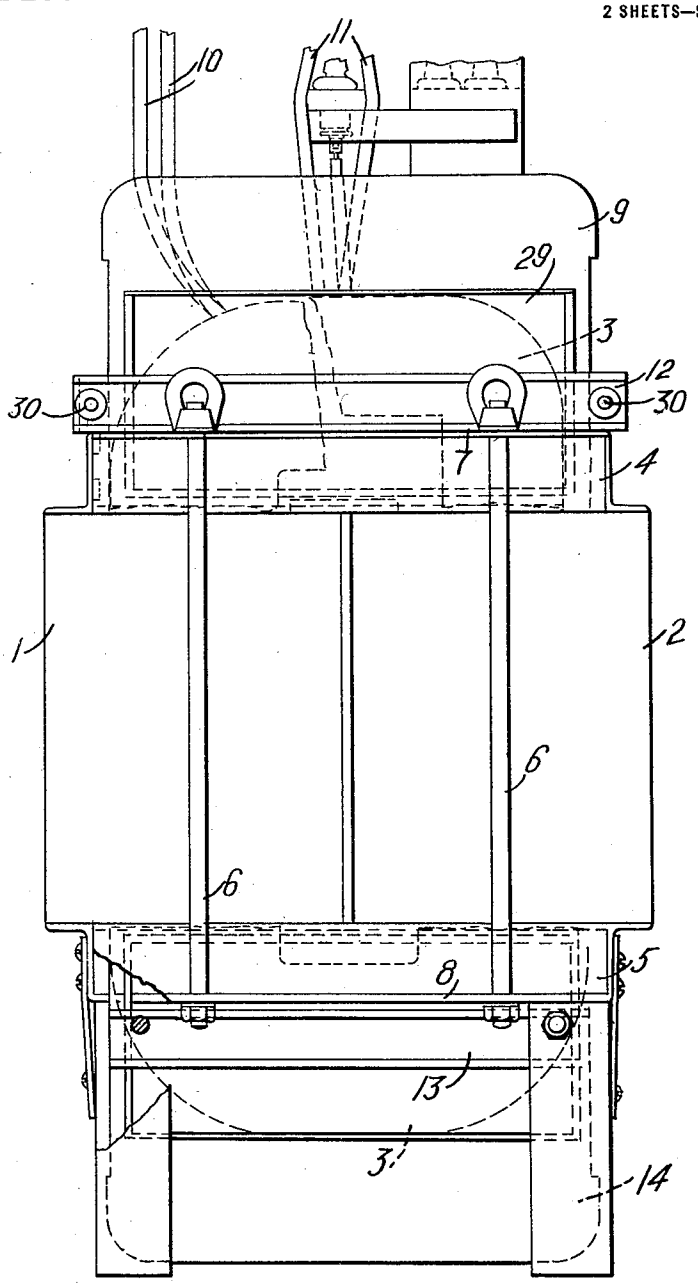


Fig. 1.

WITNESSES:

Fred. A. Lind.

Geo. W. Hansen.

INVENTOR

Walter M. Dann

BY

Wesley G. Carr

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

W. M. DANN.

TRANSFORMER.

APPLICATION FILED FEB. 21, 1914.

1,224,149.

Patented May 1, 1917.

2 SHEETS—SHEET 2.

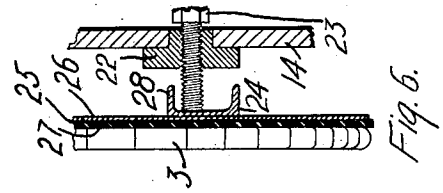


Fig. 6.

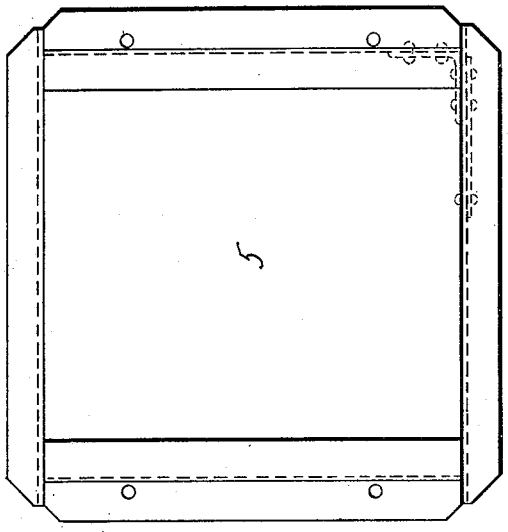


Fig. 4

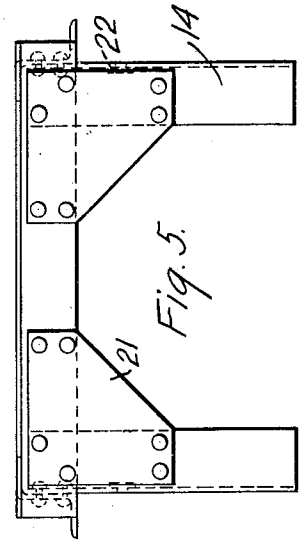


Fig. 5.

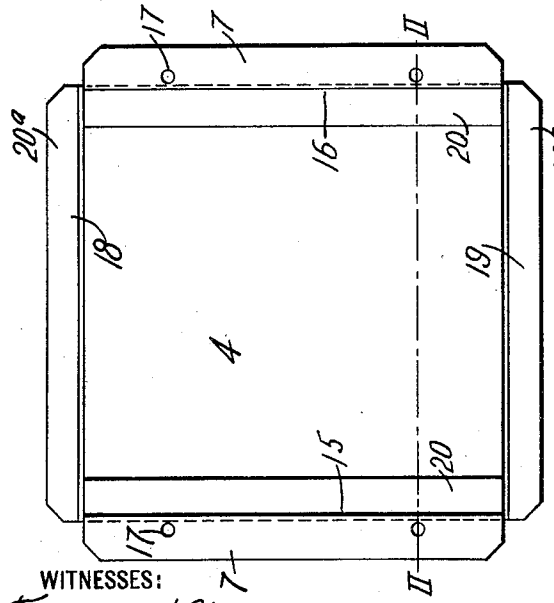


Fig. 2.

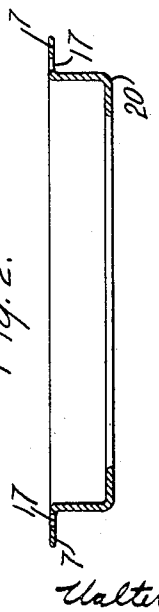


Fig. 3.

WITNESSES:

Fred. A. Lind.

Geo. W. Hansen.

INVENTOR

Walter M. Dann

BY

Wesley G. Carr

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WALTER M. DANN, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

TRANSFORMER.

1,224,149. Specification of Letters Patent. Patented May 1, 1917.

Application filed February 21, 1914. Serial No. 820,203.

To all whom it may concern:

Be it known that I, WALTER M. DANN, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Transformers, of which the following is a specification.

My invention relates to electrical transformers and particularly to improvements in the mechanical structure thereof.

It is highly desirable to simplify the construction of transformers in order to decrease their cost of manufacture. Also, it is advantageous to minimize the total weights of transformers in order to facilitate in transporting and handling them. My invention contemplates the employment of standard rolled steel sections, which are secured to one another in any suitable manner, for example, by autogenous welds, in place of the usual cumbersome cast iron end frames. This substitution of end frames greatly decreases the total weights and initial costs of transformers.

In addition, I provide new and efficient means for bracing transformer coils against the stresses occasioned by short circuits, overloads, etc., to which they may be subjected.

For a better understanding of the nature, the scope and the characteristic features of my invention, reference may be had to the following description and the accompanying drawings in which Figure 1 is a view in elevation, of a transformer constructed in accordance with my invention; Fig. 2 is a plan view of a top end frame; Fig. 3 is a transverse sectional view, taken along the line II—II of Fig. 2; Figs. 4 and 5 are plan and side views, respectively, of the lower end frame constructed in accordance with my invention, and Fig. 6 is an enlarged cross sectional view of the bracing means employed in reinforcing the lower portions of the transformer coils.

Referring to Fig. 1, core members 1 and 2 provide magnetizable circuits for the flux generated by the current flowing in transformer coils 3. Top and bottom end frames 4 and 5, respectively, engage the core members and are held in rigid relation to one another by tie rods 6 which engage corresponding flanges 7 and 8 formed upon the top and bottom end frames. The tie rods 6 firmly hold the end frames against the core members to preclude the disassociation of the core structure during the handling of the transformer. Insulating barriers 9 are interposed between adjacent coil sections to increase the insulating properties of the transformer. Low tension leads 10 and high tension leads 11 project from the proper coils through bushings (not shown) by means of which the leads are insulated from the transformer tank. Channel members 12 and 13, which are placed in parallel relation to the coils 3 and held in position as will hereinafter be explained, provide bracing means to reinforce the coils and to prevent them from becoming distorted upon the occurrence of short circuits or abnormal overloads. The bottom end frame 5 is provided with legs 14 to engage the bottom of the containing tank (not shown) of the transformer.

In Figs. 2 and 3, I have shown, in detail, the construction of the upper end frame 4. Standard Z-bar sections of a proper length constitute two opposite sides of the end frame, the laterally and outwardly extending flanges 7 being disposed at the top portion of the frame. Holes 17 are drilled in the flanges 7 of the Z-bars, through which the tie rods 6 may project to engage the end frame 4. Oppositely disposed members 18 and 19, which are made of standard angle iron sections, comprise the other two sides of the end frame and are connected to the Z-bars 15 and 16 by continuous autogenous welds. This form of construction obviates the use of bolts or rivets and imparts adequate rigidity to the end frame.

In Fig. 3 is shown the form of the Z-bars comprising the sides 15 and 16 of the upper end frame, the laterally and inwardly extending flanges 20 of the Z-bars, in conjunction with the laterally and outwardly extending flanges 20^a of the angle irons, being disposed to engage the upper surface of the cores 1 and 2.

By reference to Figs. 4 and 5, it will be noted that the lower end frame 5 is substantially the same as the upper end frame 4. However, the lower end frame is reversely disposed with respect to the upper end frame so as to permit the laterally extending flanges of the angle irons and the Z-bars to similarly engage the lower surfaces of the core members. The corners of the upper and lower end frames are cham-

fered to permit the transformer to be lowered into the usual cylindrical containing case. The clearance between the lower end frame 5 and the inner walls of the tank is such that the lower portion of the transformer is prevented from becoming displaced during transportation.

At each corner of the end frame 5, a leg 14 made of standard angle iron section is secured to the frame by riveting to the adjacent angle irons and Z-bars comprising the frame structure. Gussets 21, riveted to the legs 14 and the frame 5, reinforce the frame structure and preclude the separation and subsequent collapse of the legs 14 when the forces occasioned by short circuits in the windings are transmitted to the frame through the coil-bracing means which are hereinafter to be described.

Inasmuch as the thickness of the standard angle iron sections comprising the legs 14 is insufficient to permit the threading of holes which are drilled therein, I provide suitable bushings 22 which are secured to the angle iron by welding, substantially as shown in Fig. 6. As before mentioned, the bushings 22, through which threaded shanks of bolts 23 project, are welded to the angle irons comprising the legs 14. One end of the bolt 23 engages a channel beam 24 which abuts against a block 25 having a facing 26 preferably made of sheet iron or steel. The portion 27 of the block 25, immediately adjacent to the coil 3, is preferably made of some insulating material, such as treated wood, fiber, etc. By disposing the channel beam 24 relative to the bolt 23, as shown in Fig. 6, no additional means need be supplied to preclude displacement of the channel beam inasmuch as the shank of the bolt 23 engages a flange 28 which is integrally formed upon the channel beam.

It will be apparent from Fig. 1 that similar bracing means are supplied for corresponding coils disposed on the opposite side of the transformer. The particular advantages derived from using the bracing means disclosed are cheapness, simplicity and accessibility. Similarly, the upper portions of the coil 3 are braced by means of the channel member 12 abutting the reinforcing block 29 which is similar to the reinforcing block 25. However, the channel member 12 is held rigidly by tie rods 30 which engage a corresponding channel member disposed on the other side of the transformer.

While my invention is particularly adapted to be applied to transformers, it will be readily understood that it may be applied to other apparatus of a similar nature, and that the arrangements and structural details may be considerably varied from those herein shown and described, and I desire that such modifications shall be included within the scope of the appended claims.

I claim as my invention:

1. A transformer comprising current-carrying coils, magnetizable core members therefor, top and bottom end frames associated with the core members, said end frames comprising two oppositely-disposed Z-bars and two oppositely-disposed angle irons secured thereto, corresponding flanges of the Z-bars being disposed in the same plane as the flanges of the angle irons in order to effect continuous engagement with the said core members along their peripheries, and tie rods engaging the other flanges of said Z-bars for interconnecting said end frames.

2. An end frame for a transformer core member comprising two oppositely-disposed Z-bars and two oppositely-disposed angle irons that are secured to the inwardly-extending flanges and the upright portions of the Z-bars in order that a continuous flange may be formed for engagement with the periphery of a side of the transformer core member, the outwardly-extending flanges of the Z-bars constituting means for firmly holding the end frame in close contact with said core member.

3. An end frame for a transformer core member comprising two oppositely-disposed Z-bars and two oppositely-disposed angle irons, corresponding flanges of the Z-bars being disposed in the same plane as the flanges of the angle irons, said angle irons being welded to the inwardly-projecting flanges and the upright web portions of the Z-bars in order to form a continuous flange for engagement with the periphery of a side of the transformer core member, the outwardly-projecting flanges of the Z-bars providing holding means for the end frame.

4. A transformer comprising current-carrying coils, core members therefor, top and bottom end frames, and oppositely disposed coil-bracing means, each composed of a channel member that slidingly engages an outer coil, an exteriorly adjustable bolt threaded through one of said end frames and loosely engaging the upper flange of said channel member to preclude longitudinal displacement thereof, and insulating means interposed between the coils and the channel member.

In testimony whereof, I have hereunto subscribed my name this 17th day of Feb. 1914.

WALTER M. DANN.

Witnesses:
J. F. PETERS,
B. B. HINES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."