

No. 822,293.

PATENTED JUNE 5, 1906.

W. S. MOODY.  
TRANSFORMER.

APPLICATION FILED NOV. 18, 1904.

Fig. 1.

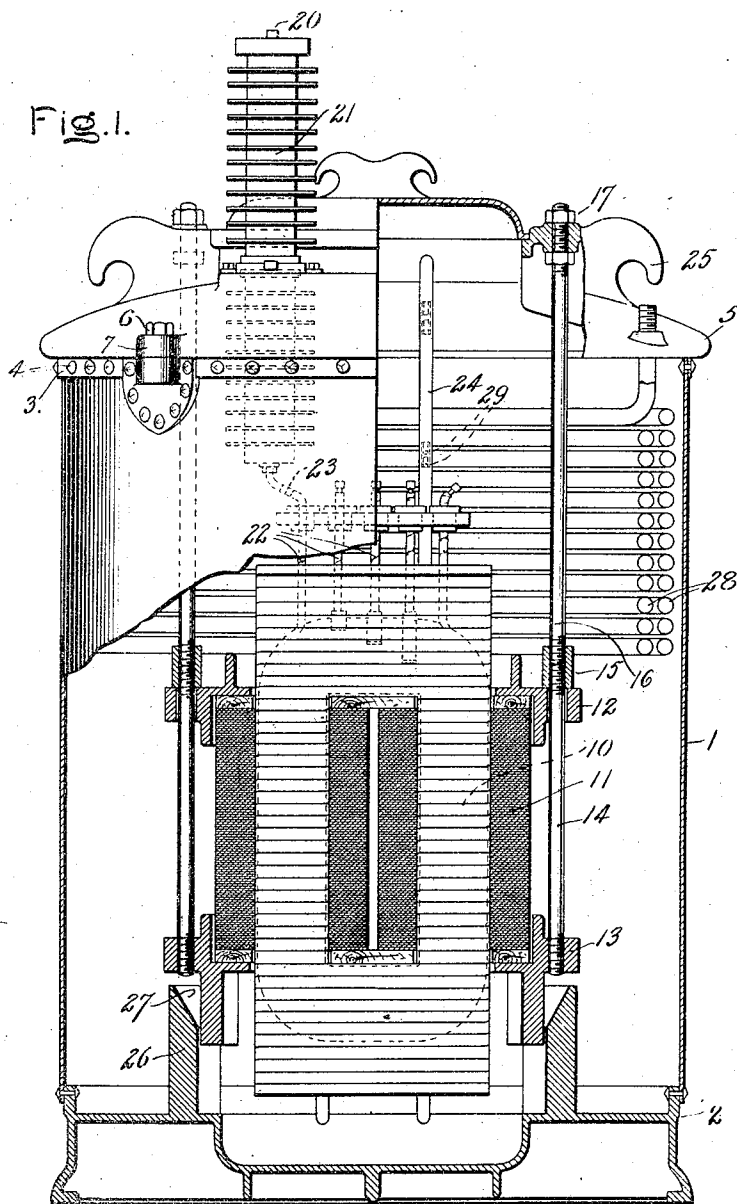
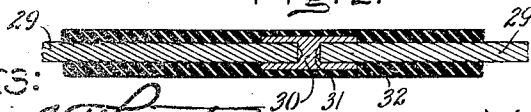


Fig. 2.



WITNESSES:

*George A. Thornton*  
*Arthur Orford*

INVENTOR:

Walter S. Moody,  
By *Albert H. Davis*  
ATTY.

# UNITED STATES PATENT OFFICE.

WALTER S. MOODY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## TRANSFORMER.

No. 822,293.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed November 18, 1904. Serial No. 233,258.

*To all whom it may concern:*

Be it known that I, WALTER S. MOODY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Transformers, of which the following is a specification.

In manufacturing transformers, particularly of large capacity, it is usually found advisable to provide for more than a single ratio of transformation. The uncertainty as to the exact voltage desirable in a particular installation, as well as the desirability of having a certain flexibility in the ratio in order to correct for different drops of potential in supply systems, are among the causes which render it necessary, or at least desirable, to provide a transformer in which the ratio of transformation can be varied.

With comparatively low voltages it is easy to provide for variations in the ratio of transformation by the use of leads tapped into different portions of the windings and brought out through the case in which the transformer is run. When dealing with voltages which are now called "high"—say forty thousand volts and upward—the space occupied by the bushings and other insulation necessary to properly insulate the high-potential terminal leads when bringing them through the case of the transformer is so large that it becomes impracticable to bring out all of the necessary leads. It has thus become essential, or at least desirable, to adopt a construction in which the tapped leads terminate inside the transformer-case. With this construction it is only necessary to employ one set of leads passing through the transformer-case.

It is usually difficult to change the connections of the transformer-leads passing through the case with the tap-leads when the transformer is in its case. I have found, however, that if the transformer is secured directly to the cover of its inclosing case and the leads or terminals of the transformer are passed through the case-cover the change in connections may be readily made after the cover is removed from the case-cover and the transformer is moved bodily out of the casing. With this construction the transformer may be readily moved out of the case at any time without in any manner interfering with the connections of the transformer. This is advantageous for many pur-

poses other than change of connections, as it facilitates inspection, alteration, or repair of the transformer at any time.

The various features of novelty which characterize my invention I have pointed out with particularity in claims annexed to and forming a part of this specification.

For a better understanding of my invention, however, reference may be had to the accompanying drawings and description, in which I have illustrated and described one embodiment of my invention.

Of the drawings, Figure 1 is an elevation with parts broken away and in section, showing a transformer constructed in accordance with my invention; and Fig. 2 is an elevation, partly in section, showing the construction of one of the transformer-leads.

Referring to the drawings, the transformer-casing is shown as comprising a body portion 1, which may be formed out of sheet metal, and is usually in the shape of a flattened cylinder. The lower end of the body portion 1 is secured to a base 2, usually formed of cast metal. The upper end of the body portion 1 has a reinforcing-strap 3 secured to it by rivets 4. The casing-cover 5 is preferably formed out of cast-iron and closes the upper end of the casing, being normally secured in place by bolts 6 and cooperating lugs 7, carried by the body portion 1 of the case-cover 5.

The transformer proper comprises winding 10 and core 11. The core 11 is formed of laminae, which are clamped between upper and lower end members 12 and 13, respectively, by threaded rods 14. In the construction illustrated the core is laminated in horizontal planes. The rods 14 are tapped into threaded apertures formed for the purpose into the lower member 13 and pass through apertures formed for the purpose in the upper end member 12. The upper end of the rods 14 are screwed into externally-threaded collars or nuts 15, as shown. The nuts 15 are practically twice as long as the portions of the rods 14 screwed into them. The lower ends of threaded rods 16 are screwed into the upper ends of the collars or nuts 15. The upper ends of the rods, which are also threaded, pass through and are secured to the case-cover 5 by nuts 17.

The high-potential terminal conductors 20 of the transformer pass through the cover, being insulated therefrom by suitable insulating bushings or member 21. The lower

end of each terminal conductor 20 is adapted to be interchangeably connected to one of a set of leads 22, as indicated at 23.

In the particular construction illustrated 5 the leads 24 from the low-potential windings of the transformer are all passed directly through the case-cover 5.

The case-cover 5 is provided on its upper side with hooks 25. When it is desired to 10 change the connections between the terminal conductors 20 and the corresponding tapped leads 22, or desirable for any purpose to inspect the transformer, the hooks 25 on the case-cover may be connected to any suitable 15 hoisting device, such as an overhead traveling crane, and the case-cover and transformer lifted away from the case proper without removing from the case any of the oil in which such transformer is usually immersed 20 and without change of the position of the case proper. After the connections are changed, or inspection, repairs, or alterations which it was desirable to make have been completed, the cover and transformer may 25 be again lowered into position.

In order that the transformer may be centrally located in the case, the base 2 is provided with a flange or portion 26, into which the lower end member 13 telescopes. In 30 order to facilitate the entrance of the end member into the flange 26, its inner upper surface is beveled, as shown at 27. The pipe-coil 28, through which water for cooling the oil in the casing passes usually found in 35 large transformers of the type illustrated, may also be advantageously carried by the case-cover.

The leads 24 from the low-potential winding are preferably flexible conductors. When 40 constructed entirely of stranded conductors in the manner in which flexible leads are usually made, trouble is sometimes experienced from the siphoning of oil out of the casing by a sort of capillary action along the 45 strands of the conductor. To obviate these difficulties, I have formed the leads 24, as shown in Fig. 2, out of alternate stranded sections 29 and solid sections 30. The stranded sections may be inserted in sockets 50 31, formed for the purpose in the solid section, as shown. Preferably the solid and stranded sections are soldered together. The layer of insulation 32, surrounding these conductors, is preferably formed of some non-porous 55 insulating material, such as a suitable paint, varnished cloth, or the like. This construction of lead is comparatively cheap and is effective for the purpose described.

What I claim as new, and desire to secure 60 by Letters Patent of the United States, is—

1. In combination, a transformer case or receptacle, a cover therefor, a transformer 65 comprising a core of laminae assembled between end members and means for securing the end members together, and means en-

gaging one of said end members for securing said transformer to said cover.

2. In combination, a receptacle or case having an opening formed at its upper end, a 70 cover for closing said opening, a transformer located within said receptacle comprising a core laminated in horizontal planes, end members between which said core is assembled and means for securing said end mem- 75 bers together, and means engaging one of the end members for securing said transformer to the cover.

3. In combination, a case or receptacle having an opening at its upper end, a cover for closing said opening, a transformer within 80 the receptacle comprising a core laminated in horizontal planes and an end member or support upon which said core rests, means for securing said end member to the cover, and terminal conductors for the transformer 85 passing through the cover.

4. In combination, a case, a cover therefor, a transformer suspended from the cover, and a guiding device for the transformer carried 90 by the case.

5. In combination, a transformer-case, a cover therefor, a transformer suspended from the cover, a guide carried by the lower 95 end of the case, and a transformer portion adapted to telescope therewith.

6. In combination, a case, a cover therefor, a transformer provided with a number of leads suspended from the cover, terminal 100 conductors secured to the cover, the inner ends of each of said terminal conductors being adapted to be secured interchangeably to one of a series of transformer-leads.

7. A lead for an oil-immersed transformer formed of alternate solid sections and stranded 105 sections, and a non-porous insulating cover therefor.

8. A lead for an oil-immersed transformer formed of solid conducting-sections, each of said sections being formed with a socket in 110 opposite sides or ends, and intermediate stranded sections secured in the sockets of adjacent solid sections.

9. A non-capillary flexible conductor comprising solid sections socketed in opposite 115 sides or ends, and stranded intermediate sections, the ends of each of which are inserted in the sockets of the adjacent solid sections.

10. A non-capillary flexible conductor comprising solid sections socketed in opposite 120 sides or ends, stranded intermediate sections, the ends of each of which are inserted in the sockets of the adjacent solid sections, and a non-porous socket or cover of insulating material.

In witness whereof I have hereunto set my 125 hand this 16th day of November, 1904.

WALTER S. MOODY.

Witnesses:

EDWARD WILLIAMS, Jr.,  
BENJAMIN B. HULL.