Feb. 3, 1931. F. J. FISCHER 1,790,981

CURRENT TRANSFORMER HAVING FIELD EQUALIZING CONDUCTING COATINGS

Filed May 21, 1929

Fig. 1.

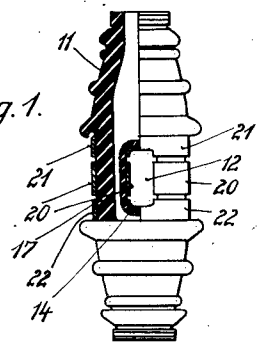


Fig. 2.

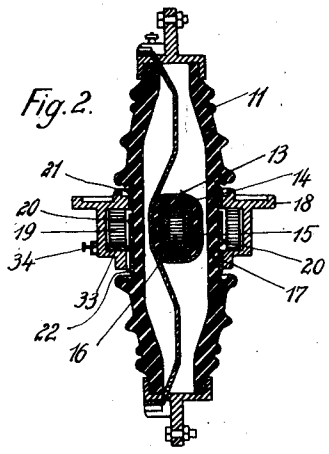


Fig. 3.

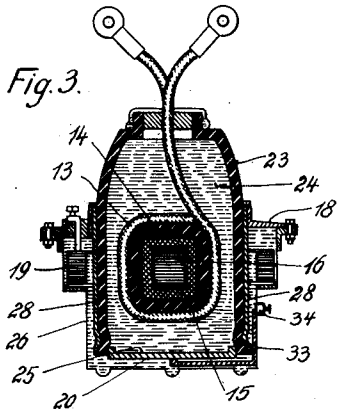


Fig. 4.

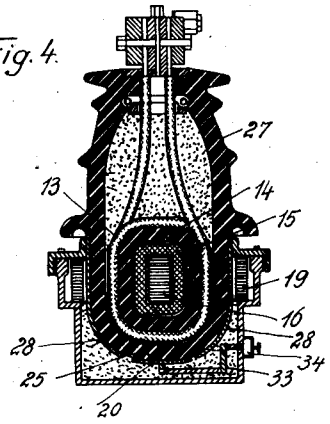
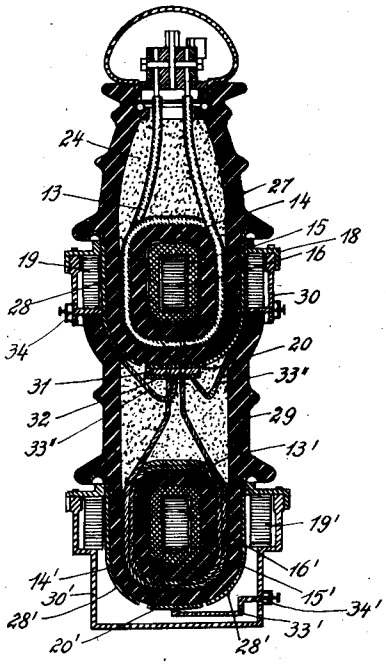


Fig. 5.



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Patented Feb. 3, 1931

1,790,981

UNITED STATES PATENT OFFICE

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CURRENT TRANSFORMER HAVING FIELD-EQUALIZING CONDUCTING COATINGS

Application filed May 21, 1929, Serial No. 364,918, and in Germany May 21, 1928.

My invention relates to current transformers in which on the inside or on the outside of a leading-in insulator which contains the primary winding of the transformer, conducting coatings are arranged for equalizing the electric field which extend along the inner or outer surface of the leading-in insulator. More particularly my invention relates to measuring current transformers the leading-in insulator of which is provided with a tunnel supporting the secondary winding and receiving the iron core on which the winding is carried.

It is an object of my invention to improve an insulator of this type, and to this end I arrange on the insulator a conducting surface in the shape of a conducting coating on the wall, or on part of the wall, of an insulator which coating is arranged intermediate the primary winding and a grounded part of the transformer, which part may be a flange supporting the insulator, a casing surrounding the transformer, the iron core of the transformer, or a separate grounded coating. The coating is insulated from the primary winding and from the grounded part and, with the grounded part, constitutes a measuring condenser to which electrostatic instruments may be connected.

According to my invention I arrange the coating in insulated relation to the usual conducting layers for equalizing the field. By thus insulating the coating, the equalizing coatings protect the insulated coating, which will be referred to hereinafter as the "measuring coating", against disturbance by the electric field, and I thus obtain by very simple expedients an instrument which is a current and a voltage transformer adapted to be connected with electrostatic instruments.

In an embodiment of my invention to which, however, I do not desire to be limited, the dielectric of the measuring condenser is constituted by a liquid, plastic or granular body with which the casing of the transformer is filled. The dielectric may be the same with which the cavity of the insulator is filled.

In adapting my invention to a set of superimposed current transformers with their primary windings connected in series, as described in my copending application for patent of the United States Serial No. 282,922, I may provide with a measuring coating only that transformer, the flange or casing of which is grounded, or I may provide each transformer with a measuring coating so that it is possible to selectively ground any casing or flange of the unit and to utilize the measuring coating allotted to this flange.

If the measuring coating is arranged on a wall of the insulator, it may be applied by any known process, preferably by spraying.

Preferably the measuring coating is made thicker than the equalizing coatings. I prefer producing a coating of such thickness as to permit the conductor of the instrument to be soldered directly to the coating. If the conductor is stranded its strands are spread in the manner of a fan.

In the drawings affixed to this specification and forming part thereof transformers in combination with transversely perforated insulators and embodying my invention are illustrated diagrammatically by way of example.

In the drawings

Fig. 1 is a partly sectional elevation of a transversely perforated leading-in insulator,

Fig. 2 is a section of the insulator showing a current transformer in position therein,

Fig. 3 is a sectional elevation of a pot-shaped current transformer,

Fig. 4 is a sectional elevation of a pot-shaped transformer with a bottle-shaped insulator as described in my copending application aforesaid, and

Fig. 5 is a sectional elevation of a graded transformer having several insulators, each with a transformer unit, as also described in the said copending application.

Referring now to the drawings, and first to Figs. 1 and 2, 11 is an insulator, 12 is a transverse perforation or tunnel in the insulator, 14 is the wall of the tunnel, 17 is the wall of the insulator, 20 are measuring coatings which are applied to the wall of the tunnel 12 on the inside and to the adjacent wall 17 of the insulator on the outside, and 21 and 22 are the usual coatings for equalizing the elec-

tric field which are arranged in insulated relation to the measuring coatings 20, 20 so that there is no conducting connection between the measuring coatings 20 and the equalizing coatings 21, 22. 13 is the primary of the current transformer which surrounds the wall 14 of the tunnel 12, 15 is the secondary of the transformer, 16 is an iron core in the tunnel 12 on which the secondary 15 is wound, 18 is a grounded flange surrounding the insulator in the region of the metal coatings, and 19 are the yokes of the core which are arranged to surround the outer perimeter of the insulator 11 and are held by the flange 18 which also supports the insulator itself. It will appear from Fig. 2 that each measuring coating 20 is arranged in insulated relation between the primary 13 on the one hand and the grounded flange 18 and yokes 19 and core 16 which are parts of the current transformer, on the other hand.

The measuring coatings may be applied according to any suitable method, for instance, by spraying, as mentioned above, and may be connected with any suitable instruments such as voltmeters, synchronizing apparatus, indicators of excess voltage, wattmeters, and the like. Preferably the measuring coatings are made thicker than the equalizing coatings so that conductors may be directly connected to them, for instance, by soldering after the strands of such conductors have been spread to the shape of a fan.

Referring now to Fig. 3, 23 is a bottle-shaped insulator open at the bottom and provided with a tunnel for the reception of the secondary 15 and its core 16, the primary 13 being wound about the tunnel, as described with reference to Fig. 2, the open bottom of the insulator is closed by the measuring coating 20 which in this case forms the bottom of the bottle. 24 is an insulating filling in the insulator, such as oil, quartz, sand and the like. 26 is the grounded vessel of the transformer, 34 is one of the voltage terminals of the transformer and 33 is a conductor extending from the terminal 34 to the measuring coating 20 to which it is secured by spreading and soldering its strands as described. 28 is the usual equalizing coating. The measuring coating 20 is insulated from the primary 13 and from the grounded vessel 26 by the insulating filling 24.

Referring now to Fig. 4, the insulator 27 is closed at the bottom below the tunnel 12, in which are arranged the secondary 15 and its core 16, as described, with the primary 13 surrounding the tunnel. The measuring coating 20 is applied to the bottom of the insulator, insulated from the equalizing coating 28 and connected with the terminal 34 by the conductor 33.

In Fig. 5 an insulator 27 as illustrated in Fig. 4 is inserted in the upper end of a second insulator 29, each insulator having the tunnel referred to, and each containing a transformer unit, the two units making up a graded transformer, as mentioned in the introduction. The upper insulator 27 with its transformer unit is designed exactly as described with reference to Fig. 4. The lower insulator 29 is provided with a suitable seat for the upper insulator at its upper end and equipped with the other transformer unit comprising the primary 13′, the secondary 15′ and the iron core 16′, the primary being wound about the wall 14′ of the tunnel in the lower insulator 29, and the secondary with its core being inserted in the tunnel. The measuring coating 20′ is arranged at the bottom of the lower transformer 29 which is equipped with the usual equalizing coatings 28′ at the sides of the measuring coating 20. The coating 20′ is connected with a voltage terminal 34′ by a conductor 33′, similarly as described with reference to Fig. 4.

If it is not desired to ground the casing 30′, but the flange 18 of the upper insulator 27, an insulating coating 31 is secured to the measuring coating 20, and a second measuring coating 32 is secured to the insulating coating 31, this second coating 32 being grounded by a conductor 33″ which is secured to the flange 18 of the upper transformer unit, while the coating 20 is connected to an insulated terminal 34 as described with reference to Fig. 4. The advantage of providing a separate combination of measuring coatings 20′ and 32 with a solid dielectric 31 is that the ratio of capacities is independent of the insulating filling 24.

In any of the cases described with reference to Figs. 3–5 the measuring coating may be arranged as described with reference to Figs. 1 and 2, that is, on the inside of the tunnel wall 14 and on the outside of the insulator wall 17.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim to any modification not covered by these claims is expressly reserved.

I claim:—

1. In a current transformer a leading-in insulator, a primary winding in said insulator, a tunnel in said insulator, an iron core in said tunnel, iron yokes surrounding said tunnel, field-equalizing coatings on the outer wall of said insulator, a conducting coating on the inner wall of said tunnel and on the adjacent outer wall of said insulator, which coating is insulated from all other parts, and a terminal electrically connected with said conducting coating.

2. In a current transformer a leading-in insulator which is open at the base, a primary winding in said insulator, a conducting casing having a bottom surrounding the lower part of said insulator, field-equalizing coatings on the outer surface of said insulator, a conducting coating fitted into the opening at the base of said insulator so as to close it, and insulated from all other parts, and a terminal electrically connected with said conducting coating.

3. In a current transformer a leading-in insulator which is open at the base, a primary winding in said insulator, a conducting casing having a bottom surrounding the lower part of said insulator, a dielectric filling between said casing and said insulator, field-equalizing coatings on the outer surface of said insulator, a conducting coating fitted into the opening at the base of said insulator so as to close it, and insulated from all other parts, and a terminal electrically connected with said conducting coating.

4. In a current transformer a leading-in insulator with insulating walls and insulating bottom, a primary winding in said insulator, a casing surrounding said insulator and having a conducting wall and a conducting bottom, field-equalizing coatings on the outer surface of said insulator, a conducting coating on the outside of the bottom of said insulator opposite the bottom of said casing, and insulated from all other parts, and a terminal electrically connected with said conducting coating.

5. In a current transformer a leading-in insulator with insulating walls and insulating bottom, a primary winding in said insulator, a casing surrounding said insulator and having a conducting wall and a conducting bottom, a dielectric filling between said casing and said insulator, field-equalizing coatings on the outer surface of said insulator, a conducting coating on the outer surface of the bottom of said insulator opposite the bottom of said casing, and insulated from all other parts, and a terminal electrically connected with said conducting coating.

6. In a current transformer a leading-in insulator with insulating walls and insulating bottom, a primary winding in said insulator, grounded parts secured to said insulator, field equalizing coatings on the outer wall of said insulator, a conducting coating on the outer surface of the bottom of said insulator which is insulated from all other parts, a dielectric on said coating, another conducting coating on said dielectric connected with a grounded part, and a terminal electrically connected with said conducting coating.

7. A leading-in inusulator having a conducting coating on the outer wall of said insulator and adapted to constitute a measuring condenser in combination with another coating, said coating being so thick as to permit soldering a conductor thereto.

8. A leading-in insulator having a conducting coating on the outer wall of said insulator and adapted to constitute a measuring condenser in combination with another coating, said coating being so thick as to permit soldering a conductor thereto, and a stranded conductor having its strand spread in the manner of a fan and soldered to said coating.

9. In a current transformer a leading-in insulator, a primary winding in said insulator, grounded parts surrounding said insulator, metallic coatings electrically insulated from each other on the outer surface of said insulator, one coating serving as field-equalizing coating and the other coating being arranged between and insulated from said primary winding and said grounded parts, and constituting a measuring condenser together with one of said grounded parts.

In testimony whereof I affix my signature.

FRANZ JOSEPH FISCHER.