

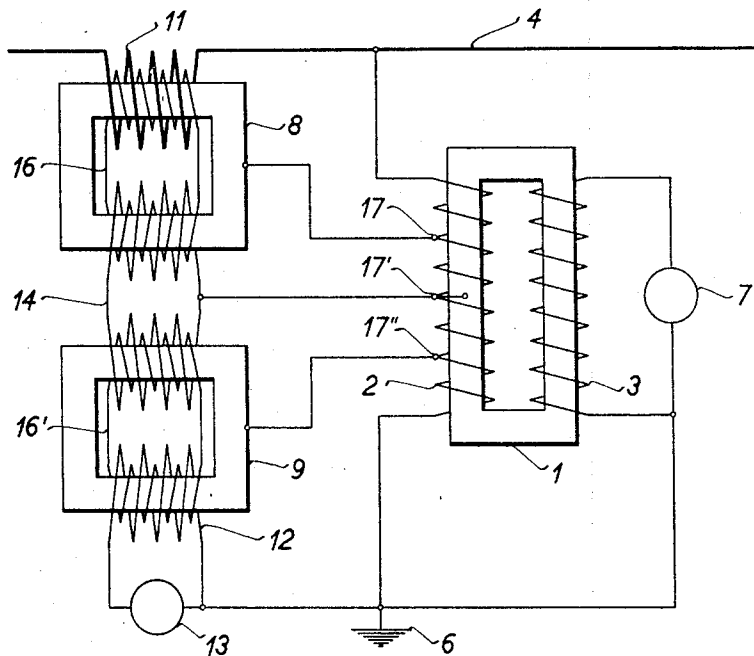
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S. RUMP

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CURRENT TRANSFORMER

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UNITED STATES PATENT OFFICE

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CURRENT TRANSFORMER

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This invention relates to current transformers and, particularly, to a construction in which an equal and uniform potential division is obtained throughout the entire transformer.

The amount of insulation required in a voltage transformer may be decreased by voltage division by such means as the series connection of transformers, or by connection of the center of the winding with the core, so that the core is brought to half the potential of the transformer. Thus, when the latter method is used, the amount of insulation required between the several high voltage windings and the core need be commensurate only to half the voltage which, especially for high voltages, materially reduces the cost of the transformer.

The amount of insulation required in current transformers is particularly disadvantageous because of the large space required between the windings and core which causes an increase in size and expense, and a decrease in the accuracy of the electrical measurements of instruments connected therewith. A division of the voltage in current transformers, therefore, has very special advantages. Such voltage division cannot, however, be obtained in the same simple manner as above for voltage transformers. Heretofore, voltage division in current transformers was obtained by means of condensers, resistances or inductances, all of which means are complicated and expensive.

It is, therefore, among the objects of the present invention to provide means for obtaining voltage division in current transformers.

Another object of the invention is to utilize a voltage transformer for controlling the voltage in a current transformer.

Another object of the invention is to so connect the several portions of a current transformer with the high voltage winding of a voltage transformer as to obtain sub-

stantially uniform voltage division throughout the entire current transformer.

Objects and advantages, other than those above set forth, will be apparent from the following description when read in connection with the accompanying drawing which diagrammatically illustrates one embodiment of the present invention.

Referring more particularly to the drawing by characters of reference, the reference numeral 1 designates the core of a voltage transformer having a high voltage or primary winding 2 arranged on one leg thereof and a low voltage or secondary winding 3 arranged on the other leg thereof. The high voltage winding 2 is connected with a high voltage transmission line 4 and both windings 2 and 3 are grounded as at 6. A voltmeter 7 is connected with the low voltage winding 3 and with the ground 6 for the purpose of indicating the line voltage to an operator as is usual in electrical substations.

Numerals 8 and 9 designate the cores of a cascade-connected current transformer, which cores carry a primary winding 11 and a secondary winding 12 across which is connected an ammeter 13 grounded at 6. The cores 8 and 9 are connected by an intermediate winding 14 and have equalizing windings 16 and 16' arranged thereon, in cross connection, to decrease the stray flux. The two cores 8 and 9 and the intermediate winding 14 are connected at substantially equally spaced points 17, 17' and 17'' with the high voltage winding of the voltage transformer. It will likewise be noted that the high voltage winding 2 of the voltage transformer is connected at its center to the core 1.

When a current flows in line 4, the flow of current magnetizes core 8 which induces current in winding 14, and winding 14 magnetizes core 9 which induces current in winding 12 and ammeter 13. To retain the current in ammeter 13 substantially proportional at all intensities to the current in line

4, core 8 is provided with winding 16 which causes the flux linking winding 14 to be closely similar in magnitude and in phase with the flux linking winding 16 as is well-known. Core 9 is likewise provided with winding 16' for a purpose similar to that above set forth.

If winding 2 is assumed to be divided into four equal sections as shown, by connecting core 8 to point 17, the voltage between winding 11 and core 9 is fixed at one-fourth of the line voltage. The voltages between core 8 and winding 14, as well as between winding 14 and core 9 and between core 9 and winding 12 are each fixed at one-fourth of the line voltage. It is thus possible to reduce the insulation of the structure very materially if it is remembered that under the present practice, the windings 11 and 12 would be placed on a common grounded core so that insulation for the full line voltage would have to be provided between the primary winding and the core.

Both the voltage and the current transformer are preferably arranged in the same housing or tank, although separate tanks may be used; and there is also no reason why a single voltage transformer may not be used with a plurality of separate current transformers provided care is taken that the primary winding of a current transformer does not have a potential different from that of the voltage transformer. The voltage transformer may be connected to a bus-bar while the current transformer may be connected in a feeder line between the bus-bar and the switches so that a separation of the current transformer from the line and from the voltage transformer is impossible, or that opening of the switch puts the current transformer out of operation without grounding it.

It will be seen that the present invention provides a means for equally distributing the voltage through a current transformer into as many divisions as desired, with uniform voltage in each division, by the use of any ordinary potential transformer which may be conveniently located, or by the use of a separate potential transformer. The amount of insulation required, the cost of such construction, and the size of the structure are greatly reduced and the operative safety is materially increased.

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

The invention claimed is:

1. In a transformer arrangement, a current transformer having a plurality of cores, a primary winding, a secondary winding and

an intermediate winding connecting the cores; and a voltage transformer, the cores and the intermediate winding of said current transformer being connected with said voltage transformer at different points thereof, both of said transformers being grounded.

2. In a transformer arrangement, a current transformer having a plurality of cores a primary winding, a secondary winding and an intermediate winding connecting the cores; and a voltage transformer having a primary winding and a secondary winding, the cores and the intermediate winding of said current transformer being connected with the primary winding of said voltage transformer at different points thereof, both of said transformers being grounded.

3. In a current transformer arrangement, a current transformer having a plurality of cores, a primary winding, a secondary winding and an intermediate winding connecting the cores, the secondary winding being grounded; and a voltage transformer having a primary winding and a secondary winding, the cores and the intermediate winding of said current transformer being connected with the primary winding of said voltage transformer at separated points thereof, both windings of said voltage transformer being grounded.

4. In a transformer arrangement, a current transformer having a plurality of cores, a primary winding, equalizing windings on the cores, a secondary winding, and an intermediate winding connecting the cores; and a voltage transformer having a grounded primary winding, and a secondary winding, the cores and the intermediate winding of said current transformer being connected at different points with the primary winding of said voltage transformer, both of the secondary windings of said transformers being grounded.

5. In a transformer arrangement, a current transformer having a plurality of cores, a primary winding on one of the cores, an equalizing winding on each of the cores, a secondary winding on one of the cores, the secondary winding being grounded, and an intermediate winding connecting the cores; and a voltage transformer having a core, a primary winding, the primary winding being connected with the core, and a secondary winding, both of the windings of said voltage transformer being grounded, the cores and the intermediate winding of said current transformer being connected at different points with the primary winding of said voltage transformer.

6. In a transformer arrangement, a current transformer having a plurality of cores, a primary winding, a secondary winding, an intermediate winding connecting the cores and a plurality of equalizing windings arranged on the cores, the secondary winding

being grounded; and a voltage transformer having a core, a primary winding, the primary winding of said voltage transformer being conductively connected with the core thereof, and a secondary winding, both of the windings of said voltage transformer being grounded, the cores and the intermediate winding of said current transformer being connected at different points with the primary winding of said voltage transformer.

In testimony whereof I have hereunto subscribed my name this 11th day of June, A. D. 1930.

SIGURD RUMP.