

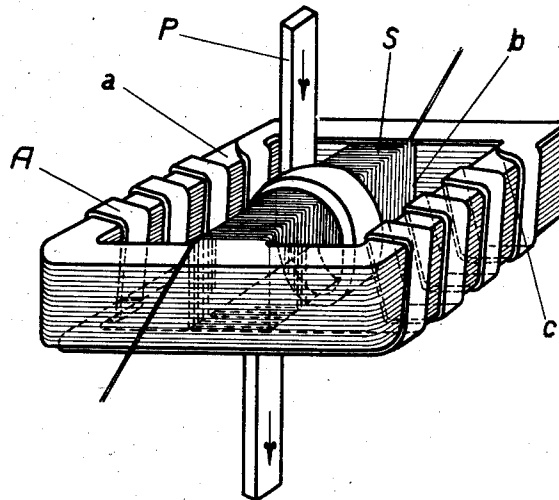
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CONNECTING TRANSFORMER OF THE SHELL TYPE

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CONNECTING TRANSFORMER OF THE SHELL TYPE.

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The present invention relates to connecting transformers of the shell type with equipotential winding. Transformers of this class, particularly for measuring purposes, have been brought to a certain degree of perfection, although, at greater intensities of the primary current, a considerable error exists due to the lack of uniformity in the magnetization of the outer free ends of the core, which is unavoidably due again to the fact that the primary conductor arranged vertically to the plane of the core and embracing the connecting piece of the latter extends at one time more through one window of the core than through the other, as indicated by the drawing. With the direction of current of winding of the primary conductor P as shown, which embraces the connecting piece *b*, the left end *a* of the core is magnetized more than the right end *c*. If only one winding is used as shown, the error is particularly large, but even if several windings are provided, it is quite considerable and troublesome. In literature, the error of such transformers is referred to as a "peculiar characteristic" without any attempt being made to remedy it. The present invention has for its object to provide this remedy in the form of the equipotential winding known and used for other purposes in the construction of transformers. The accompanying illustration shows such a self-contained permanently closed winding A. The secondary winding S, concentric with the primary winding P, is wound on the connecting piece *b* of the core. If both outer legs of the core are magnetized equally, the compensating winding will be inactive if there are equal numbers of turns on both the outer legs. Since, however, the primary conductor P passes through one of the openings of the core more than the other, both legs of the core will, therefore, not be magnetized to equal strength. The winding A is, therefore, necessary and is always active. On account of this property of the equipotential winding the invention eliminates the lack of uniformity in magnetization and the error in current in so far as it is due to this cause. Furthermore, the winding used by the invention eliminates a second source of error consisting in the inducing reaction of a return of current or another conductor of larger intensities of current. This is for instance important if in connecting trans-

formers for three-phase current the transformers corresponding to the three phases are arranged side by side.

In ordinary cases the equipotential winding according to the invention consists of one winding or several windings of copper-band attached to the outer free ends, both windings being connected in opposition, but under certain circumstances the invention may be extended to comprise any number of windings arranged on a conductor of relatively small section or low conductivity to obtain incomplete compensation and a definite form of the curve of errors owing to the relative great resistance. For the same purpose, the number of windings on both free ends may vary or an equipotential winding uniformly embracing both free ends may carry another equipotential winding possessing different qualities to tune off the effect.

The turns of the windings of the coil A being in opposition on the two legs of the core, when one leg of the core is magnetized more than the other an unbalanced current is generated in the section of the coil A on that leg. This current passing through the turns of the same winding on the other leg increases the magnetization thereof to the required extent to make the magnetic strength in both legs of the core equal as required by the object of this invention. When the transformer is in operation the primary winding P produces the effect of one more conductor in the space at the left of the middle part *b* of the core; as shown in the drawing than in the space at the right of this part *b*. Hence the magnetization may be a little stronger in the left part *a* of the closed core than in the right part *c*. By the presence of the windings of the coil A which forms in effect two coils, one on each of the sides *a* and *c*, the two coils being closed upon one another and each comprising an equal number of turns, this effect is obviated and the magnetization in the two sides *a* and *c* is equalized. If the primary winding should develop an N—pole at the front of the core as presented to the observer in the drawing the magnetic lines of force in the side *a* will induce in the turns of the winding *a* on that side a current, the magnetic effect of which is opposed to the magnetization caused by the primary P. On the opposite side *c*, the turns of the winding *a* will be wound in such a direction that the

induced current therein will not oppose but will add to the magnetic effect due to the primary P in the side *c* of the core. Thus the magnetization of the core will tend to become equal. The winding A is particularly useful when the primary P has both its terminals on the same side of the central connecting piece *b*, as shown in the drawing.

10 The turns of the windings on the part *a* are equal to the number of turns on the part *c*; but, as appears from the drawing, the arrangement is such that there is one more coil or conductor on the outer face of one of the
15 legs, such as the leg *c*, than upon the outer face of the leg *a*.

I claim:—

1. A current transformer having an annular closed core with a central leg and two outer legs, a primary conductor wound 20 around the center leg, a secondary winding, and a compensating winding consisting of two coils, one on each outer leg and connected to each other.

2. A current transformer according to 25 claim 1, in which the coils of the winding on the outside faces of the core legs are unequally numbered.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

WILLI REICHE.