

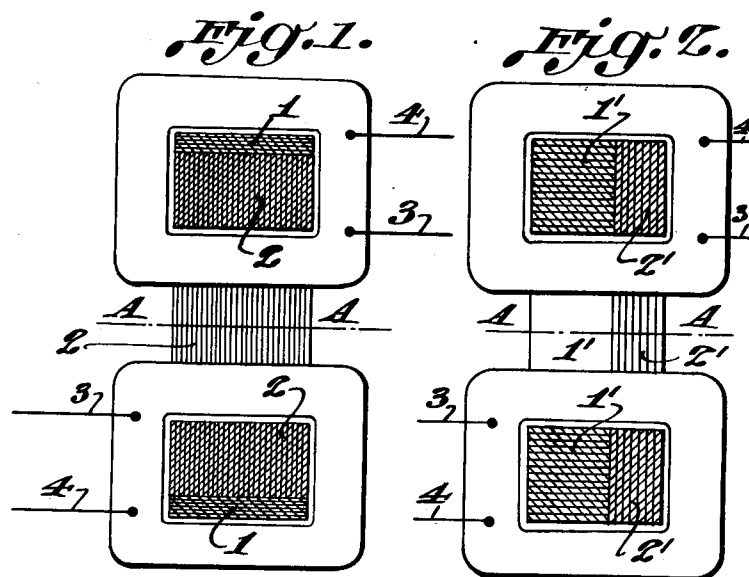
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CURRENT TRANSFORMER

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CURRENT TRANSFORMER

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My invention relates to improvements in current transformers.

To reduce errors in phase and transformation ratio of a current transformer to a minimum, two possibilities present themselves theoretically: viz. the use of iron of highest permeability, and the use of large dimensions. Both possibilities are prohibitive for economic reasons. It has therefore been attempted to reduce the errors to a minimum by special means, the phase error by additional load and the transformation ratio error by equalizing the number of turns. These means provide, however, a correction only which is uniform over the entire range of the load. The value of the percentage error varies, however, strongly with the load so that this correction is accurate for a definite load only. Since the shape of the error curve is connected with the magnetizing curve, the error curve is, according to a feature of my invention, changed by a suitable control of the magnetization, in such a manner that the percentage error is as uniform as possible over the entire range of the load and can thus the more easily be compensated over the whole range. The course of the magnetizing curve is influenced by using alternately different grades or qualities of iron for the construction of the core of the transformer.

In carrying out my invention, I use two grades of iron, one of which is ordinary high-alloy dynamo sheets and the other sheet iron of particularly high permeability, especially such as has a high initial permeability, for instance an alloy of nickel and iron. The grades of iron having high permeability, and particularly the alloys of nickel and iron, are materially more expensive than the ordinary high-alloy dynamo sheets. In order that the cost of manufacturing the transformer may be kept moderate, I have, as a further feature of my invention, formed that portion of the core which consists of the more expensive iron, by winding one or more strips of sheet iron, while that portion of the core which consists of ordinary high-alloy dynamo sheet material is formed by stacking sheet metal laminations of proper form in the usual way. Since the core portion

made of the expensive material is formed by winding or coiling one or more strips of sheet iron, I avoid, in this portion of the core, losses of material such as would occur if this relatively expensive portion of the core were made from stamped sheets.

Two typical examples of my invention are illustrated in the accompanying drawing in which Figs. 1 and 2 are cross sections of two embodiments of my improved transformer core, together with the primary and secondary windings.

As shown in the drawing, the core consists of two portions. The portion 1 in Fig. 1, consists of material of high initial permeability, for instance an alloy of iron and nickel and is made by coiling one or more strips of sheet metal around the other portion 2 of the core. This other portion 2 consists of pieces of sheet metal made from ordinary high-alloy dynamo sheets, generally by stamping, and stacked as illustrated. The laminations of the core portion 2 will generally be plane and the strip or strips of the core portion 1 extend across the outer edges of said laminations, the width of said strip or strips being preferably equal to the thickness of the stack of laminations. Instead of winding the core portion 1 around the core portion 2, I may, as shown in Fig. 2, place a similar portion 1' at one side of the stacked core portion 2', but in either event, the coiled core portion 1 or 1', made of relatively expensive material, is formed by winding or coiling a strip or strips of such material. In either case, the core may be constructed in a very simple and economical manner, and there is no loss of the expensive material such as would be unavoidable if the core portion 1 or 1' were made of stampings. The material, such as an iron-nickel alloy, of which the coiled portion 1 or 1' is made, has a relatively high magnetic permeability even under a light load of the transformer, which permeability falls off somewhat under an increasing load. The other material, such as high-alloy dynamo sheets, of which the stacked portion 2 or 2' is made, has a relatively low magnetic permeability under a light load, which permeability increases under an

increasing load, thus compensating for the loss in permeability which the coiled portion suffers under such circumstances.

The primary winding 3 of the transformer is common to both core portions 1 and 2 or 1' and 2' and surrounds both of them, and the secondary transformer winding 4 likewise is common to both of said core portions. Each of the core portions 1 or 1' and 2 or 2' by itself forms a closed magnetic circuit. In both forms of my invention, the coiled portion 1 or 1' is co-axial with the stacked portion 2 or 2' respectively, the axis of the core being indicated at A in each case. In either case the error is fairly uniformly distributed over the largest portion of the load range if a judicious choice of the ratio of the grades of iron is made, so that the error still remaining may easily be compensated up to an insignificant balance by the additional means mentioned at the beginning of the specification.

It will be noted that any plane of the same character as the one on which the section shown in the drawing is taken, or in other words, any plane axial with reference to the core, will intersect both the spirally coiled portion 1 or 1' of the core and the stacked portion 2 or 2'. The drawing shows this stacked portion as made of like pieces of laminae of sheet metal each having a central clear space or opening, these pieces being stacked in such a way that their outer edges will be in registry with each other, and that the edges of their central openings will likewise be in registry with each other.

I claim as my invention:

1. In a current transformer, a core comprising a portion consisting of pieces of high-alloy dynamo sheets stacked together, and another portion of a material of high permeability in the nature of strip sheet metal coiled spirally around said stacked portion, the width of said coiled portion being equal to the thickness of said stacked portion.

2. In a current transformer, a core comprising two portions, a primary winding common to said portions and surrounding them, a secondary winding common to said portions, each of said core portions forming a closed magnetic circuit by itself, one of said portions consisting of stacked pieces of iron-alloy sheet material of a relatively low magnetic permeability which increases with increasing load, while the other core portion, surrounded by the same primary winding, consists of spirally coiled strip sheet metal of a high initial magnetic permeability which decreases with increasing load.

3. In a current transformer, a core according to claim 2, in which the spirally coiled core portion consists of an iron-nickel alloy.

4. In a current transformer, a core according to claim 2, in which the spirally coiled

core portion surrounds the stacked coil portion.

5. In a current transformer, a core according to claim 2, in which the spirally coiled core portion consists of an iron-nickel alloy and surrounds the stacked core portion.

6. In a current transformer, a core according to claim 2, in which the spirally coiled core portion is located to one side of the stacked portion and co-axially therewith.

7. In a current transformer, a core according to claim 2, in which the spirally coiled strip sheet metal core portion consists of an iron-nickel alloy and is located to one side of, and co-axially with, the stacked core portion, the latter consisting of high-alloy dynamo sheets.

In testimony whereof I affix my signature.
GEORG KEINATH.