

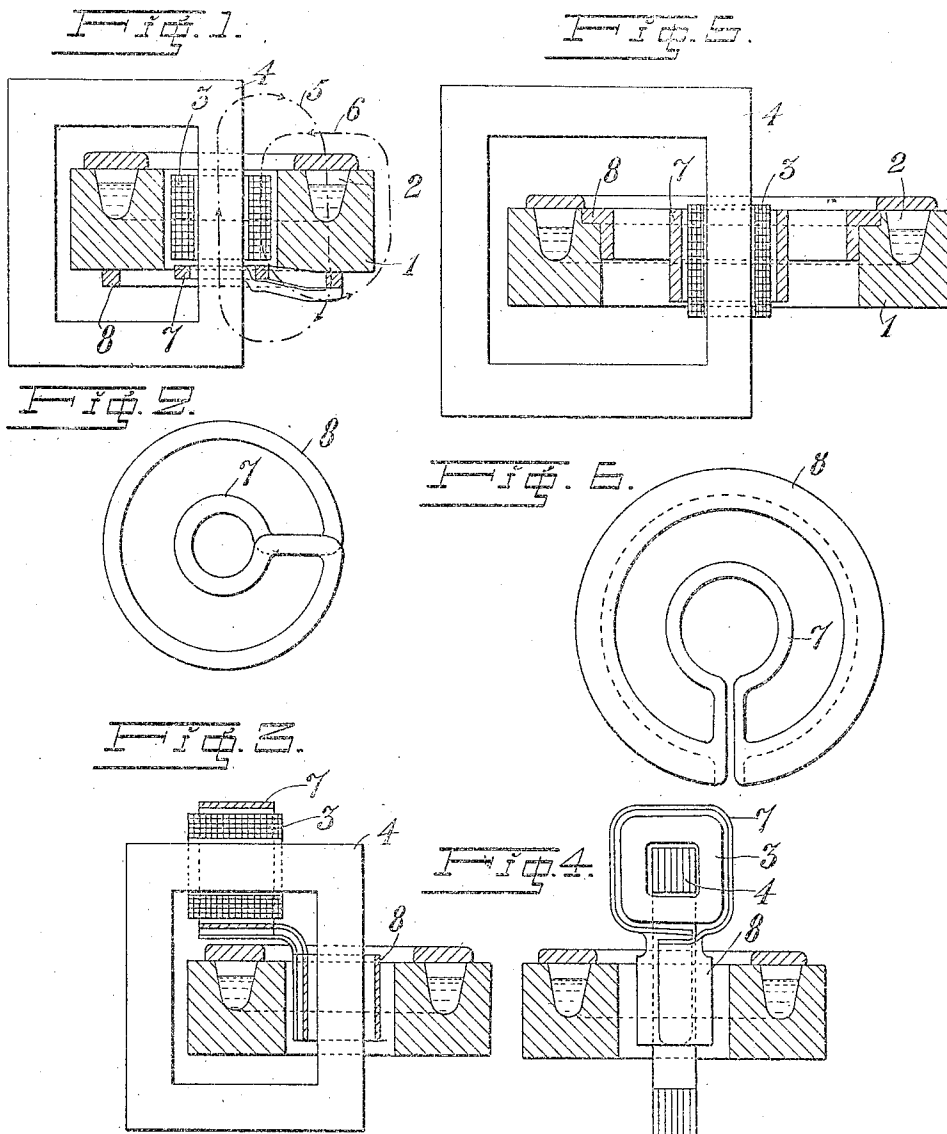
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ELECTRIC TRANSFORMER FURNACE.

APPLICATION FILED SEPT. 14, 1906. RENEWED MAR. 20, 1908.

983,169.

Patented Sept. 7, 1909



Witnesses

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ELECTRIC TRANSFORMER-FURNACE.

933,169.

Specification of Letters Patent.

Patented Sept. 7, 1909.

Application filed September 14, 1906, Serial No. 334,648. Renewed March 20, 1908. Serial No. 422,236.

To all whom it may concern:

Be it known that I, OTTO FRICK, a subject of the King of Sweden, and resident of Saltsjöbaden, Sweden, have invented new and useful Improvements in Electric Transformer-Furnaces, of which the following is a specification, reference being had to the drawing accompanying and forming a part hereof.

10 This invention relates to electric transformer furnaces.

In electric transformer furnaces, the leakage fields around the primary coil as well as around the secondary conductor formed by the melting bath exert a considerable influence on the working conditions of the furnace, said fields attaining great values, on account of the comparatively great distance between the primary and secondary conductors, thus causing considerable tensions of self-induction in each conductor.

20 The object of this invention is to suppress, to a considerable extent, the said leakage field, especially that around the primary coil.

25 The invention consists, chiefly, in the arrangement in the leakage field of the furnace, of one or more conductors, said conductors forming closed electric circuits in inductive relation to the said leakage fields but being arranged, with relation to the main field, in such a manner as not to be effectively induced by the same. Preferably, the invention can be carried out by placing, around the field-core, a short-circuited conductor having two coils placed at a distance from each other and wound in opposite directions, each coil consisting, generally, of only one winding and connected in such a manner as not to be effectively induced by the main field, whereas the lines of force of the leakage field or fields pass through the closed circuit of the conductor and excite therein a current counteracting the said field.

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Such short-circuited conductors may suitably be termed leakage-field-coils.

In the accompanying drawing some forms of embodiment of my invention are schematically illustrated.

50 Figure 1 shows a vertical section through one form of the invention. Fig. 2 shows a plan-view of the short-circuit conductor employed therein. Figs. 3 and 4 show two sections, at right angles to each other, of a sec-

ond form of the invention. Fig. 5 shows a vertical section through a third form of the invention. Fig. 6 shows a plan-view of the short-circuit conductor employed according to Fig. 5.

The furnace shown in Fig. 1 is provided, as usual, with an annular melting space 2 arranged in a suitable brickwork 1 as well as with a primary coil 3 placed around the shank of the closed iron core 4 passing through the central opening in the brickwork. In such an arrangement of the primary and secondary conductors of the furnace, leakage-fields are created about the said conductors, the limits of the said leakage-fields in the right half-part of the sections shown being represented by the dotted lines 5, 6 respectively. The direction of the flux of the lines of force in a given moment are supposed to be those indicated by the arrows. Now, in order to neutralize the leakage-field from the primary coil, there is placed, beneath the primary coil, a short-circuited conductor or loop consisting of a central part 7, situated immediately below the primary coil 3, and an outer part 8 whose diameter is so large that it substantially incloses the leakage-field of the primary coil and which is so arranged that the current in the same will run in opposite direction to that in the part 7. As easily understood, the main field in the closed iron core exerts the same inducing action in the parts 7 and 8 of the short-circuit loop or conductor 7, 8, and inasmuch as these parts are connected in series so that the induced currents will flow in opposite directions, the result of this induction will be zero. The leakage-field of the primary coil flowing between the parts 7 and 8 excites in the short-circuit conductor a current counteracting the leakage-field.

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As indicated in the drawing, also a part of the leakage-field of the secondary conductor passes through the space between the hoops 7 and 8 formed by the short-circuit conductor, and, inasmuch as this field has the same direction as the primary one, also this leakage-field is partly counteracted by the current produced in the short-circuit conductor. As easily seen, the possibility of counteracting the leakage-field of the secondary conductor is to an essential degree dependent upon the possibility of placing the short-circuit conductor in close prox-

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imity to the secondary conductor. As the secondary conductor can here be formed by a thick cable or bar without electric insulation, it is easily understood that the said conductor can without danger be allowed to be heated to a high temperature, so that it can be placed, without any very great danger, close up to or within the brickwork at an inconsiderable distance from the melting bath. It is also obvious that more than one short-circuit conductor of the kind described may be employed within the leakage-fields, if desired. Obviously, the action of the said short-circuit conductors is chiefly dependent upon their cross-sectional area, which determines their capacity of conducting the short-circuit currents necessary for suppressing the leakage-fields, without any higher tension being required in the short-circuit conductor.

The hereinbefore described invention furnishes an effective means of suppressing, to an essential degree, the injurious consequences of disposing the primary coil outside the part of the iron core inclosed by the secondary conductors, for instance on any of the horizontal shanks of the iron core, in that by placing one winding of a conductor or loop close around or within the primary coil and connecting this winding with a winding around the central iron core, as shown in Figs. 3 and 4, the leakage-fields may be employed for producing in these windings a current tending to blow away the leakage-fields. Such an arrangement is schematically shown in Figs. 3 and 4. The primary coil 3 is placed around the upper horizontal shank of the iron core 4. As easily understood, a strong leakage-field will be created about the primary coil which, in case no measures were taken to prevent it, would entail unfavorable working conditions for the furnace. According to this invention, a short-circuit conductor in two sections is arranged about the iron core. The current produced therein has no action upon the main field passing through the iron core, the direction of current in one part being opposite to that in the other part in relation to the iron core. The parts of the primary and secondary leakage penetrating the space between 7 and 8 produces a current in the short-circuit conductor, which current tends, in the same manner as in the arrangement shown in Figs. 1 and 2, to counteract or blow off the leakage-fields.

Fig. 5 shows a short-circuit conductor acting to suppress the chief parts of the primary as well as of the secondary leakage-field. This effect is gained by extending the inner part of the short-circuit conductor along the whole primary coil and placing its outer part as near the melting bath as

possible. For the rest, the arrangement is analogous to that illustrated in Figs. 1 and 2 in that the two parts 7 and 8 are connected to each other in such a manner that their windings run in opposite directions. The advantage of this arrangement is especially obvious, when the furnace is built with a melting bath of a great diameter.

In order to obtain the greatest possible effect it is advantageous to divide the primary coil, or the short-circuit conductor, respectively, into parts arranged between one another. In certain cases the leakage-field-coil can be built up of solid copper plates. For instance, in Fig. 2, it might consist of a circular disk having at the middle thereof a circular opening for the central iron core and being also cut radially.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with an electric transformer furnace having a magnetic core, of a main coil therefor, and a conductor comprising two short-circuited windings inclosing the magnetic core and extending around the same in opposite directions for reducing the effect of the magnetic leakage in said magnetic coil and said main coil.

2. In an electric transformer furnace, the combination of an annular melting bath, a closed iron core having one shank inclosed by the said melting bath, a primary coil surrounding part of said iron core, said coil being so placed as to surround a part of said iron core not inclosed by the melting bath, and arranged on the shank which extends at a right angle to the perpendicular of the shank inclosed by said melting bath, and a short-circuit conductor having two windings for blowing away magnetic leakage of said iron core and said coil, one of which is placed in immediate proximity to the primary coil and adapted to surround the same, while the other is arranged to surround the shank inclosed by the melting bath.

3. The combination with an electric transformer furnace, having a main field and a leakage field, of a conductor formed with windings arranged in inductive relation to the leakage field and main field so that the combined inductive effects upon the conductor due to the main field and leakage field will be zero.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OTTO. FRICK.

Witnesses:

AUG. SÖRENSEN,
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