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ELECTRIC INDUCTION FURNACE

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Fig. 1.

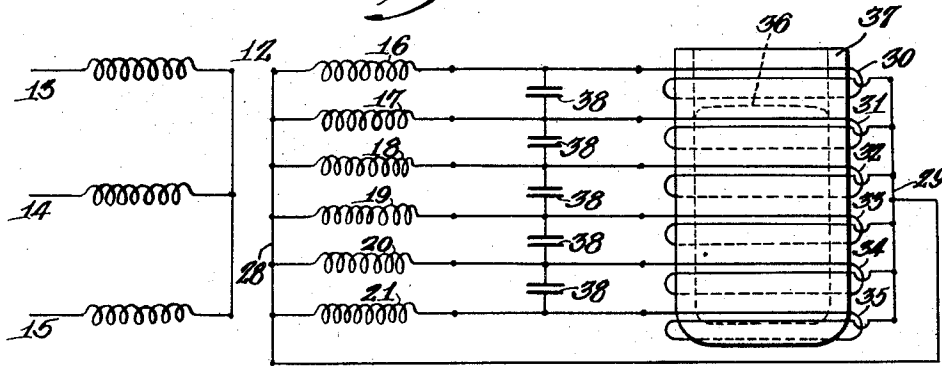
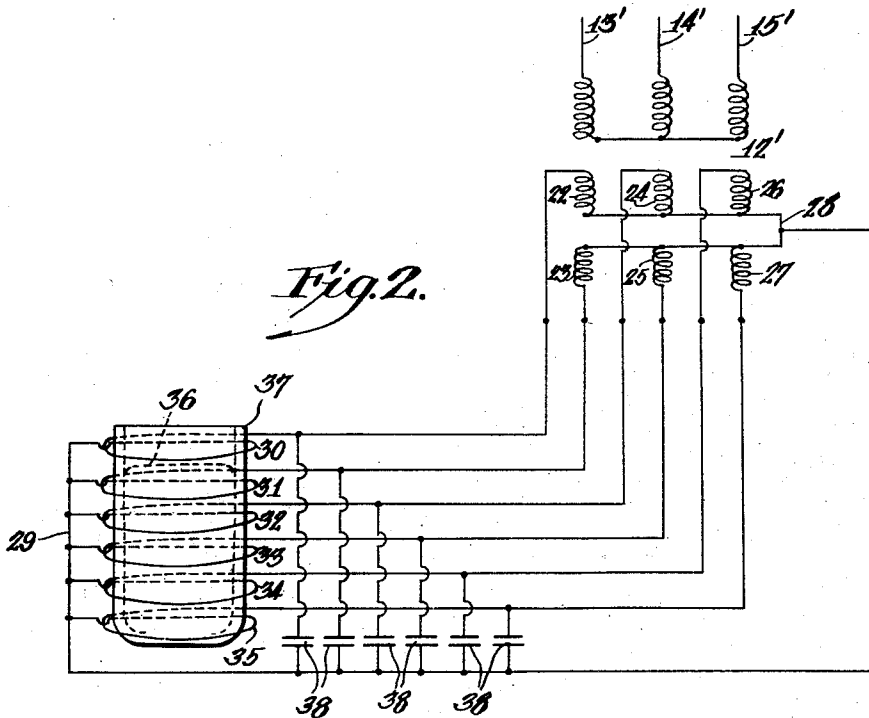


Fig. 2.



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ELECTRIC INDUCTION FURNACE

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My invention relates to electric induction furnaces.

One object of these improvements is to devise a combination of phases for use in a furnace coil whereby the dissipation of energy in the charge will be greater and the power factor will be higher than when single phase current is used.

Further objects will appear in the specification and in the claims.

In the drawings Figures 1 and 2 are diagrammatic illustrations showing the first part of my invention applied to an inductor furnace.

In the drawings similar numerals indicate like parts.

According to this invention currents of normal frequency or currents of high frequency are supplied to the furnace coil by the aid of transformers comprising a number of secondary windings, which have not only an individual inductive action on the charge but also a combined action, the effect of which is to produce a wave of magnetism which will travel from top to bottom or from bottom to top of the charge enclosed by such a coil.

In practice, the application of normal frequency (60 cycles or more) or high frequency currents to an ironless induction furnace may be advantageously performed by the aid of a transformer taking 3-phase currents on the primary and delivering 6, 12 or 24 phase in the secondary. The secondary side of the transformer for a 6-phase output may comprise six separate coils connected up with sections or an ironless induction furnace coil in the manner hereinbefore indicated. In operation, there will be an individual inductive action on the charge within the furnace coil by the different and separate windings which are connected to the ends of the different phases, and there will also be a combined action producing a wave of magnetism progressing axially through the charge from end to end. This wave will travel the length of the winding in time

$$\frac{1}{N}$$

seconds where N is the frequency of the supply current.

Transformers of the kind referred to may be constructed to operate with a high degree of efficiency, and examples adapted for taking 3-phase current in the primary and delivering 6, 12 or even 24-phase current from the secondary are to be found described in the Journal of the American Institution of Electrical Engineers, in pages 818/826 of the issue dated September 1926.

Condensers may be connected across the ends of the phases for power factor rectification, correction or improvement. Thus, in the example described, condensers may be connected between neighboring conductors in the series serving for connecting the secondary windings with respective furnace coil sections or across each coil separately.

The two illustrations given in Figures 1 and 2 are substantially alike but for the difference in the condenser connections.

In each figure a transformer 12 or 12' is shown as taking 3-phase current to feed primaries 13, 14, and 15, or 13', 14', 15', and delivering 6-phase current from its secondary coils 16, 17, 18, 19, 20 and 21 or 22, 23, 24, 25, 26, 27. The secondary coils of each transformer have a terminal 28 common to all of the secondaries of that transformer and these common terminals connect to a terminal 29 common to one end each of the inductor coils 30, 31, 32, 33, 34 and 35 surrounding crucible 37, the charge, 36 here, illustrated as molten and as contained within. The other ends of the inductor coils are connected with the otherwise free ends of the respective secondaries.

In one diagram condensers 38 are thrown across from one coil to the next (Figure 1) and in the other the condensers are thrown across the individual coils (Figure 2). In either event the power factor corrective result is much the same.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain part or all of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall

within the reasonable spirit and scope of my invention.

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

- 5 1. A polyphase source of electric energy, a transformer therefor having a primary wound to receive the same number of phases of current on the primary as are delivered by
10 the polyphase source and connected therewith, and a secondary comprising a plurality of separate coils and a furnace inductor free from interthreading of furnace iron split up into sections corresponding in number with the number of coils
15 of the secondary and severally fed therefrom.
2. A polyphase source of electric energy, a transformer therefor having a primary
20 wound to receive the same number of phases of current on the primary as are delivered by the polyphase source and connected therewith, and a secondary comprising a number of separate coils, which number is a multiple
25 of the number of phases of the primary current, an inductor furnace coil free from interthreading of furnace iron, split up into sections corresponding in number with the number of coils of the secondary and several-
30 ly fed therefrom.
3. A polyphase source of electric energy, a transformer therefor having a primary wound to receive the same number of phases of current on the primary as are delivered by
35 the polyphase source and connected therewith, and a secondary comprising a plurality of separate coils, a multiple of the number of primary phases, an ironless inductor furnace coil split up into sections corresponding
40 in number with the number of coils of the secondary and severally fed therefrom, and condenser power factor rectification connected across the ends of the sections of the inductor coil.
4. A polyphase source of alternating current, a transformer fed therefrom having a plurality of phases from its secondary greater in number than the number of phases in
45 the primary, an inductor furnace coil having different portions of the length of the coil
50 fed by different phases of the secondary and condenser power factor correction across each of the phases of the inductor.
5. A furnace inductor free from inclusion
55 of transformer iron and comprising a plurality of separate inductor coils, a common source of energy therefor providing a plurality of different phases and separate power factor correction across each of the individual
60 coils.

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