

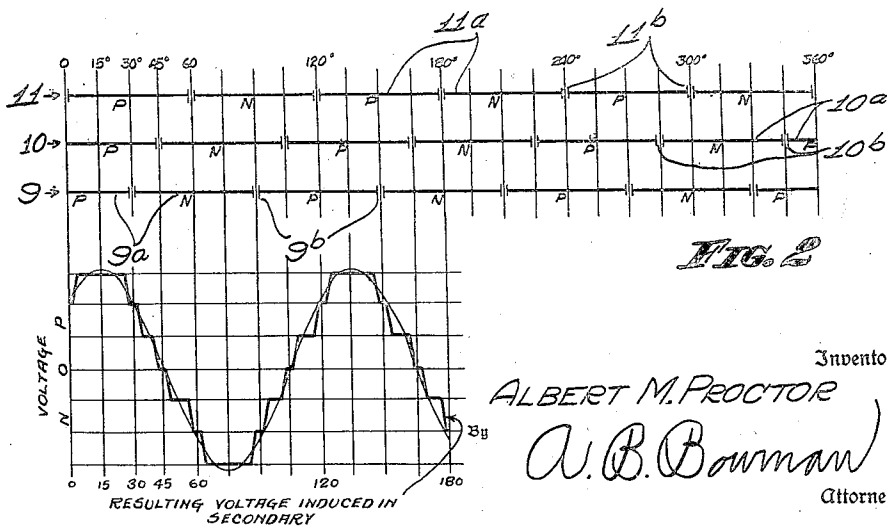
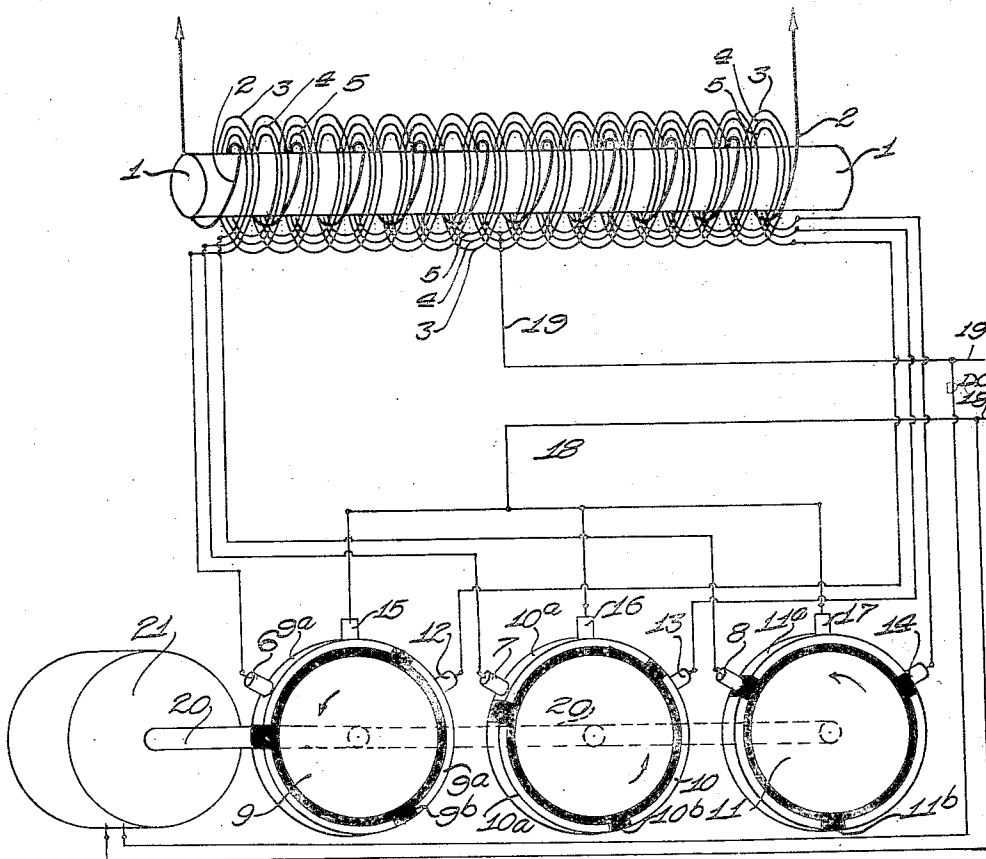
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1,971,730

MEANS FOR CHANGING DIRECT ELECTRIC CURRENT INTO ALTERNATING CURRENT

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MEANS FOR CHANGING DIRECT ELECTRIC
CURRENT INTO ALTERNATING CUR-
RENT

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9 Claims. (Cl. 175—364)

My invention relates to means for changing direct electric current into alternating current and the objects of my invention are:

First, to provide a means which produces from a direct current source an alternating current having all the characteristics of the conventional alternating current inasmuch as the current fluctuation may be caused to approximate the sine curve of the conventional alternating current;

Second, to provide a means of this class which combines in an electric system the advantages of a direct current generating means with the advantages of an alternating current distributing system, in other words, to provide a means of this class which combines the ability of the direct current generator to maintain a constant voltage throughout a wide load range with the ability to vary the voltage according to requirements, a feature inherent in alternating current systems;

Third, to provide a means of this class which enables the alternating current to be produced in any frequency or any desired voltage;

Fourth, to provide a means of this class in which the tendency to arc is reduced to a minimum, and

Fifth, to provide on the whole a novel and simply constructed means for changing direct electric current into alternating current which is durable, efficient in its action, and which will not readily deteriorate or get out of order.

With these and other objects in view as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawing and to the characters of reference thereon which form a part of this application, in which:

Figure 1 is a diagrammatical view of my novel means for changing direct electric current into alternating current, and Fig. 2 shows the timing relation of the various commutators, and the resulting voltage impressed on the secondary of the transformer.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawing.

Core 1, secondary coil 2, primary coils 3, 4 and 5, contacts 6, 7 and 8, commutators 9, 10 and 11, contacts 12, 13 and 14, contacts 15, 16 and 17, leads of direct current supply line 18 and 19, shaft 20, and driving means 21, constitute the

principal parts and portions of my novel means for transforming direct electric current into alternating current.

A core 1 is provided which is similar to the conventional transformer core. Around the core is positioned a secondary coil 2 which is adapted to be connected to the place of demand. The core 1 is also provided with three primary coils 3, 4 and 5, which are preferably arranged to have equal effect upon the secondary coil.

The one ends of the primary coils 3, 4 and 5 are connected through suitable conduits to contacts 6, 7 and 8 respectively. The contacts 6, 7 and 8 are adapted to ride respectively on commutators 9, 10 and 11. The other ends of the primary coils 3, 4 and 5 are connected to contacts 12, 13 and 14 which also ride upon the commutators 9, 10 and 11 respectively.

The commutators 9, 10 and 11 are divided into segments 9a, 10a and 11a, respectively; there being provided three segments for each commutator. These segments are separated by insulated portions 9b, 10b and 11b. The corresponding contacts 6, 7 and 8, and 12, 13 and 14 are arranged approximately 120° apart.

The commutators 9, 10 and 11 are also provided with contacts 15, 16 and 17, respectively, which are positioned midway between the pairs of contacts 6 and 12, 7 and 13, and 8 and 14, respectively. The contacts 15, 16 and 17 are connected together and to one lead 18 of a direct current supply line. The other lead 19 of said direct current supply line is connected to the three coils 3, 4 and 5 midway between their ends.

The commutators 9, 10 and 11 are mounted upon a common shaft 20 which is rotated by a suitable driving means 21, such as a small electric motor driven from the direct current supply line.

The commutators are arranged with their contacting segments offset a few degrees with respect to each other, or, if desired, the contacts 6, 7, 8, 12, 13 and 14 may be offset instead. The purpose of this arrangement is to cause the several coils forming the primary side of the transformer to come into action successively and to reverse their action successively. Thus, as shown diagrammatically in Fig. 2, this arrangement enables the primary coils of the transformer to build up the magnetic field through the core in successive stages and to break down the field at successive stages, then again build up the magnetic field with its polarity reversed, thereby inducing an alternating current in the secondary coil 2. With particular reference to the portion of Fig. 2

illustrating diagrammatically the resulting voltage, when all the coils have the same polarity the voltage is at a maximum. When the first coil, designated 3, connected with commutator 9, reverses its polarity the remaining two are easily capable of carrying the current and arcing is minimized. When the second coil, designated 4, reverses its polarity, the current drops to zero because the other coils are in opposition and again there is no arcing. Then when the third coil, designated 5, reverses its polarity the other two easily carry the current and arcing is again minimized.

By comparison of the sine curve representing alternating current as obtained by conventional means and the resulting voltage "curve" obtained with my arrangement, it can be seen that they are roughly the same.

The sloping of the lines representing the change in voltage value when the polarity of each coil changes roughly indicates the influence of the inherent lag of hysteresis characteristic of a transformer, which influence, it will be noted tends to decrease the difference between the character of the alternating current produced by my arrangement and that produced by the conventional means. Obviously, the similarity of the "curves" may be enhanced by providing more than three commutators and primary coils, as well as varying the relation of the several contact segments and the insulated portions.

It will be noted that in place of the arrangement shown, the commutators may actuate a heavy duty reversing switch connected with the coils, wherever the voltage or power produced is large; such arrangement being shown in my co-pending application Serial No. 586,166.

Though I have shown and described a particular construction, combination and arrangement of parts and portions, I do not wish to be limited to this particular construction, combination and arrangement, but desire to include in the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

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

1. In a means for changing direct current into alternating current, a transformer including a secondary coil and a plurality of primary coils arranged in parallel, a direct current supply line its one lead connected to said primary coils intermediate their ends, and a polarity reversing means for each of said primary coils connecting the other lead of said direct current supply line with the extremities thereof and timing means for operating, the several polarity reversing means in such predetermined sequential relation that the primary coils at times operate in unison and at other times in opposition.

2. In a means for changing direct current into alternating current, a transformer including a secondary coil and a plurality of primary coils arranged in parallel, a polarity reversing mechanism for each of said primary coils connected to the extremities thereof, a direct current supply line including one lead connected to each of said primary coils so as to divide it into equal portions, and a second lead connected to each of said polarity reversing mechanisms, whereby current is caused to flow in one portion of each primary coil at a time, and timing means for operating said polarity reversing mechanisms whereby the polarities of said primary coils are reversed

in sequential order the primary coils operating at intervals in unison and between such intervals in opposition.

3. In a means for changing direct current into alternating current, a transformer including a plurality of parallel wound primary coils, a lead common to said coils connected to their central portions, a second lead in association with the extremities of said primary coils, and a polarity reversing means interposed in said second lead including timing means for connecting first one end then the other end of each primary coil with said lead said polarity reversing means causing substantially continuous operation of said primary coils in displaced phase relation and being so arranged that the resulting field produced by the primary coils has the value of the algebraic sum of their several fields.

4. In a means for changing direct current into alternating current, a transformer including a plurality of parallel wound primary coils, a lead common to said coils connected to their central portions, a second lead in association with the extremities of said primary coils, and a plurality of polarity reversing units for connecting said second lead with first one extremity then the other extremity of each of said primary coils, and means for timing said polarity reversing units with respect to each other so that said primary coils operate in overlapping successive order and the resulting field has the value of the algebraic sum of the several fields of the primary coils.

5. In a means for changing direct current into alternating current, a transformer including a plurality of parallel wound primary coils, a direct current supply line including one lead common to said coils, said lead joined to the central portion of each coil so as to divide each coil into dual portions having a like polarity at their contiguous ends, and a reversing switch mechanism associated with each primary coil including alternately acting contacts joined to the extremities of a primary coil, a supply contact connected with the remaining lead of said direct current supply line, and means for connecting first one then the other of said alternately acting contacts with said supply contacts whereby current is caused to flow first from one end of each primary coil to the center thereof then from the other end of said primary coil to said center, and timing means for operating said reversing switch mechanisms and causing said primary coils to operate in overlapping sequential order of such character that the resulting field has the value of the algebraic sum of the several fields of the primary coils.

6. In a means for changing direct current into alternating current, a transformer including a plurality of parallel wound primary coils, a direct current supply line including one lead common to said coils, said lead joined to the central portion of each coil so as to divide each coil into dual portions having a like polarity at their contiguous ends, and a second lead associated with the extremities of each primary coil, and a multiple unit means interposed in said second lead for connecting first one portion then the other portion of each primary coil with said direct current supply line so that current is caused to flow first from one end to the center then from the other end to the center of said primary coil, and mechanism for timing the units of said means with respect to each other so that said primary coils operate in overlapping sequential order and their resulting field has the value of the algebraic

braic sum of the several individual fields of said primary coils.

7. In a means for changing direct current into alternating current, a transformer, including a core, a secondary coil, and a plurality of parallel wound primary coils, a polarity reversing unit connected to the extremities of each primary coil, and a direct current supply line, the one lead common to said primary coils and joined to the central portions thereof, the other lead common to said polarity reversing units, operating means common to the several polarity reversing units, said polarity reversing units relatively disposed so as to operate their respective primary coils at times in unison and at other times in opposition and in such sequential order that the variation in the current impressed upon the secondary coil of said transformer approaches the sine curve of conventional alternating current.

8. In a means for changing direct current into alternating current, a transformer including a secondary coil and a plurality of primary coils arranged in parallel, a direct current supply line its one lead connected to said primary coils intermediate their ends, and a polarity reversing means for each of said primary coils connecting the other lead of said direct current supply line with the extremities thereof, operating means common to the several polarity reversing means,

said polarity reversing means being so timed with respect to each other that said primary coils operate at times in unison and at times in opposition and in such sequential order that the variation in the current impressed upon said secondary coil approaches the sine curve of conventional alternating current.

9. In a means for changing direct current into alternating current, a transformer, including a core, a secondary coil, and a plurality of parallel wound primary coils, a direct current supply line including a first lead connected to the central portions of said primary coils, and a secondary lead associated with the extremities of said primary coils, and a plurality of reversing units interposed between said second lead and said primary coils for directing the current first to one then to the other end of each primary coil, there being one reversing unit for each primary coil, and means for timing said reversing units with respect to each other whereby said primary coils successively reverse their polarities until they act in unison then again successively reverse their polarities until they again act in unison, and between such times operate in opposition to provide a stepped series of field values intermediate the field value occurring when the primary coils are in unison.

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35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150