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ELECTRIC MACHINE

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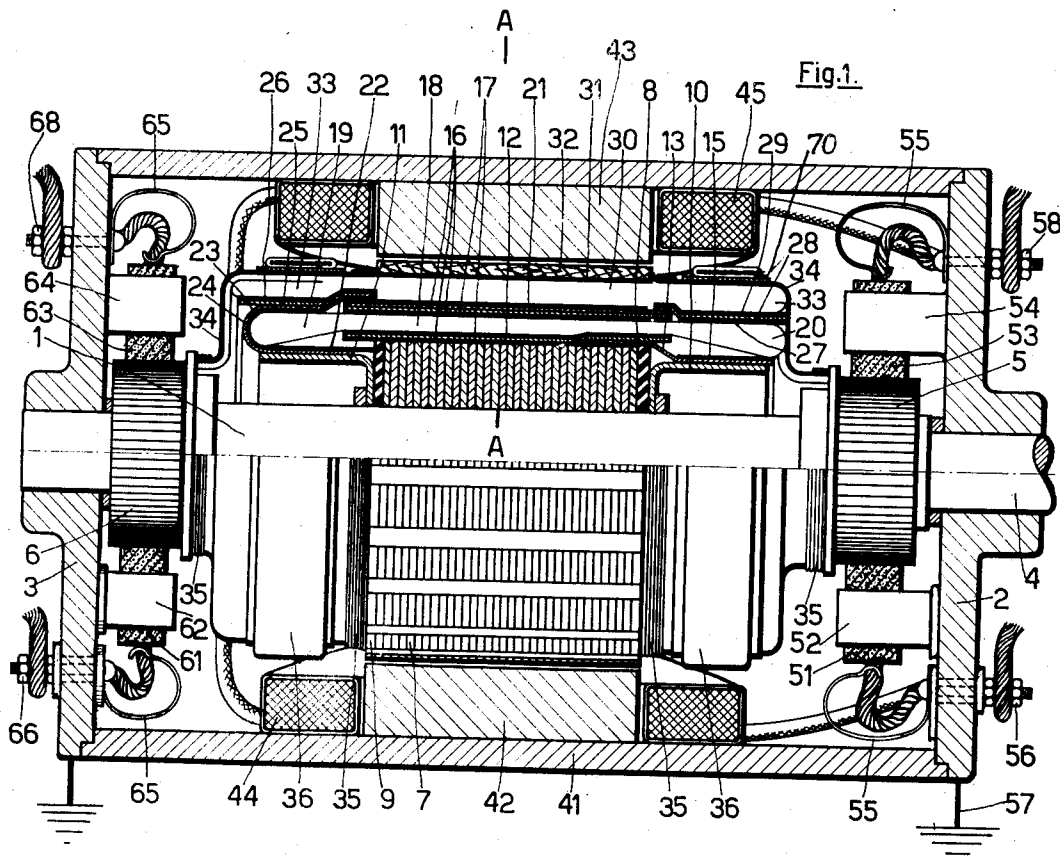
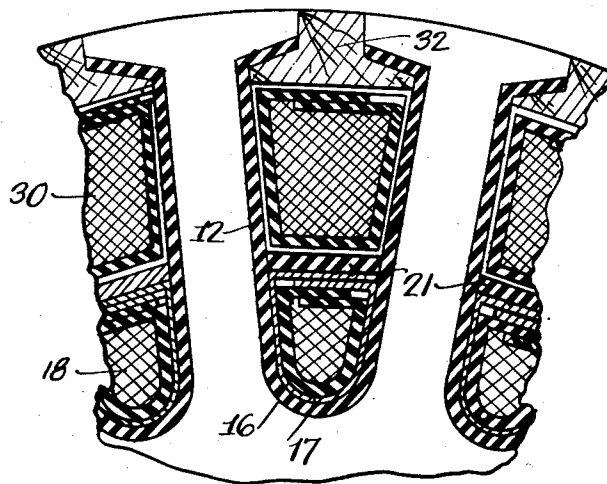


Fig. 2.



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ELECTRIC MACHINE

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The present invention relates to dynamo-electric machines for radio telegraphy and telephony, and more particularly, to armatures of such machines provided with a plurality of windings forming parts of electrically independent circuits.

With known plural circuit machines high frequency disturbances of the potential which may arise in the conductors of one of the circuits on the armature, e. g., through sparking at the collector, also cause similar disturbances in the adjacent conductors of others of the said circuits, on account of the electrostatic interaction between the said conductors.

Although in general applications of dynamo-electric machines such high frequency disturbances are not a severe drawback they are very undesirable in machines employed for purposes of radio telegraphy and telephony. With these, it is necessary to connect smoothing means, in the form of filters, to the circuit where the disturbances are likely to be felt.

In the known electric machines of the kind to which the invention relates, the smoothing means connected to each one of the several circuits must not only be constructed for eliminating the high frequency disturbances which have their origin in the circuit itself, but also for eliminating disturbances having origin in other circuits which have conductors carried by the same armature, so that their disturbances are electrostatically transmitted to the circuit in question. Thus, rather bulky or complicated smoothing devices are required, even in connection with circuits not likely to cause such disturbances.

One of the purposes of the present invention is to provide an effective electrostatic shielding between the windings of different circuits, so that the potential in each circuit is subject only to such variations as have their origin in the circuit itself.

Further, the invention has for its object to provide for a convenient arrangement of such shielding means on the rotating armatures of dynamo-electric machines.

Another important purpose of the invention is to provide such an arrangement of the shielding means as to prevent the formation of undesirable eddy currents (Foucault currents) therein.

The main object of my invention is, therefore, to provide means for preventing the electrostatic field associated with the currents in one of said circuits from influencing the currents in

other of said circuits, that is, to prevent high frequency interference.

Further objects and advantages of my invention will appear from the following description of an embodiment thereof with reference to the accompanying drawing, and it will be understood that while I have described what may be considered as a preferable embodiment of my invention, I do not limit myself to the precise conditions or proportions herein set forth, as they may be varied by those skilled in the art in accordance with the particular purposes for which they are intended, and the conditions under which they are to be utilized.

In the accompanying drawing,

Fig. 1 shows in longitudinal section a generator machine designed for supplying electric current at two different potentials. Such generator machines are used, by way of example, for purposes of wireless telegraphy.

Fig. 2 is a cross-section on the line A—A of Fig. 1, showing at a larger scale the arrangement of the parts within the slots of the armature.

The cylindrical housing 41 of the generator machine is fitted with end plates 2 and 3 in which bearings are provided for supporting the armature shaft 1; at its end 4, the latter is coupled to driving means not shown in the drawing. 5 and 6 are commutators of usual construction consisting each of a number of bars fastened to the shaft and insulated therefrom and from each other.

The commutator 5 cooperates with a carbon brush 51 which is guided in an insulated brush holder 52, and with another carbon brush 53, which is guided in a brush holder 54 integral with the end plate 2. Each one of the said carbon brushes is resiliently pressed onto the surface of the commutator 5 by a spring 55. The brush 51 is electrically connected to an insulated terminal 56, whilst the brush 53 is grounded through the end plate 2, as indicated diagrammatically at 57. However, the said brush 51 is also connected to grounded terminal 58. One consumer circuit may be connected between the terminals 56 and 58.

Similarly, a carbon brush 61 guided in the insulated brush holder 62 connected to terminal 56 and a carbon brush 63 guided in the grounded brush holder 64 connected to the grounded terminal 58 are provided on the end plate 3 for co-operating with the commutator 6, onto which they are pressed by springs 65. The second con-

sumer circuit may be connected between the said terminals 66 and 68.

In the housing 41 exciting means are provided consisting of stationary armatures 42 and 43 and of field coils 44 and 45 which latter are connected in series to one another between the terminals 56 and 58, thus shunting the armature winding 18 hereinafter referred to.

Between the commutators 5 and 6 the shaft 1 carries an armature core 7 built up from iron discs located between end plates 3 and 9 of insulating material. Between the latter and the commutators 5 and 6 metallic drums 10 and 11 are fastened to the shaft 1. Both said drums and the iron discs forming the core 7 are electrically connected to the ground, through the shaft 1 and the end plates 2 and 3. The core 7 has slots of trapezoidal cross-section extending parallel to its axis along its outer surface and communicating with the latter through longitudinal openings.

Each of said grooves is entirely lined with a strip 12 of insulating board. For a small portion of the slot's length at its end facing the commutator 5 a narrow strip 13 of tin-foil is placed over the board 12 at the bottom of the slot. The ends of said tin-foil strips project from the ends of all slots and are maintained in electric contact with the drum 10 by means of a band of insulating board wound across them and around said drum. Strips 16 of tin-foil, which are of U-shaped cross-section in their primitive form, are lodged in the slots on the insulating board lining 12 and on the inner ends of the tin-foil strips 13 with which they are in conducting contact. The strips 16 are lined with corresponding strips 17 of silk tissue.

The insulated copper wire conductors 18 of one of the windings are wound into the slots thus lined. Each of them runs from one bar of the commutator 5 through one slot of the core 7 to the head 19 of the winding and thence through another slot and through the head 20 back to the beginning of the first-mentioned slot. After several such turns the conductor joins another bar of the commutator 5. The longitudinal edges of the silk strip 17, and with them those of the tin-foil strip 16, are folded down so as to overlap each other on the conductors thus wound into each slot and they are covered with a strip 21 of insulating board which projects from the core end plate 9, for the purpose hereinafter to be explained. A band 22 of tin-foil is wound around the outside of the drum 11, said band being much broader than the drum. Its projecting portion is divided into lobes 23 by cuts carried in diametral planes. Between the band 22 and the head 19 of the conductors a silk ribbon 24 is interposed, the latter being also much broader than the drum 11. The lobes 23 and the corresponding portion of the ribbon 24 are tucked up over the winding head 19. Their edges rest around the latter on the projecting ends of the strips 21 so that the lobes 23 are insulated from the tin-foil strips 16. The ends of said lobes are covered by a further tin-foil strip 25 and an insulating board strip 26 wound all around and across them.

The outer surface of the winding head 20 is covered by a silk ribbon 27, by a tin-foil band 28 carried in electric contact across the projecting ends of the tin-foil strips 16, and by a band 29 of insulating board.

On the described coverings of the conductors 18 of the said winding, the winding of a second

circuit is lodged in the same slots. This winding consists of conductors 30 connected to the bars of the commutator 6, which conductors are wound to coils, comprising bundles of conductors wrapped into silk tissue and secured by bandages before being inserted into the armature slots. In the present example, this second winding has no metallic envelope. A further strip of insulating board is placed in each slot upon the conductors of said second winding. All the conductors and their wrapping are maintained in place by wooden key bars 32.

The heads 33 of the second winding are protected by pieces 34 of impregnated fabric fastened by cord bindings 35. On the fabric 34 there are also wire bindings 36 by means of which the heads of all windings and the fabric, tin-foil, bands of insulating board inserted between them are pressed together and secured against centrifugal force. Bands 70 of metal or other suitable material are provided beneath the wire windings 36 to prevent them from cutting into the fabric.

When the armature shaft 1 is rotated, an alternating electromotive force is set up in opposite bars of the commutator 5 through induction in the conductors 18. As in dynamos of usual type this electromotive force is commutated into a direct current from brush 51 to the terminal 56, thence through the first consumer circuit to grounded terminal 58, and back to brush 53. Simultaneously, the exciting coils 44 and 45, which are connected between the terminals 56 and 58, are energized, whereby the magnetic field exciting the machine is obtained. The force lines of said field go from the stationary armature core 42 through the rotary armature core 7, the opposite stationary armature core 43 and back through the housing 41. A direct current is also obtained by commutation of the current induced in the conductors 30 of the second armature winding, the direct current going from brush 61 and terminal 66 through the second consumer circuit and back to grounded terminal 68 and brush 63.

The described shielding of the conductors 18 of the first winding by means of the tin-foils 16, 22, 23, 25 and 28 all electrically connected to the drums 10 and 11 which are grounded and thus remain at a substantially constant potential, serves to maintain the electrostatic field in the conductors 18 substantially unaffected by disturbances of the electrostatic field around the conductors 30. Such disturbances may, for example, arise from sparking at the commutator 6. When the armature is rotated in the magnetic field set up by the exciting means, the induction of short-circuit currents in the tin-foils is prevented as far as possible, because the said foils and their connections do not form loops encircling the magnetic flux which varies substantially when the armature is rotated about its axis.

To avoid the formation of such loops, the tin-foils 22/23 and 16 are insulated from each other though both are electrically connected to the shaft 1, the former through the drum 11, and the other through the strips 13 and the drum 10. The strip 25 communicates with the ground or constant potential body only through lobes 23 of the band 22. On the other hand, the band 28 has a plurality of connections to the drum 10, each across the end portion of a strip 16 and along one of the strips 13; each two such connections, together with the intermediate portions 75

of the band 28 and of the drum 10, form a conducting loop. However, these loops do extend only very little in a direction parallel to the armature axis, so that, when the armature is rotated, the magnetic flux encircled by them varies only by a small amount in comparison with the total flux crossing the armature.

The overlapping longitudinal edges of each strip 16 are in conducting contact with each other, so that each of the said strips forms a closed conducting circuit around the conductors 18. These circuits being perpendicular to the axis of rotation of the armature, the flux encircled by them does not vary when the armature is rotated.

The armature construction according to the invention is suitable for rotary converters as well as for generators, and may be applied to any type of dynamo-electric machine of appropriate type especially where employed in radio telegraphy or telephony.

What I claim is:

1. In a dynamo-electric machine in combination a core having slots formed therein, a plurality of electrically independent sets of conductors carried on said core, said sets of conductors being adapted for connection to independent circuits and for operation at materially different potentials, each conductor having portions located outside said slots, and electrically conducting shielding members interposed between such portions of the said conductors of different sets as are located outside said slots.

2. In a dynamo-electric machine in combination a core having slots formed therein, a body adapted to persist at substantially constant electric potential, a plurality of electrically independent sets of conductors carried on said core, portions of conductors of different sets being lodged in the same slots of said core, electrically conducting shielding members interposed in such slots of said core between the said conductors of different sets and each insulated from said core and from shielding members interposed in other slots of said core, said shielding members being each separately connected to said body.

3. In a dynamo-electric machine in combination exciting means for producing a magnetic field when energised, a core movable relatively to said exciting means, a body adapted to persist at substantially constant electric potential, a plurality of electrically independent sets of conductors carried on said core, electrically conducting shielding members interposed between the said conductors of different sets, a plurality of conducting members electrically connected at their one end to the same one of said shielding members and at their other end to the said body, the loops formed by such shielding member together with two of said conducting members connected to the shielding member and said body being so arranged in relation to said core that when the latter is moved with said exciting means energised, the variation of the magnetic flux encircled by said loops is small in comparison to the total magnetic flux produced by said exciting means.

4. In a multiple-circuit dynamo-electric machine for radio telegraphy and telephony in combination a body of substantially constant electric potential, a core, a plurality of electrically independent sets of conductors wound on said core so as to cover a portion only of its surface, electrically conducting shielding members interposed between the said conductors of different sets and between the conductors of at least one set and the said core, each of the said shielding members

being electrically connected to the said body but insulated from direct contact with said core and said conductors.

5. In a multiple-circuit dynamo-electric machine for radio telegraphy and telephony in combination a core having slots formed therein, a body of substantially constant electric potential, a plurality of electrically independent sets of conductors carried on said core and so arranged that portions of conductors of different sets are carried in the same slots of the core, electrically conducting shielding members interposed in such slots of said core between the said conductors of different sets, and between the conductors of at least one set and the said core, each of said shielding members being insulated from direct contact with said core and said conductors and having one end separately connected to the said body, the other end being free of any electrical contact or connection.

6. In a multiple-circuit dynamo-electric machine for radio telegraphy and telephony, a substantially cylindrical transversely laminated core having longitudinal slots, a body of substantially constant potential, a lining of insulating material in each of said slots, a longitudinally extending shielding strip of metal foil in each of said slots and having its one end electrically connected to said body, said shielding strip being arranged on said lining so as to be insulated from direct contact with said core, a set of insulated conductors arranged on said core in the form of bundles carried each in one of such slots, and each of the said shielding strips having its longitudinal edges joined on one of the said bundles so as to form a tube therearound, a second set of conductors electrically independent from the conductors of the said first set, the conductors of this second set being arranged on said core so as to have portions lodged within the said slots but outside of the tubes constituted by the said shielding strips.

7. In a multiple-circuit dynamo-electric machine for radio telegraphy and telephony in combination a core having slots formed therein, a plurality of electrically independent sets of conductors carried on said core, each conductor having portions carried in said slots and connecting portions located outside said slots at each end of the said core, electrically conducting shielding members interposed at each end of the said core between the whole of the connecting portions of the conductors of one set and the whole of the connecting portions of the remaining conductors at the same end of the said core.

8. In a multiple-circuit dynamo-electric machine for radio telegraphy and telephony means for providing a directed magnetic field, a core rotatable in the magnetic field provided by said means about an axis substantially perpendicular to the main axis of the field, a body of substantially constant electric potential, a plurality of electrically independent sets of conductors carried on said core, an electrically conducting shielding member interposed between the said conductors of different sets, a plurality of electric connections between the said shielding member and the said body, said connections extending in a direction parallel to the axis of rotation of the core for so short a distance that, when the said core rotates, substantially no current is induced in the circuit formed by said body through one of the said connections to the said shielding member and thence back to the main body through another of the said connections.

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