No. 688,340. Patented Dec. 10, 1901.

A. ROTTH.

DIRECT CURRENT DYNAMO ELECTRIC MACHINE.

(Application filed May 19, 1900.)

(No Model.)

Fig. 1.

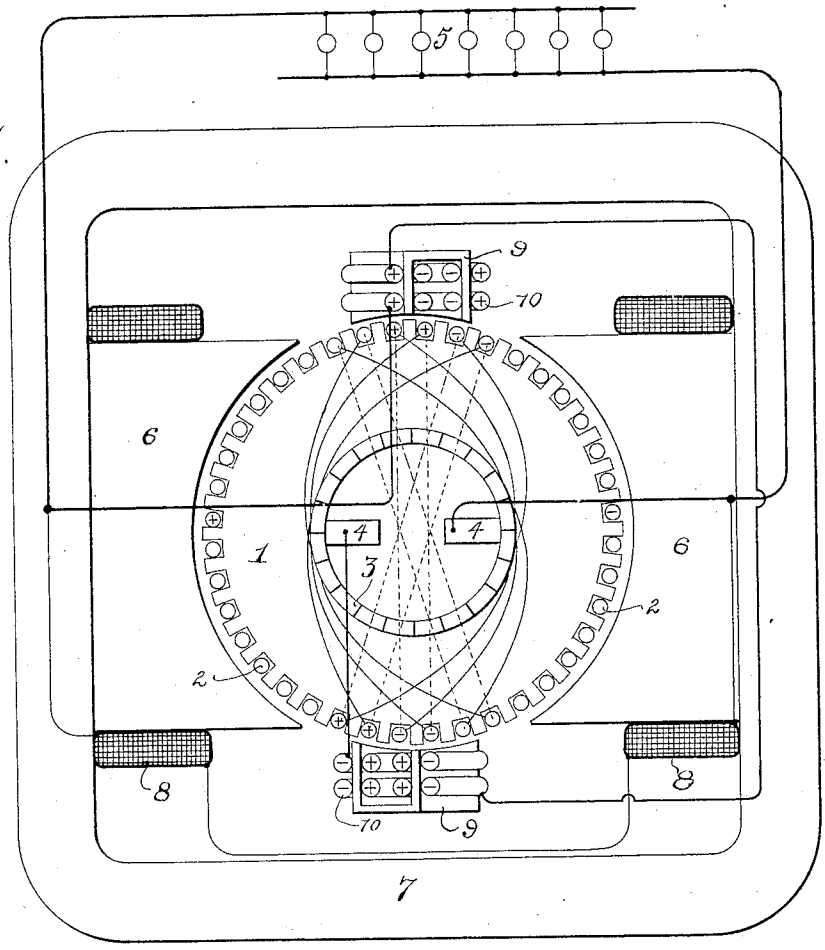
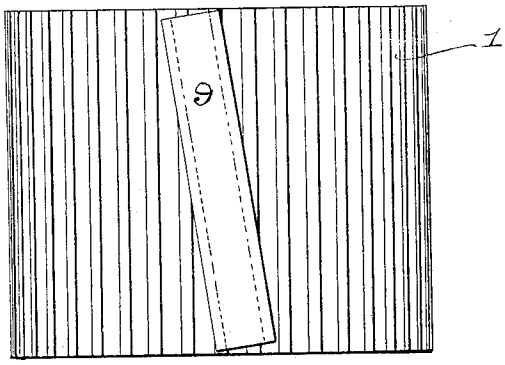


Fig. 2.



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UNITED STATES PATENT OFFICE.

AUGUST ROTTH, OF BERLIN, GERMANY, ASSIGNOR TO THE SIEMENS & HALSKE ELECTRIC COMPANY OF AMERICA, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DIRECT-CURRENT DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 688,340, dated December 10, 1901.

Application filed May 19, 1900. Serial No. 17,280. (No model.)

To all whom it may concern:

Be it known that I, AUGUST ROTTH, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented a certain new and useful Improvement in Direct-Current Dynamo-Electric Machines, (Case No. 356,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to direct-current dynamo-electric machines, and has for its object the provision of improved means for subduing and preventing the sparking at the commutator-brushes occurring upon reversal of current in the armature-coils when passing from a field of one polarity into a field of opposite polarity or, in other words, when commutation of the current in the armature-coils is taking place.

My invention has for its further object the provision of improved means for governing the direction of the lines of force emanating from the trailing pole-tips and directing them into the path of the armature-wire. By means of my invention I am enabled to reduce the leakage coefficient.

Heretofore the use of an auxiliary magnet has occasioned difficulties in certain classes of dynamo-electric machines, due to the increased currents which were generated in the armature-coils or the increased induction threading the same upon a reversal of the current therethrough, the potential of the dynamo-electric machine rising considerably over the potential of the machine at no load. In my present invention I provide improved means to be used in connection with certain classes of dynamo-electric machines, in which I preferably employ an auxiliary electromagnet placed, preferably, longitudinally of the armature, but diagonally with relation to the slots upon the armature-surface. I have found in practice that I can decrease the induction through the armature-conductors occasioned by the electromagnets without in any way detracting from the good influence of the said electromagnets upon the said conductors by providing an inclined position of the polar faces of the electromagnets relatively to the armature-axis.

In accordance with my invention I provide auxiliary means for deflecting the lines of force that would otherwise stray from the path of the armature-wire into the path of the armature. I preferably employ an auxiliary field-coil located near each trailing pole-tip, the field due to the auxiliary field-coils serving to react upon the lines of force emanating from the trailing pole-tips to deflect the same in the desired direction. These same auxiliary field-coils are also preferably employed for preventing sparking at the commutator. By means of the auxiliary field-coils I am enabled to create fields which react upon the current in the armature-coil slightly prior to, during, and slightly subsequent to the commutation of current in the said armature-coil. To this end I construct the cores for these auxiliary field-windings in such manner that the magnetic effect due to these auxiliary windings will react upon the short-circuited windings of the armature during commutation. I am thus enabled to provide auxiliary field members which are capable of greatly decreasing the percentage of leakage lines of force and which at the same time are capable of preventing sparks when the current is being commutated, so that it is not necessary in order to effect sparkless commutation to rely solely upon the adjustment of the commutator-brushes with relation to the field-poles.

In practice in connection with bipolar machines, for example, I prefer to employ two sets of auxiliary field-windings and prefer to provide in connection with each set a core, which auxiliary fields are each disposed between tips of opposite poles. In constant-potential work in order that the current flowing through the auxiliary field-windings may be proportionate to that flowing in the armature, which armature-current varies according to the load, I include the windings of the supplemental fields in series with the working conductors, the two sets of windings being preferably associated in parallel relation with each other. I am thus enabled to produce auxiliary fields which react upon the

current that is about to be commutated proportionately to the load. I am also enabled thereby to create auxiliary fields which vary with the leakage lines of force, which latter change upon the change in load. While I preferably include the auxiliary field-windings in the main circuit, I do not wish to be limited to this arrangement; nor do I wish to be limited to the employment of the same current passing through the machine for the purpose of energizing the auxiliary field-windings, as any suitable source of current varying with the armature-current may be employed.

I will describe my invention more in detail with reference to the accompanying drawings, illustrating one embodiment thereof as applied to the direct-current dynamo-electric machines, in which—

Figure 1 is a diagrammatic view of a shunt-wound-drum machine constructed in accordance with my invention. Fig. 2 is a detailed developed view of the armature-surface, showing the relative position of the auxiliary magnets and armature-conductors.

Like characters of reference indicate like parts in the two views.

In the drawings I have shown an armature 1, provided with conductors 2, suitably embedded in slots about the armature circumference, said conductors being connected in any suitable manner with a commutator 3, the connection of a portion of the said conductors with the commutator to indicate the character of the winding herein employed being indicated diagrammatically. I have shown brushes 4 4, adapted to bear against the commutator to convey the current therefrom through the external circuit, which is here shown as including a series of incandescent lamps 5. I have shown pole-pieces 6 6 about the armature circumference, the said pole-pieces being connected by a yoke 7. I employ in this instance a shunt-winding consisting of coils 8 8, said coils receiving their current directly from the brushes 4 4.

In order to overcome the deleterious effects which are due to reactions occasioned by the armature-conductors, as well as to deflect leakage lines of force into the armature, I employ the auxiliary magnets 9 9, each being placed, preferably, between the tips of the pole-pieces 6 6, the pole-faces of the said auxiliary magnets 9 9 being turned toward the armature 1. I preferably provide series windings 10 10 about the legs of each of the auxiliary magnets 9 9, the said windings being in series with the main circuit. The action of the auxiliary magnet will therefore be proportional to the current flowing through the armature-conductors, the effect of the said auxiliary magnet being therefore substantially proportional to the strength of the armature reactions. I have shown the legs of the electromagnet as displaced a distance from each other equal to an amount which is sufficient to inclose two of the armature-conductors, this being necessary in the character of winding as herein shown, in which two adjacent coils are short-circuited at one time during commutation. In order to avoid unduly increasing the induction through the armature-conductors, which may occur through the use of these auxiliary magnets 9 9, I preferably place the same diagonally with respect to the axis of the armature, so that the said magnets occupy a position diagonal to the armature-conductors, thereby placing more than two conductors normally under the influence thereof. The auxiliary magnet serves in this instance to reverse the current through the armature-conductors in which the current is to be commutated in the same manner as though the said auxiliary magnet were placed longitudinally to the said armature and parallel to its axis, as well as to deflect leakage lines of force into the armature. The arrangement of the said auxiliary magnet with relation to the armature-slots is shown more clearly in Fig. 2, in which the armature conductors and windings about the auxiliary magnet have been omitted for the sake of clearness.

I have herein shown and particularly described one embodiment of my invention; but I do not wish to be limited to the precise construction and arrangement shown, as modifications thereof may readily be made without departing from the spirit of my said invention.

What I therefore claim as new, and desire to secure by Letters Patent, is—

1. In a direct-current dynamo-electric machine, the combination with an armature, of a commutator therefor, a field member for the armature, an auxiliary field-winding for creating a field to decrease the effects of armature reaction, and a core for the auxiliary field-winding located adjacent to the armature and placed diagonally of the axis thereof, substantially as described.

2. In a dynamo-electric machine, the combination with an armature, of a commutator therefor, a plurality of main field-poles, an auxiliary field-winding disposed between the field-poles for creating a field to decrease the effects of armature reaction, and a core for the said auxiliary field-winding placed diagonally of the axis of the said armature, substantially as described.

3. In a direct-current dynamo-electric machine, the combination with a plurality of main field-poles, of main field-windings therefor, an armature associated with the main field-poles, a commutator for the armature, brushes for the commutator, an auxiliary field-winding located adjacent to the armature and disposed between tips of poles of unlike sign, and a core for the said winding, the legs of the said core being separated transversely and placed diagonally of the axis of the said armature, the said core being inductively related to the short-circuited coil of the armature, substantially as described.

4. In a direct-current dynamo-electric machine, the combination with a plurality of main field-poles, of main field-windings therefor, an armature associated with the main field-poles, a commutator for the armature, brushes for the commutator, an auxiliary field-winding located adjacent to the armature and disposed between tips of poles of unlike sign, a core for said winding, the legs of the said core being separated transversely and placed diagonally to the axis of the said armature, the said core being inductively related to the short-circuited coil of the armature, and means for supplying the auxiliary field-winding with current which varies with the armature-current, substantially as described.

5. In a direct-current dynamo-electric machine, the combination with a plurality of main field-poles, of main field-windings therefor, an armature associated with the main field-poles, a commutator for the armature, brushes for the commutator, an auxiliary field-winding located adjacent to the armature and disposed between tips of poles of unlike sign, the said auxiliary field-winding being supplied with current from the armature, and a core for said winding, the legs of the said core being separated transversely and placed diagonally of the axis of the said armature, the said core being inductively related to the short-circuited coil of the armature, substantially as described.

In witness whereof I hereunto subscribe my name this 31st day of March, A. D. 1900.

AUGUST ROTTH.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.