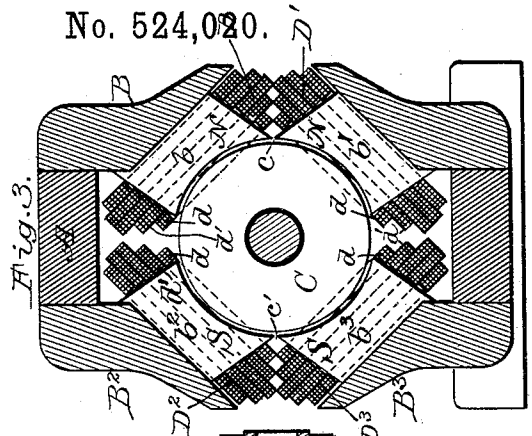
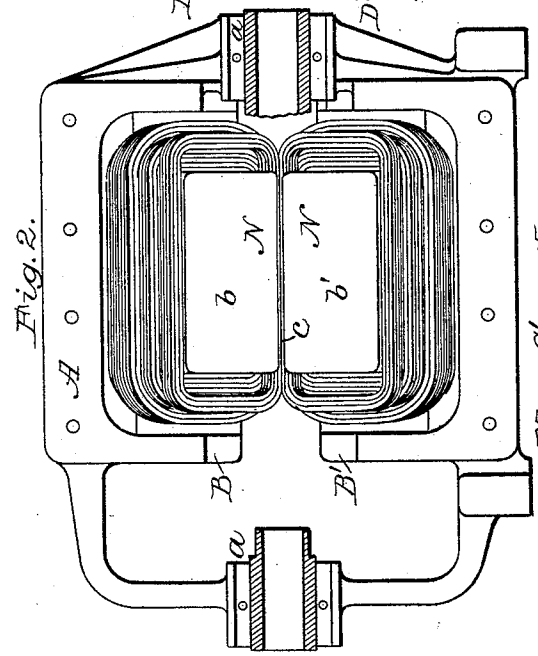
(No Model.)

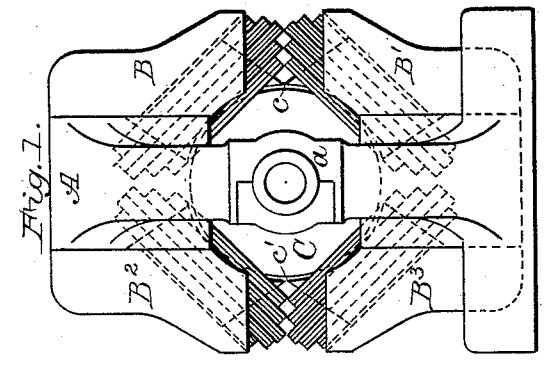
R. EICKEMEYER.

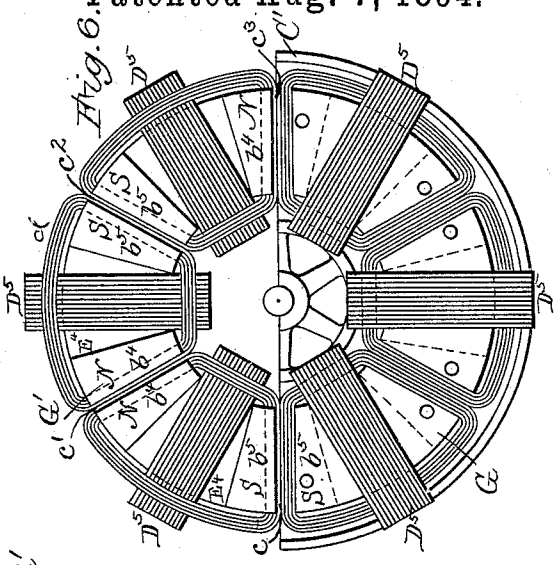
DYNAMO ELECTRIC MACHINE.

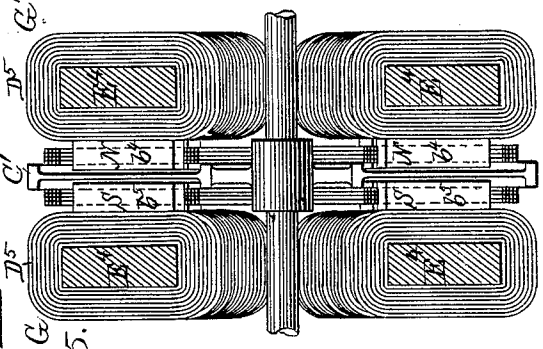
No. 524,020. Patented Aug. 7, 1894.

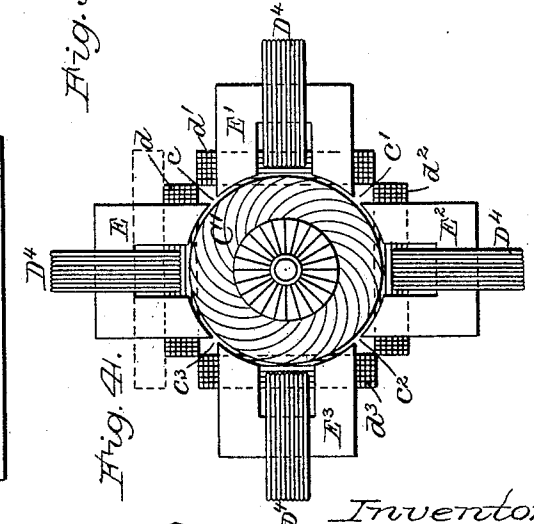












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UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 524,020, dated August 7, 1894.

Application filed October 7, 1891. Serial No. 407,977. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My present application, is intended to specially embrace or include certain widely applicable improvements heretofore invented by me, when embodied in such dynamo electric machines as depend for their magnetic field, upon electro magnets, appropriate portions of which, afford suitable cheek pieces, as distinguished from that special type of machines, disclosed in my Letters Patent No. 358,340, in which the armature cores are directly magnetized, and wherein the cheek pieces are polarized by induction, and are relied upon for affording practically continuous magnetic circuits.

In a separate application for Letters Patent filed herewith, it is my intention to broadly claim my aforesaid improvements, and to also make appropriate claims therein, specially applicable to certain of the organizations therein described and shown.

In another application for patent Serial No. 376,361—my said improvements were also disclosed and appropriately claimed, as successfully embodied by me in alternating current machines.

Broadly stated, the object of my said improvements is to eliminate from dynamo electric machines, as far as may be practicable, that magnetization induced by the armature winding, which is obstructive to the proper operation of such machines, and to enable them to operate with greater efficiency, regardless of the service to which they may be applied.

After describing the present portion of my invention, as applied by me in and to the several organizations illustrated in the drawings, the features deemed novel, and within the intended scope of this application, will be duly specified in the several clauses of claims, hereunto annexed.

Referring to the drawings, Figure 1, in end elevation illustrates a machine embodying a magnetic system, including two electro magnets, organized for bi-polar service, with a drum armature. Fig. 2, illustrates the same, but with the armature and one set of cheeks, and their coils removed. Fig. 3, is a lateral vertical central section, of Fig. 1. Fig. 4, in end view, illustrates a drum armature, and a magnetic system, embodying four electro magnets, organized for multipolar service. Fig. 5, in diametric section, illustrates a dish armature, and an annular multipolar magnetic system, embodying twelve electro magnets. Fig. 6, is an outside view of one half, and an inside view of the other half of the magnets shown in Fig. 5, the one-half of the armature being shown at its center and rim.

The bipolar machine, shown in Figs. 1, 2 and 3 is in a preferred form, and it embodies a central frame A, of iron, which longitudinally surrounds the armature, and serves as a part of the magnetic system which includes two electro magnets. This frame at its ends, affords seats *a*, *a*, for the journal boxes of the armature shaft. To one side of this frame, upper and lower cheek pieces B, and B′, are secured, these being provided respectively with core pieces *b*, *b′*, clearly shown in Fig. 2, and these are of the same polarity, for instance, N. On the opposite side of the frame, are upper and lower pole cheeks B^2, B^3, having core pieces b^2, b^3, these being of like polarity, S, for instance, as indicated in Fig. 3. These four core pieces, afford in substance two pole faces similarly magnetized, or of like polarity, each divided and separated, by a long narrow space at *c*, or *c′*, which is parallel with the axis of the bi-polar drum armature C, and hence of course, parallel with adjacent portions of the armature winding. Each core piece, is provided with a set of coils which may be varied in number. As here shown, these coils D, D′, D^2, D^3, are in five sections each. The two sections *d*, *d′*, nearest the armature, on each core, are what I term the auxiliary, or counterfield coils, and these are connected in circuit with the armature winding, so as to cause said coils to develop magnetic circuits which are opposite in the direction of flow, to those magnetic circuits which are objectionably induced by the adjacent portions of the armature winding, and

therefore, the wire in each of these four pairs of said inner coil sections, is but little greater in quantity, than the wire in those portions of the armature winding which said auxiliary field sections are intended to counteract. The three outlying sections of coil, on each of the four cores, are the true field coils, and the auxiliary coils in this machine, sometimes co-operate with their adjacent field coils, in augmenting magnetism in their cores, and sometimes they lessen said magnetism. As here shown, the magnetic system is organized for a reversible motor, and according to the direction in which the armature is to be driven, the magnetization of either the upper, or the lower half of the divided or separated similarly magnetized cheeks, is increased, or lessened, in magnetic power, and the diagonally opposite halves are proportionately lessened, or increased, and therefore a substantially fixed point of commutation is secured, and sparking at the brushes obviated.

If the machine be intended to operate in one direction only, then the appropriate upper core, and the diagonally opposite lower core, would need only the three field coil sections, and the other diagonal cores, would each have three field sections, and also the two auxiliary sections, these latter serving to weaken the magnetism of their respective cores to the extent to which they would otherwise be strengthened by the magnetic currents induced by the armature winding.

An armature section, while passing the space or air gaps c, or c', (between the cores of like polarity,) has no continuous adjacent iron, in which its magnetic lines can travel, and hence the magnetic circuits of the armature at those points, are in part obstructed by air space resistance, and in part by the opposing magnetic lines, induced from those portions of the several coils, which are adjacent to the armature, and occupy positions in, or opposite, said spaces. With the field coils reduced to three on each core, there will be afforded at the spaces c, c', at each side of the machine, sufficient space inside of the field coils to accommodate the sides of an auxiliary field coil, which would surround the armature longitudinally, as in machines illustrated in my aforesaid application for patent. (See Serial No. 407,976.)

In the multipolar machine, shown in Fig. 4, the drum armature C′, is well surrounded by eight pole cheeks, afforded by four separate electro magnets E, E′, E^2, E^3, and these are so organized, and excited, that a cheek piece of any one magnet, is of like polarity with the adjacent cheek piece, of the next magnet, and these cheeks, are separated by narrow air gaps, or spaces c, c', c^2, c^3, thus in substance, making each pair of contiguous cheeks, one pole face, divided into two parts, separated by a space parallel with the winding on the face of the armature.

The core of each magnet, is of horse shoe form in cross section, and its field coil D^4 may be variously applied. As here shown, the field coils, in one section each, are mounted upon the body or central portion of the core, but they could each be divided into two sections, and each leg of the core, be surrounded by its own field section, as indicated in dotted lines, at the upper magnet E.

In this machine, the gaps c, c', c^2, c^3, afford air space resistance in the objectionable magnetic circuits induced by the armature winding, as in the machine first described. Each magnet, as near as may be to the armature, and to the spaces c, c', &c., is provided with a counterfield coil, or auxiliary field coil, d, d', d^2, d^3, and the electric current is supplied thereto in such a manner, as will magnetically strengthen, or weaken, appropriate cheek pieces, and afford magnetic circuits opposite in direction, to those objectionable magnetic circuits induced by the armature winding. If, as hereinbefore suggested, each leg, of each magnet, should be surrounded by a section of field coil, then each auxiliary coil, would be in like manner divided, each half being located on and surrounding a core, and between the true field coil, and the armature.

The features of invention already described, are capable of being variably organized in disk armature machines. As shown in Figs. 5 and 6, a disk armature is employed in combination with a series of electro magnets, for operating as a multipolar machine. Two series of flat faced magnets are circularly arranged, opposite each other, as at G, G′, with an intervening space for the radially wound disk armature C^2, and in each series, there are six electro magnets E^4, each having its own field coil D^5, the magnets in each series, being separated from each other, by narrow radial spaces c, c', c^2, &c. Several magnetized cheeks, of the several magnets in each series, are closely adjacent to each other, but separated by said spaces c, c', as at N, N, b^4, b^4, and S, S, b^5, b^5. Each magnet has also a counterfield coil d, and these, as in the previously described machines, have portions which occupy the spaces between the similarly magnetized cheeks of the magnets, and they are in like manner, connected with the armature circuit, and the portions of said coils which occupy said spaces, are parallel with the adjacent portions of the radial winding of the armature.

In all of these machines, each of the magnets has its own field coil, or coils, and in each instance, the counterfield coils are to be understood as being in circuit with the armature winding, but so receiving the electric current, that it will flow in an opposite direction from the current flowing in those sections of the winding, which are adjacent to those portions of the counter field coils, which occupy the spaces, separating the closely adjacent, and similarly magnetized cheeks of the several magnets.

Although each of these machines, embodies

electro magnets, which are substantially U-shaped, it is obvious that other forms may be employed, as, for instance, bar magnets, only one end of each affording a cheek piece, in which case, similarly magnetized cheeks would be, as before described, separated by narrow spaces parallel with the armature winding, and the counterfield coils, would be organized therewith, as in the machines illustrated.

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

1. In a dynamo electric machine, the combination with an armature, of separate electro magnets, arranged with their similarly polarized cheeks closely adjacent to each other, but separated by narrow spaces, parallel with the armature winding; and counterfield coils in circuit with the armature winding, but receiving electric current, in a direction opposite to that in the adjacent portion of said winding, and having portions of said coils located at said spaces parallel with said adjacent portions of the winding, the air spaces affording resistance in those magnetic circuits which are induced by said adjacent portions of the armature winding, and the counterfield coils inducing a magnetic flow, opposite to that, which is induced by said portions of the armature winding.

2. In a dynamo electric machine, the combination substantially as hereinbefore described, of an armature; separate U-shaped electro magnets each having its own field coil, or coils, and provided with appropriate cheek pieces, and having the several similarly-magnetized cheeks located closely adjacent to each other, but separated by air spaces parallel with the armature winding, and a counterfield coil on each magnet, in circuit with the armature winding, and having portions thereof located in said spaces, and parallel with the armature winding.

3. In a dynamo electric machine, the combination of an armature; separate electro magnets each having its own field coil or coils, and having cheek pieces symmetrically arranged with relation to the armature, with each two similarly polarized cheeks separated by spaces parallel with the armature winding, and a counter field coil or coils, which either strengthen or weaken the magnetism of appropriate cheeks, according to the direction in which the machine is operated, for maintaining a permanent line of commutation, regardless of variations in speed or load.

4. In a dynamo electric machine, the combination of a drum armature; an iron frame longitudinally surrounding the armature, constituting portions of two separate electro magnets; cheek pieces attached to said frame, and provided with concaved cores radial to the armature, and having similarly magnetized cores, separated from each other near the periphery of the armature, by narrow spaces parallel with the armature winding; field coils on said cores; and counterfield coils having portions thereof located at said narrow spaces, and parallel with the armature winding, and in circuit therewith, but receiving electric current in a direction opposite to the direction of the current, in the adjacent portions of the armature winding.

RUDOLF EICKEMEYER.

Witnesses:
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