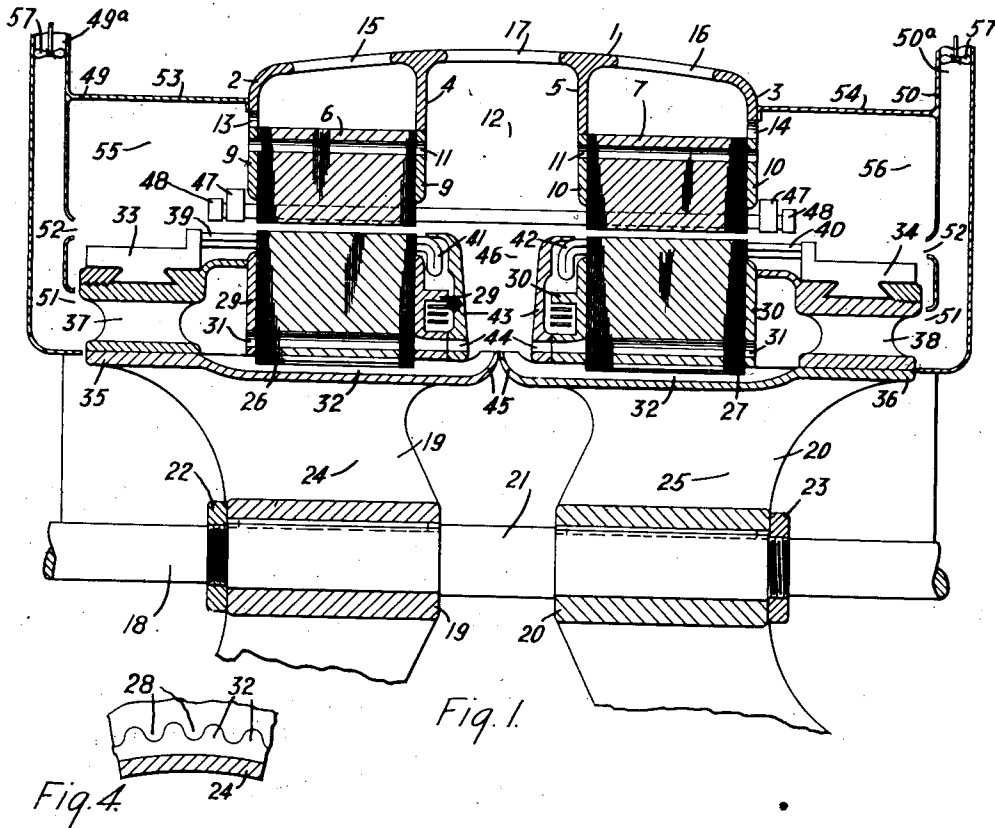


R. E. HELLMUND.
DYNAMO ELECTRIC MACHINE.
APPLICATION FILED FEB. 4, 1916.

1,301,845.

Patented Apr. 29, 1919.

2 SHEETS—SHEET 1.



WITNESSES:
F. A. Lind
Fresh Miller

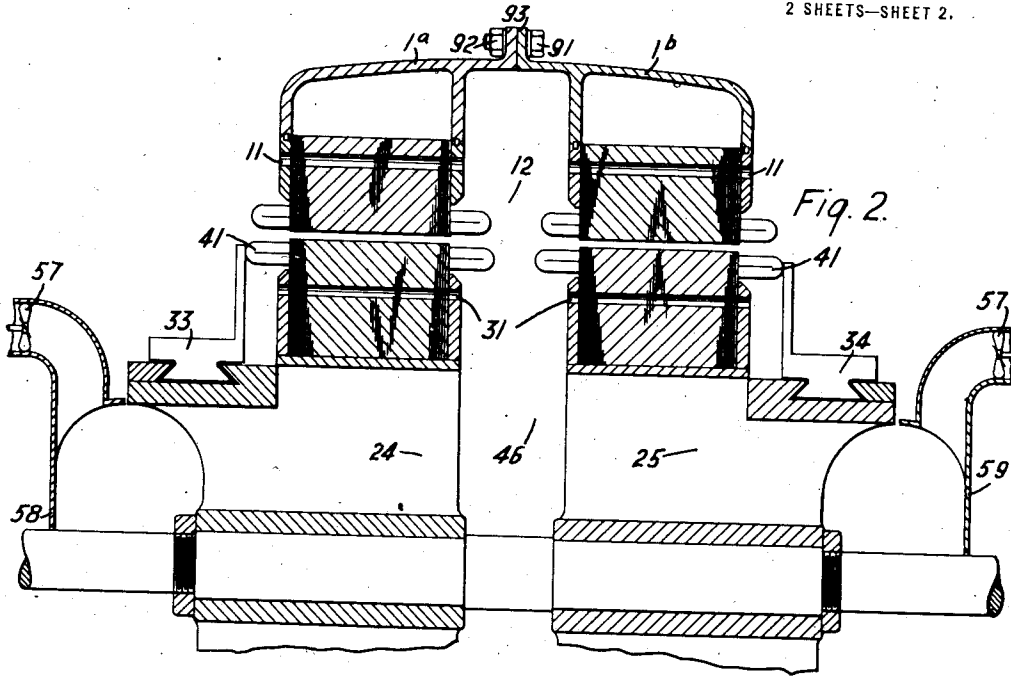
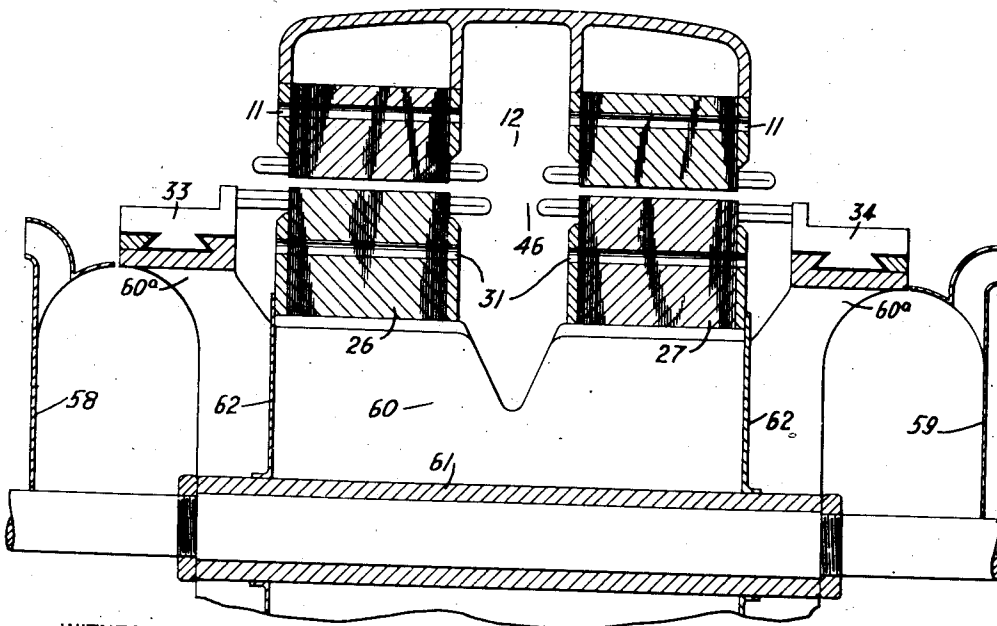
INVENTOR
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Fig. 3.

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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC MACHINE.

1,301,845.

Specification of Letters Patent.

Patented Apr. 29, 1919.

Application filed February 4, 1918. Serial No. 78,152.

To all whom it may concern:

Be it known that I, RUDOLF E. HELLMUND, a subject of the Emperor of Germany, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines and particularly to the structure and ventilation of heavy-duty motors of the single-phase, commutator type.

The object of my invention is to provide a system of ventilation for a motor of the above-described type whereby the current-carrying parts and the magnetizable core members are maintained at a substantially uniform temperature.

In the construction of motors for electric railway vehicles, particularly of the single-phase, commutator type, it has been found difficult to utilize the total width available between the sides of the supporting frames by a single armature and commutator cylinder and obtain, at the same time, the proper proportions of the armature winding and commutator cylinder necessary for good commutation. I therefore construct a motor in which the armature core is subdivided and provided with a plurality of separate armature windings and commutator cylinders, all of which are carried on a single shaft. The stationary field-magnet core is also subdivided and the entire field-magnet and armature structures are arranged within a single inclosing frame.

My invention lies in the method of ventilation of a dynamo-electric machine of the above described type. With machines of large capacity, as heretofore constructed, the usual methods of ventilation have been handicapped by the presence of housings that completely inclosed the operating parts of the machine, thus giving rise to higher initial operating temperatures. Furthermore, since the ventilating medium was usually introduced into such inclosing housings at only one side of the machine, it followed that the parts of the machine nearest the inlet opening were maintained at a lower temperature than other parts of the machine remote therefrom. According to the present invention, I employ ventilating ducts between the several portions of the core members and provide parallel longi-

tudinal passages in the core members, whereby the air is equally distributed throughout the machine, thus securing a substantially uniform temperature of all parts. I provide also means whereby air currents are directed over the surfaces of the commutator cylinders and through passages in such cylinders. This arrangement is particularly advantageous in view of the relatively high operating temperatures that are attained by the commutator cylinders of single-phase motors.

In the accompanying drawings, Figure 1 is a view, partially in section and partially in side elevation, of a plural-armature motor embodying my invention; Figs. 2 and 3, respectively, are views similar to Fig. 1 showing modifications of my invention and Fig. 4 is a fragmentary detail view of the magnetizable members shown in Fig. 1.

The motor shown in Fig. 1 comprises a frame 1 having annular end flanges 2 and 3 and annular internal ribs 4 and 5. Annular magnetizable core members 6 and 7 are composed of laminations or plates and are respectively secured between suitable end plates 9 and 10. The end-plates 9 of the member 6 are secured to the flange 2 and the rib 4, and the end-plates 10 of the member 7 are secured to the flange 3 and the rib 5 of the frame 1. Longitudinal passages 11 are provided in the members 6 and 7 and in the end-plates 9 and 10. The flanges 2 and 3 are respectively provided with openings 13 and 14 which communicate with openings 15 and 16 that are provided in the top of the frame 1 above the core members 6 and 7. A central opening 17 connects the space 12 between the ribs 4 and 5 with the outside atmosphere.

A shaft 18 is rotatably mounted in bearings (not shown) and carries spiders 19 and 20 which are spaced apart substantially the same distance as the ribs 4 and 5 by an enlarged portion 21 of the shaft and the outer ends of the spider hubs are engaged by nuts 22 and 23. The spiders 19 and 20 respectively comprise radial ribs 24 and 25 upon which are supported annular magnetizable members 26 and 27. The members 26 and 27 are composed of plates or laminations and are respectively secured between end-plates 29 and 30. Longitudinal passages 31 are provided in the members 26 and 27 and in the end-plates 29 and 30. The inner periph-

eries of members 26 and 27 are further provided with corrugations 28, as best shown in Fig. 4, thus forming passages 32 between the core members and the supporting ribs 24 and 25. Commutator cylinders 33 and 34 are respectively mounted upon annular supporting members 35 and 36 that are carried by the ribs of the spiders. The supporting members 35 and 36 are respectively provided with spaced openings 37 and 38.

Armature windings 39 and 40 are carried in suitable slots provided in the core members 26 and 27 and are respectively connected to the bars of the commutator cylinders 33 and 34, in the usual manner. The inner ends of the coils of each armature winding are bent to project radially inwardly toward the shaft 18 as indicated at 41 and 42. The bent-over portions 41 and 42 are supported and protected by brackets 43, in a manner similar to that described in a copending application, Serial No. 75,932 filed February 3, 1916, by R. E. Hellmund and R. E. Ferris, and assigned to the Westinghouse Electric & Manufacturing Company. The brackets 43 are provided with openings 44 that register with the passages 31. The ribs 24 and 25 are provided with up-turned extensions 45 that are contiguous to the inner ends of the passages 32 and abut each other to form a closure for the central duct 46 between the adjacent faces of the brackets 43. Exciting field windings 47 and cross-field windings 48 are located in suitable slots in the core members 6 and 7 and are interlinked with the core members so that each of the windings 47 and 48 serves in common for both of the armature windings 39 and 40.

Annular end-inclosing members 49 and 50 are provided with concentrically arranged discharge openings 51 and 52. The members 49 and 50 are located at the respective ends of the motor so that the inner openings 51 register with the openings 37 and 38 and the outer openings 52 are adjacent to the outer surfaces of the commutator cylinders 33 and 34. The members 49 and 50 are provided with lateral flanges 53 and 54 that are respectively secured to the flanges 2 and 3 of the frame 1, air chambers 55 and 56 being thus provided. The members 49 and 50 are further provided with air-inlet pipes 49^a and 50^a that are connected to, or provided with, a suitable means for creating a circulation of air, such, for example, as blower fans 57. When the fans 57 are operated, air will be delivered by the openings 51 into the openings 37 and 38 and by the openings 52 over the external surfaces of the commutator cylinders into the chambers 55 and 56. The air will then pass in parallel paths from the openings 37 and 38 through the passages 31 and 32 to the central duct 46 and from the chambers 55 and 56 through the passages 11 to the central duct 12 from whence it will be

discharged through the opening 17. Air will also pass through the communicating openings 13 and 15 and 14 and 16, respectively.

From the foregoing, it is apparent that both the external surfaces and the internal portions of the commutator cylinders, as well as the internal portions of the core members will be effectively cooled by parallel air currents flowing at substantially equal velocities. Furthermore, all the exposed portions of the field windings 47 and 48 will be subjected to the air currents.

In the modification shown in Fig. 2, the frame 1 comprises two separate portions 1^a and 1^b that are secured together in any suitable manner, as by bolts 91 and nuts 92 co-acting with lugs 93 provided on each of the frame portions. Annular end casings 58 and 59 are located at the respective ends of the motor with their inner edges closely adjacent to the outer edges of the commutator cylinders. Air from the fans 57 is delivered by the casings 58 and 59 to the spaces between the radial ribs of the spiders 19 and 20, and the rotation of the shaft forces the air radially outward from the central duct 46 to the duct 12. The air then flows from the central ducts in parallel paths through the passages 11 and 31, respectively, to the outside atmosphere. The passages 31 are located above the commutator cylinders 33 and 34 so that a portion of the air in passing out of the machine is discharged over the external surfaces of the commutator cylinders.

In the modification shown in Fig. 3, the armature core members 26 and 27 are mounted on the continuous ribs 60 of a single spider 61. The portions 60^a of the ribs 60 that support the commutator cylinders 33 and 34 project radially outward so that the spaces between the portions 60^a communicate with the longitudinal passages 31 in the core members 26 and 27. End casings 58 and 59 are located at the respective ends of the motor, and annular baffle plates 62 are provided at the respective ends of the spider 61 to direct the air from the end casings into the spaces between the rib portions 60^a and into the passages 31 and duct 46. The air is then forced radially outward into the duct 12 from which it is discharged to the outside atmosphere through the passages 11.

While I have shown my invention in its simple and preferred form, it is not so limited but is capable of various modifications within the scope of the appended claims.

I claim as my invention:

1. In a dynamo-electric machine, the combination with an inclosing frame, a plurality of pairs of relatively rotatable magnetizable members located in spaced relation and provided with longitudinal passages, and commutator cylinders carried by the rotatable

members, of external means for creating a circulation of air, and further means for directing the circulation of air through said passages and over the surface of said commutator cylinders.

2. In a dynamo-electric machine, the combination with a plurality of pairs of relatively rotatable magnetizable members each of which is provided with longitudinal passages, and commutator cylinders carried by the rotatable members, of external means for creating a circulation of air, and further means for directing the circulation of air in parallel paths over and beneath the surfaces of said commutator cylinders and through said passages.

3. The combination with a dynamo-electric machine comprising an inclosing frame, a plurality of pairs of relatively movable members located in spaced relation within said frame, the said members being provided with longitudinal passages, and commutator cylinders associated with the rotatable members, of external means for creating a circulation of air, and further means for simultaneously directing the circulation of air over and through said commutator cylinders in parallel paths and through said passages from each end of said machine.

4. The combination with a dynamo-electric machine comprising an inclosing frame, a plurality of pairs of relatively rotatable members located in spaced relation within said frame, the said members being provided with longitudinal passages, and commutator cylinders associated with the rotatable members, of external means for creating a circulation of air, and further means for simultaneously directing the circulation of air from each end of said machine over and through said commutator cylinders, through the said passages and into the space between the said members.

5. The combination with a dynamo-electric machine comprising an inclosing frame,

a plurality of pairs of relatively movable magnetizable members located in spaced relation within said frame and provided with longitudinal passages, a plurality of commutator cylinders carried by the rotatable members and provided with longitudinal passages, of external means for creating a circulation of air, and further means for simultaneously directing the circulation of air from each end of said machine, through the said passages in the magnetizable members and commutator cylinders and over the surfaces of said commutator cylinders.

6. The combination with a dynamo-electric machine comprising an inclosing frame, a plurality of pairs of relatively movable magnetizable members located in spaced relation within said frame and provided with longitudinal passages, a plurality of commutator cylinders carried by the rotatable members and provided with longitudinal passages, of external means for creating a circulation of air, and further means for simultaneously directing the circulation of air from each end of said machine through the said passages in the magnetizable members and commutator cylinders over the surfaces of said commutator cylinders and into the space between said members.

7. A dynamo-electric machine comprising a frame, a plurality of pairs of relatively rotatable magnetizable members mounted within said frame in spaced relation and provided with longitudinal passages extending between the outside of the frame and the spaces between said members, and a plurality of commutator cylinders carried by said rotatable members and provided with passages communicating with the passages in the said rotatable member.

In testimony whereof, I have hereunto subscribed my name this 27th day of Jan., 1916.

RUDOLF E. HELLMUND.