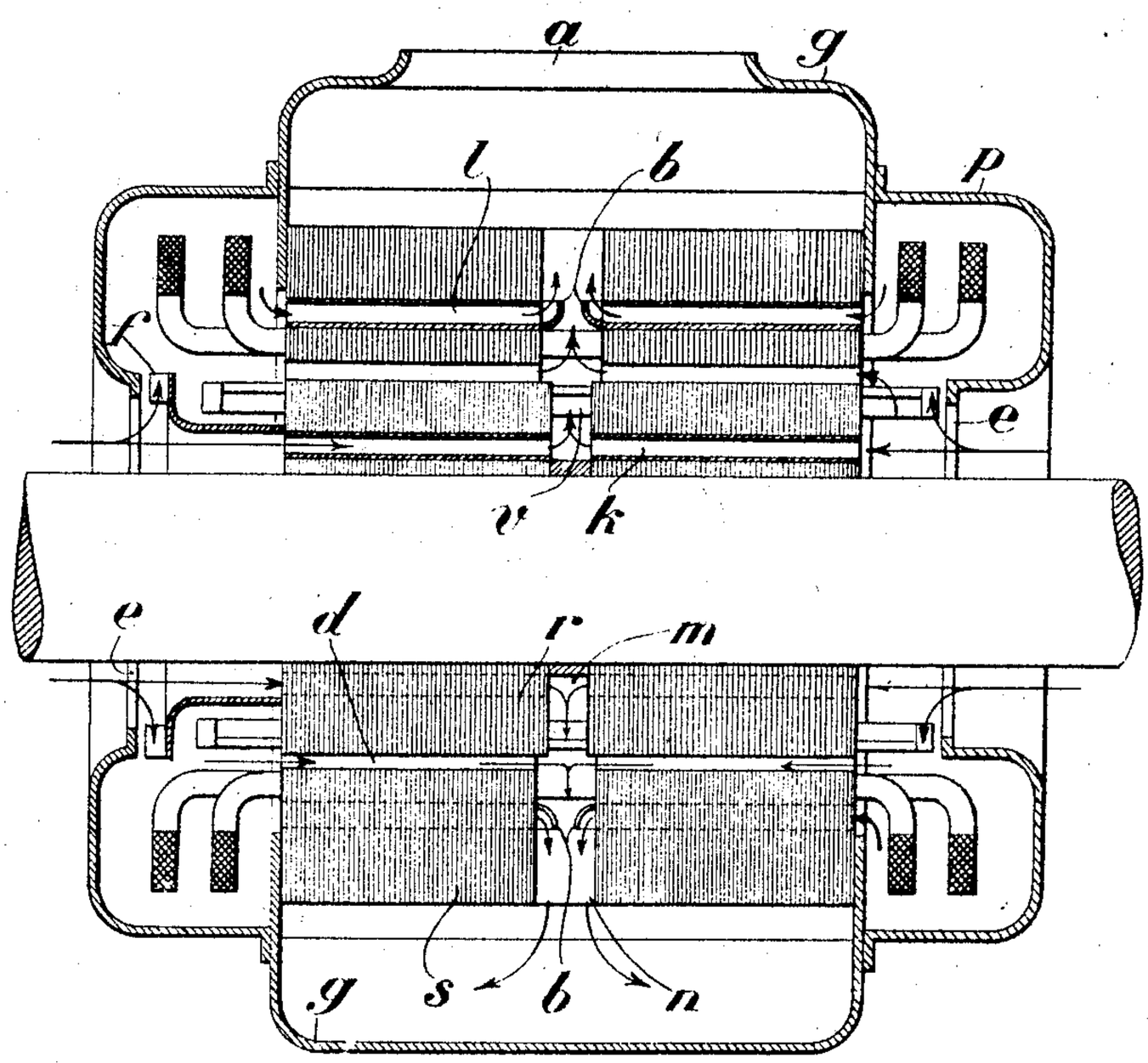
M. GRUBER.

ARRANGEMENT FOR COOLING HIGH SPEED DYNAMO ELECTRIC MACHINES.

APPLICATION FILED MAY 26, 1919.

1,316,790. Patented Sept. 23, 1919.



Inventor

Max Gruber

by Laurence Langner

Attorney

UNITED STATES PATENT OFFICE.

MAX GRUBER, OF GENEVA, SWITZERLAND.

ARRANGEMENT FOR COOLING HIGH-SPEED DYNAMO-ELECTRIC MACHINES.

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Application filed May 26, 1919. Serial No. 299,938.

To all whom it may concern:

Be it known that I, MAX GRUBER, a citizen of the Swiss Republic, and resident of Geneva, Switzerland, have invented a new and useful Arrangement for Cooling High-Speed Dynamo-Electric Machines, of which the following is a full, clear, and exact specification.

A large number of different arrangements for cooling high speed dynamo-electric machines are known, in which the rotor of the machine, with or without the aid of a special ventilating device drives cooling air through the chambers and passages provided for cooling. According to whether the ventilating device is located at the inlet, outlet or in the middle of the air passage, a pressure action, a suction action or a combined pressure and suction action results. If the active iron elements of the machine are subdivided in an axial direction by means of so called air gaps, which essentially form radially directed cooling surfaces, the action is termed radial cooling; on the other hand, if the iron is traversed by cooling passages which run parallel to the axis, the action is termed axial cooling. The supply of air to the radial air gaps must obviously be effected through axial passages, whereas the axial longitudinal passages may also communicate with radially arranged air outlet ports.

The subject matter of the present invention is a cooling arrangement in accordance with the last mentioned system. The novel feature thereof consists in that the cooling air for the stator is mainly sucked up and driven by the ejector action of the air passing out of the rotor. This can be effected by an arrangement in which the cooling air is supplied to the rotor and the stator of the machine separately from both sides being transmitted through longitudinal passages and, at the middle of the laminated core conveyed away in a radial direction. For this purpose the active iron in the rotor and stator is subdivided into two sections between which the ventilating passage is located. A special ventilating device is unnecessary if the requisite suction action is already effected by means of the free portion of the winding at this point. The rotor is provided with axial passages and the air flows through the suction ventilator thus constituted and passes out through the radial slot. This air causes an ejector action and first sucks cooling air through the annular air gap between the rotor and stator and then through the axial stator passages sucks up further cooling air, which is also driven radially outward. This method of cooling has the advantage that the heating of the cooling air produced by the compression and losses in the suction ventilator only occur when the air has already effected its cooling action and is leaving the machine, whereas with the pressure cooling system generally employed, the air is heated by compression before exercising its cooling function, whereby the latter is substantially impaired. If it is desired to increase the amount of air supplied to the stator above that due to the ejector action, then at the sides of the rotor special fan blades may be arranged which supply an additional amount of fresh air to the stator.

This is shown in the left half of the constructional example shown in longitudinal section in the annexed drawing, whereas at the right hand end of the machine the fan blades *f* are omitted. The rotor *r* and the stator *s* consist of two laminated core sections between which a space *m*, *n* is left free for conveying away the heated cooling air in the passages *k*, *l*. The fresh air flows in through the side ports *e* of the casing *g*; a portion thereof in sucked up by the ventilator *v* in the gap *m* through the longitudinal passages *k* of the rotor; the remaining air flows partly through the air gap *d*, partly from the interior of the end bells or caps *p* through the longitudinal passages *l* of the stator to the middle space *n* and from thence to the outlet port *a* in the stator casing *g*.

In order to increase the ejector action guide members *b* are provided at the ends of the stator passages *l*. In order to obtain an effective ejector action also in the air gap *d*, the radial slot *m* in the rotor is narrower in an axial direction than the slot *n* in the stator.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In an arrangement for cooling a high speed electric machine, the combination with a stator and rotor, said rotor adapted to move inside said stator, both formed with passages in an axial direction through their magnetic cores, of an ejector device for

sucking cooling air through the passages in the stator, and means for producing a flow of air in the rotor, the air from the rotor inducing the flow of air through the stator.

2. In an arrangement for cooling a high speed electric machine, the combination with a stator and a rotor formed with passages in an axial direction through their magnetic cores, of an ejector device for sucking cooling air through the passages of the stator, the active iron of said rotor and of said stator divided into two sections and forming a radially extending air passage between said sections, means for producing a flow of air in the rotor portion of said air passage, said means adapted to induce a flow of air through the stator portion of the air passage.

3. In an arrangement for cooling a high speed electric machine, the combination with a stator and a rotor formed with passages in an axial direction through their magnetic cores, of an ejector device in the stator, the active iron of said rotor and of said stator divided into two sections and forming a radially extending air passage between said sections, means for producing a flow of air in the rotor portion of said radial passage, said air flow causing an ejector action in the stator portion of said passage, in which said ejector device is located, said ejector device comprising guide members adapted to effect a powerful ejector action on the cooling air of the stator.

4. In an arrangement for cooling a high speed electric machine, the combination with a stator and rotor formed with passages in an axial direction through their magnetic cores, of an ejector device, the active iron of said rotor and of said stator divided into two sections and forming a radially extending air passage between said sections, means for producing a flow of air in the rotor portion of said radial passage, said air flow causing an ejector action in the stator portion of the passage, the radial air passage in the rotor being of smaller cross-sectional area than in the stator, whereby the ejector action is made more powerful.

5. In an arrangement for cooling a high speed electric machine, the combination with a stator and a rotor formed with passages in an axial direction through their magnetic cores, of an ejector device, the active iron of said rotor and of said stator divided into two sections and forming a radially extending air passage between said sections, a ventilator in the radial passage of the rotor for producing a flow of air through said radial passage, said air flow causing an ejector action in the stator portion of said radial passage, fan blades at the sides of the rotor, said fan blades adapted to supply an additional amount of fresh air to the stator.

In witness whereof I have hereunto signed my name this 23d day of April, 1919, in the presence of two subscribing witnesses.

MAX GRUBER.

Witnesses:
LOUIS H. MUNIER,
O. LANONAZ.