May 28, 1946. D. C. PRINCE 2,401,187

ELECTRIC INDUCTION MACHINE

Filed March 1, 1943

Fig. 1.

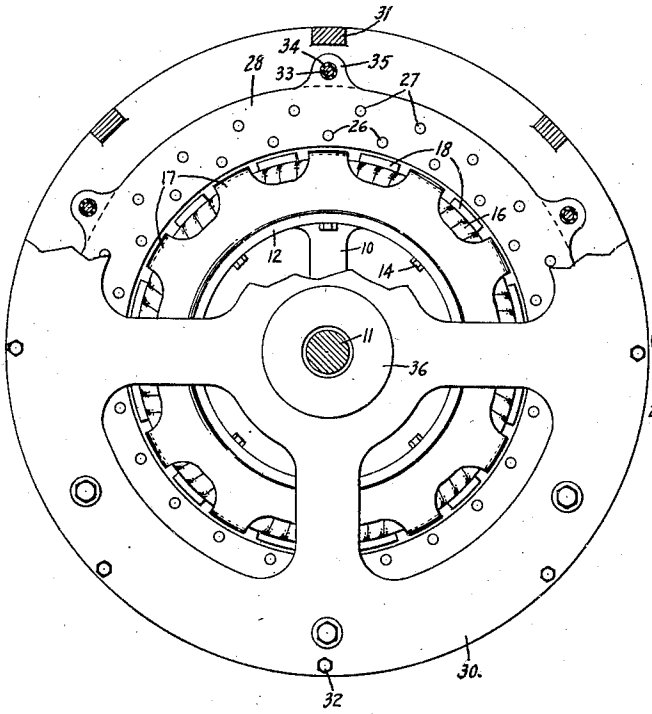


Fig. 2.

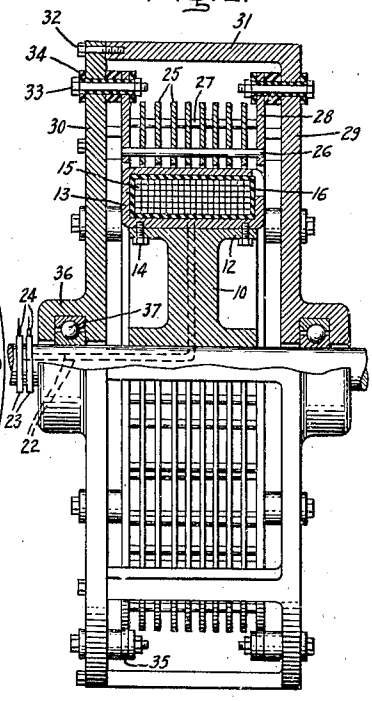


Fig. 3.

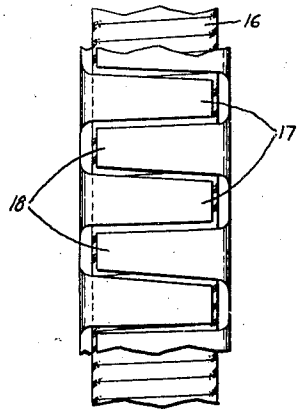
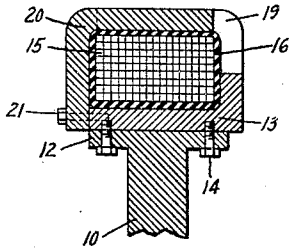


Fig. 4.



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ELECTRIC INDUCTION MACHINE

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Application March 1, 1943, Serial No. 477,511

2 Claims. (Cl. 172—120)

My invention relates to electric induction machines such as induction clutches, brakes, and dynamometers.

An object of my invention is to provide an improved electric induction machine having provision for improved use of material and an efficient cooling system.

Further objects and advantages of my invention will become apparent and my invention will be better understood from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In the drawing, Fig. 1 is an end elevational view, partly broken away, of an electric induction machine provided with an embodiment of my invention; Fig. 2 is a side elevational view, partly in section, of the machine shown in Fig. 1; Fig. 3 is a plan view of a part of the electromagnet of one of the members shown in Figs. 1 and 2; and Fig. 4 is a sectional view through an electromagnet adapted to be used in a construction similar to that shown in Fig. 2 in which the core is formed of two separable members instead of a single integral member.

Referring to the drawing, I have shown an embodiment of my improved electric induction machine provided with two relatively rotatable members, one of which is arranged within the other and provided with a supporting spider 10 mounted upon a shaft 11. The spider 10 is provided with a rim 12 to which a core 13 of magnetic material is secured by bolts 14, or in any other suitable manner. The core 13 forms part of a substantially circular electromagnet provided with a field exciting winding 15 wound about the core 13 and insulated therefrom by a covering of insulation 16. A plurality of interdigitated pole pieces 17 and 18 of alternately opposite polarity extends from opposite sides of the core 13. This electromagnet may be formed with a unitary core and pole member, in which case the pole pieces 17 and 18 are formed to extend radially outwardly from the central core portion 13 until after the coil 13 is wound in place and then the pole pieces are bent over the outer periphery of the coil 15, as shown in Fig. 3. The electromagnet also might be formed as shown in Fig. 4, in which case the central core 13 is formed integral with pole pieces 19 to provide a substantially U-shaped section member, and a substantially L-shaped care member including pole pieces 20 is secured to the central core 13 by bolts 21, or in any other suitable manner. This construction may preferably be used where it is desired to provide a relatively large section of magnetic material in the pole pieces, and also enables the use of a preformed coil which can be inserted between the core and the pole pieces. The energizing current is supplied to the coil 15 in any suitable manner by connecting leads 22 to a pair of slip rings 23 to which a source of electrical power supply is electrically connected by suitable brushes 24.

This electromagnetic member is adapted to react electrodynamically with another member provided with a core formed of axially spaced apart substantially annular plates 25 of magnetic material arranged about the electromagnetic member pole pieces. A double squirrel cage winding is arranged in this core and includes two sets of electrical conductors 26 and 27 extending through the plates 25 with a member 28 of electrically conductive material at each end of the core spaced therefrom and electrically connected to the conductors 26 and 27 providing a short-circuiting connection between these conductors. One set of the conductors 26 is arranged relatively close to the inner periphery of the core formed by the plats 25 and adjacent the electromagnetic member, while the other set of electrical conductors 27 is arranged relatively further from the inner periphery of the core. With such an arrangement, the inductive reaction due to the variations in the linkages of the magnetic lines of force from the rotatable electromagnetic member with the conductors 26 and 27 is efficiently utilized over a wide range of speed, as the arrangement of the conductors in the two squirrel cages provides for a maximum linkage with the magnetic lines of force for different penetrations into the core formed by the plates 25.

The squirrel cage member including the squirrel cage windings and the core formed by the plates 25 is supported by a frame including end plate sections 29 and 30 which are spaced apart by arms 31 and are secured together by a plurality of bolts 32, or in any other suitable manner. The core and winding are mounted in the frame by a plurality of bolts 33 which extend through insulating bushings 34 and are secured to ears 35 formed on the plates 28. The frame end sections are provided with bearing housing hubs 36 arranged about bearings 37 which rotatably support the electromagnetic member in a relatively rotatable relationship to the squirrel cage member. With this construction, rotation

of the electromagnet produces a fan effect which blows ventilating air outwardly between the core plates 25 and efficiently cools these plates and the conductors 26 and 27. The conductors form a tight fit with openings in the plates 25 to provide a good thermal connection thereto such that heat generated in the conductors by electric currents is readily transferred to the plates 25, and these plates act as radiating fins which further provide for efficiently cooling the squirrel cage member. The end sections 29 and 30 are formed with relatively large openings therein, and the spacing arms 31 provide relatively large exhaust openings therebetween to provide for a maximum and efficient flow of ventilating medium through the machine. Such a machine may be used as a clutch, brake, or dynamometer, and in each case would be provided with a suitable connection to the frame of the squirrel cage member and to the shaft of the electromagnetic member to transmit torques between these members and external mechanical connections.

While I have illustrated and described a particular embodiment of my invention, modifications thereof will occur to those skilled in the art. I desire it to be understood, therefore, that my invention is not to be limited to the particular arrangement disclosed, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric machine having a member with an electromagnet provided with interdigitated pole pieces of alternately opposite polarity, a second member arranged to react electrodynamically with said first member and having a core formed of axially spaced apart plates of magnetic material arranged around said electromagnetic member, and a squirrel cage winding in said core formed of electrical conductors extending through said plates with a member of electrically conductive material at each end of said core connected to said conductors, said interdigitated pole pieces being arranged within said plates to provide a fan effect for impelling ventilating medium outwardly between said plates whereby ventilating medium is circulated directly over said plates and said squirrel cage electrical conductors for cooling the same.

2. An electric machine having a member with an electromagnet provided with interdigitated pole pieces of alternately opposite polarity, a second member arranged to react electrodynamically with said first member and having a core formed of axially spaced apart plates of magnetic material arranged around said electromagnetic member, a double squirrel cage winding in said core formed of two sets of electrical conductors extending through said plates with a member of electrically conductive material at each end of said core connected to said conductors, one of said sets of conductors being arranged relatively close to the inner periphery of said core and the other of said sets of conductors being arranged relatively further from the inner periphery of said core, means including end plates for supporting said core of axially spaced apart plates, and means for supporting said electromagnetic member in relatively rotatable relation to said second member, said interdigitated pole pieces being arranged within said plates to provide a fan effect for impelling ventilating medium outwardly between said plates whereby ventilating medium is circulated directly over said plates and said squirrel cage electrical conductors for cooling the same.

DAVID C. PRINCE.