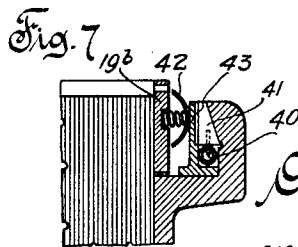
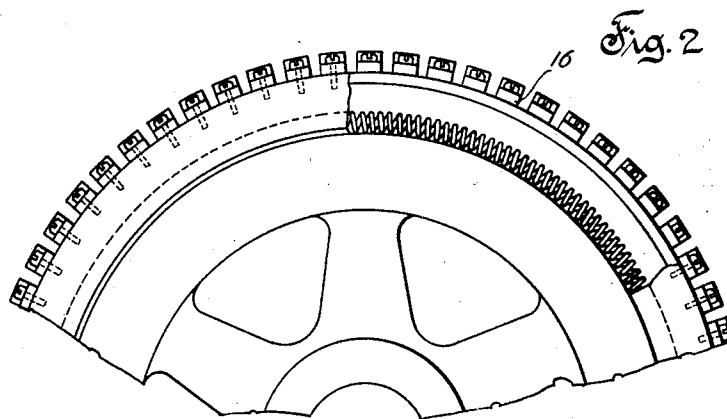
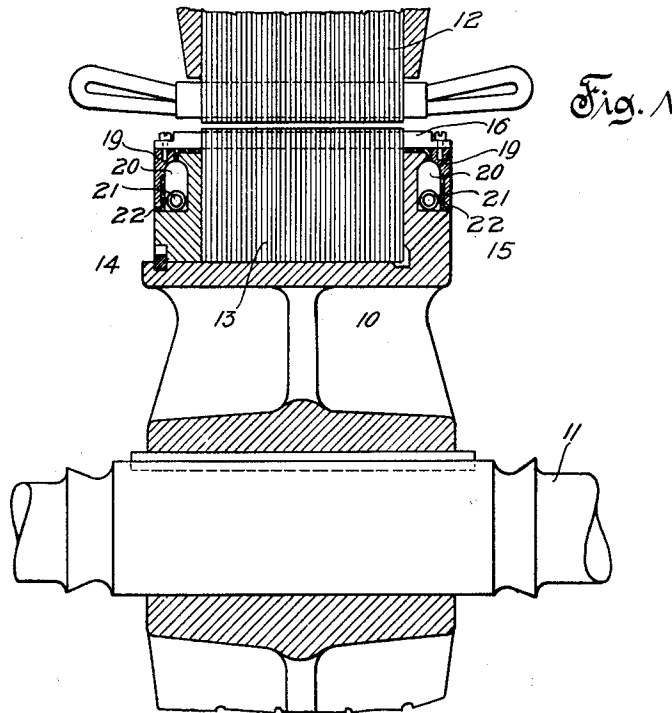


A. M. GRAY.
INDUCTION MOTOR.
APPLICATION FILED NOV. 13, 1908.

1,002,837.

Patented Sept. 12, 1911.

2 SHEETS—SHEET 1.



Witnesses:
Rob. E. Lull
Chas. L. Byron.

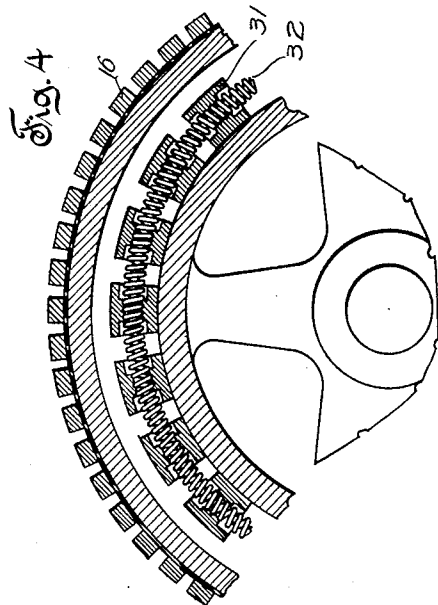
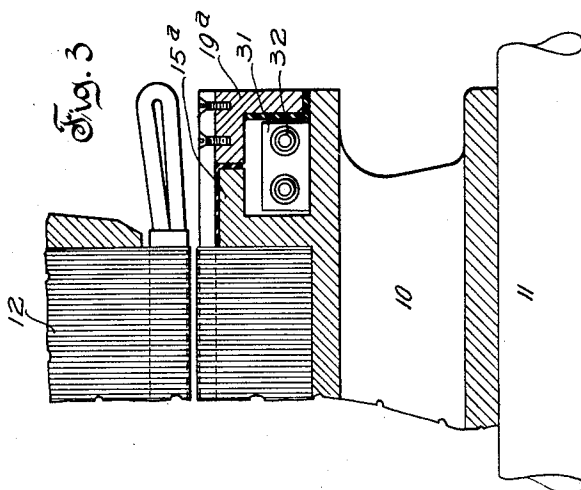
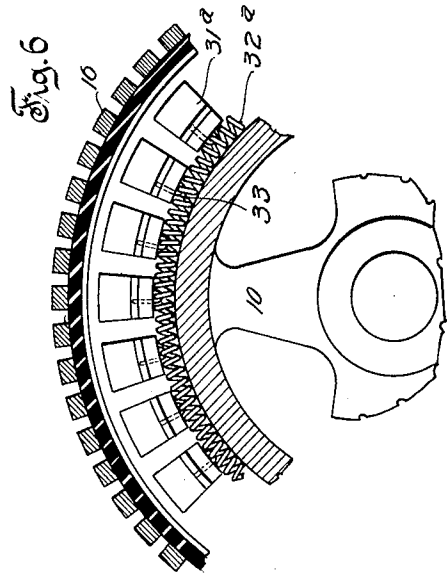
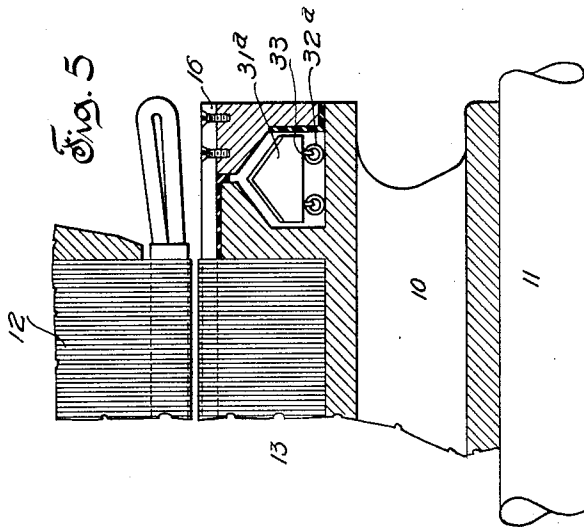
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2 SHEETS—SHEET 2.



Witnesses:

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Chas. L. Byron.

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UNITED STATES PATENT OFFICE.

ALEXANDER M. GRAY, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY.

INDUCTION-MOTOR.

1,002,837.

Specification of Letters Patent.

Patented Sept. 12, 1911.

Application filed November 13, 1908. Serial No. 462,451.

To all whom it may concern:

Be it known that I, ALEXANDER M. GRAY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Induction-Motors, of which the following is a full, clear, and exact specification.

My invention relates to induction motors, particularly to those of the squirrel cage type.

In induction motors it is necessary, in order to attain a large starting torque, to increase the electrical resistance of the secondary circuit of the motor above the value it should have during normal running conditions in order to obtain a high running efficiency. This has been done with induction motors of the wound rotor type by cutting a resistance into the rotor circuits during starting, and automatically or manually cutting said resistance out of circuit when the motor approaches its normal running speed.

It is the object of my present invention to provide a squirrel cage induction motor in which the resistance of the secondary circuits is different during the starting of the motor from what it is when the motor is running at full speed.

My invention may be said to consist broadly in a squirrel cage rotor the bars of which are normally connected through a high resistance, and a low resistance which is cut in to interconnect the bars when the rotor has attained a predetermined speed.

The specific novel features of my invention will be apparent from the specification and drawings, and will be particularly pointed out in the claims.

Figure 1 is a fragmental longitudinal section through an induction motor embodying my invention; Fig. 2 is an end view of the rotor of said motor, with part of the high resistance ring broken away; Figs. 3 and 4 are views somewhat similar to Figs. 1 and 2 respectively, but showing a slightly modified construction; Figs. 5 and 6 are somewhat similar views showing another modification; and Fig. 7 shows a further modification.

The rotor 10 is mounted on the shaft 11 to rotate within the stator 12. This stator may be of any desired construction. The rotor consists of a laminated core 13 clamped between end plates 14 and 15 of low elec-

trical resistance. One of the end plates, as 15 may be integral with the spider of the rotor, if desired. Embedded in slots in the core 13 are the squirrel cage bars or rods 16, which are insulated from the rotor core. Corresponding ends of all of the bars 16 are mechanically and electrically connected by rings 19 of high resistance material, these rings being insulated from the end plates 13 and 14 and supported in any suitable manner. In annular grooves 20 between the rings 19 and 14, and 19 and 15 respectively, are located circular resilient members 21. These resilient members in Figs. 1 and 2 consist of helical springs formed into circles. The members 21 are normally prevented from engaging the high resistance rings 19 by insulation 22.

When the rotor 10 is at rest, the members 21 are contracted, and are therefore in the position shown in Figs. 1 and 2. The bars 16 are therefore electrically connected only through the high resistance rings 19. When the primary circuit of the motor is closed, the rotor starts with a comparatively large starting torque, a torque much greater than would be obtained if the squirrel cage bars 16 were connected by low resistance. As the rotor 10 increases in speed, centrifugal force acting on the members 21 causes them to expand more and more, until as the rotor approaches full speed, they have expanded sufficiently to engage the outer edges of the grooves 20, thus connecting the high resistance rings 19 to the low resistance rings or end plates 14 and 15. By this means the resistance of the electrical connection between the squirrel cage bars 16 is very considerably diminished, and thus a high running efficiency of the motor is obtained.

In Figs. 1 and 2 a very simple form of circular resilient member is shown. This construction may be modified in a number of ways. In Figs. 3 and 4 the circular expandable member consists of a number of blocks 31, through which one or more springs 32 are threaded. In this case, the blocks 31, which are preferably of copper, carry the current between the high and low resistance rings 19^a and 15^a, the springs 32 being relieved of this work. In Figs. 5 and 6, the blocks 31^a are attached to the springs 32^a by hooks 33 or in some other suitable manner. The blocks and rings may have a tapering fit as indicated in Fig. 5, and one or more of

the contacting surfaces may be faced with copper. In the arrangement shown in Figs. 5 and 6, the blocks 31^a are shown as of material other than copper, but faced with copper or other similar material of high conductivity. In Fig. 7, the resilient member consists of a circular helical spring 40 carrying wedges 41, which, when acted upon by centrifugal force, move outward and force the springs 42 on the ring 43 of low resistance against the comparatively high resistance ring 19^b which normally connects the ends of the squirrel cage bars. The operation of the arrangements of Figs. 3 to 7 is substantially the same as that of the arrangement of Figs. 1 and 2.

Many other modifications may be made in the arrangements shown without departing from the spirit and scope of my invention, and all such I aim to cover in the following claims.

What I claim as new is:

1. In an induction motor, a squirrel-cage rotor comprising a plurality of bars or rods, high resistance means normally connecting the ends of said rods or bars, and low resistance means including an end-plate and another member for connecting the ends of said rods or bars only when the speed of the rotor exceeds a predetermined value.

2. In an induction motor, a squirrel cage rotor comprising squirrel cage rods or bars, a high resistance ring normally connecting corresponding ends of said rods or bars, a low resistance end-plate, and means for automatically connecting said low resistance end-plate to said bars at a predetermined speed of the rotor, said means comprising a

continuous resilient member arranged circumferentially.

3. In an induction motor, a squirrel-cage rotor comprising squirrel-cage rods or bars, a high resistance ring connecting the ends of said rods or bars, a low resistance end-plate, and automatic means for connecting said low resistance end-plate to corresponding ends of said rods or bars at a predetermined speed of the rotor.

4. In an induction motor, a squirrel cage rotor comprising squirrel cage rods or bars, a high resistance ring permanently connected to the corresponding ends of said rods or bars, a low resistance end-plate, and means operated by centrifugal force for connecting said low resistance end-plate in shunt to said high resistance ring at a predetermined speed of the rotor, said means comprising a continuous resilient member.

5. In an induction motor, a squirrel cage rotor comprising a laminated core, squirrel cage rods or bars embedded in slots in said core, a high resistance ring normally connecting the corresponding ends of said rods or bars, a combined end plate and low resistance ring normally insulated from said rods or bars, and centrifugally operated means for connecting said low resistance ring in shunt to said high resistance ring at a predetermined speed of the rotor.

Milwaukee, Wis., Nov. 9, 1908.

In testimony whereof I affix my signature, in the presence of two witnesses.

ALEXANDER M. GRAY.

Witnesses:

H. C. CASE,
CHAS. L. BYRON.