J. B. WIARD.

INDUCTION MOTOR.

APPLICATION FILED MAY 10, 1909.

1,003,839. Patented Sept. 19, 1911.

Fig. 1.

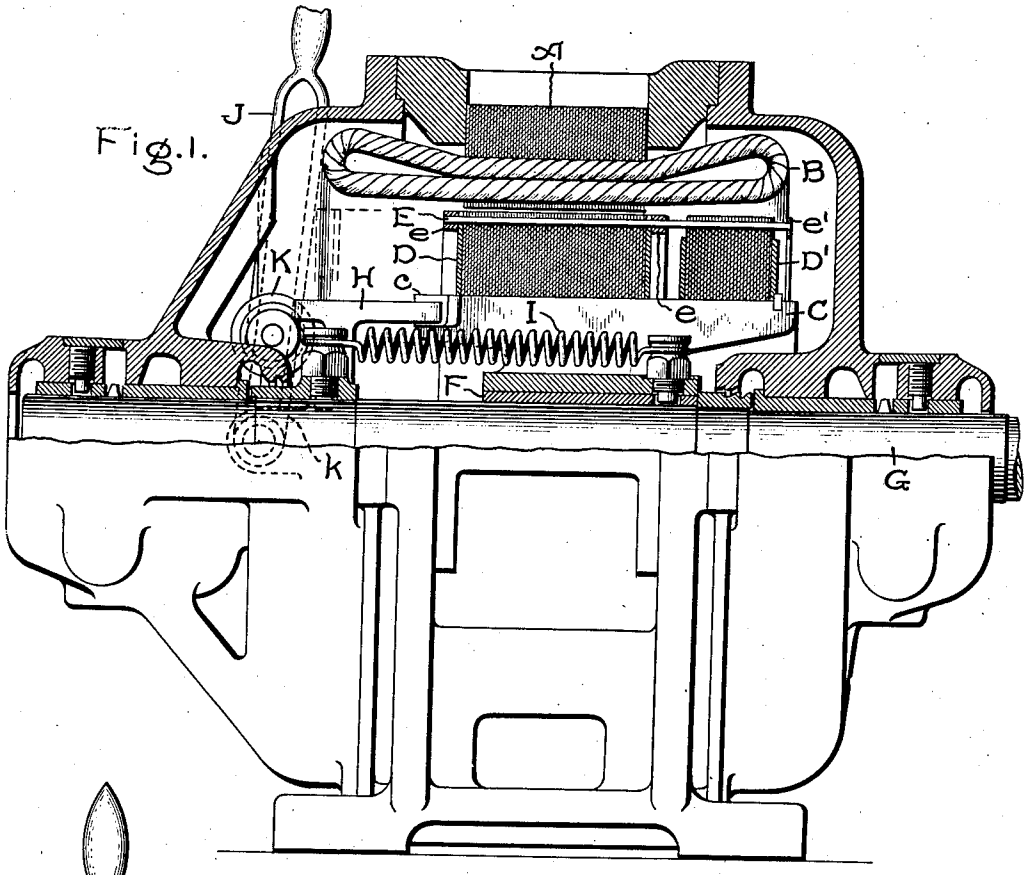


Fig. 2

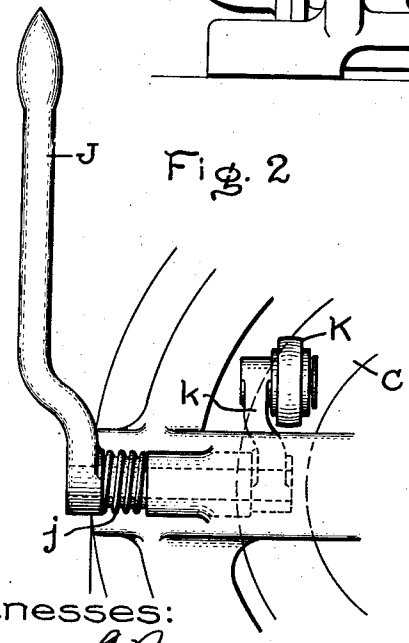
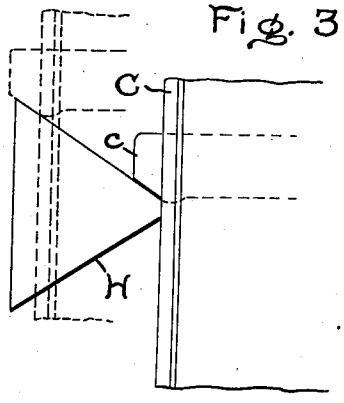


Fig. 3



Witnesses:
Marcus L. Byng.
J. Ellis Glen.

Inventor:
John B. Wiard,
by Albert G. Davis
Att'y.

UNITED STATES PATENT OFFICE.

JOHN B. WIARD, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INDUCTION-MOTOR.

1,003,839. Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed May 10, 1909. Serial No. 495,087.

To all whom it may concern:

Be it known that I, JOHN B. WIARD, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Induction-Motors, of which the following is a specification.

My invention relates to induction motors, and its object is to produce a motor having certain advantages not heretofore attained.

The squirrel cage winding is the simplest and cheapest form of secondary winding for induction motors, but, as ordinarily arranged, it possesses the disadvantage, as compared with a coil winding, that the starting torque is comparatively low and the starting current very high. With a coil wound secondary resistance may be inserted at starting and gradually cut out as the motor accelerates, high torque being developed with low line current. By my invention I attain substantially the same results as with a coil wound secondary with automatic transition from high resistance secondary at starting to low resistance for running without any auxiliary starting device external to the motor.

My invention consists in providing the rotor with high and low resistance members displaced from each other axially, the rotor being movable axially along its shaft, and with automatic means for shifting the rotor axially, so that at starting the high resistance member is in the field produced by the stator winding, and as the motor comes up to speed the rotor is moved along the shaft so as to bring the low resistance member into the field. The motor thus starts with a high resistance secondary member and comes up to speed with secondary members whose combined effective resistance is gradually lowered.

For starting very heavy loads, or loads in which the torque increases with the speed, the motor sometimes cannot be designed conveniently for entirely automatic operation. I accordingly provide a handle which may be used to assist the automatic means for shifting the rotor when starting certain kinds of loads and arrange the handle and the rotor in such a manner that the rotor may be moved automatically without movement of the handle when the character of the load permits entirely automatic operation.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows a side elevation, partly in cross-section, of an induction motor arranged in accordance with my invention, and Figs. 2 and 3 show details.

In the drawings, A represents the stator, which is of the usual laminated construction, carrying the coils B of the primary winding.

C represents the rotor spider or hub, which carries high and low resistance members D and D′ side by side. Both members are preferably provided with squirrel cage windings. The conductors E may extend across both the core portions of the members D and D′ so as to be common to both windings.

The end rings *e* of member D are of low resistance, while the end ring *e′* of the member D′ is of high resistance. This arrangement of rings gives in effect a low resistance squirrel cage winding for the member D and a high resistance squirrel cage winding for the member D′. The rotor hub C is mounted on a sleeve F, which is loose on the shaft G.

H is a member fixed to the shaft and having a surface adapted to be engaged by a member *c* on the rotor, as is best shown in Fig. 3. The shaft is driven by the rotor through the member H, and the bearing surfaces between the member H and the member *c* on the rotor are so shaped that the driving pressure between them tends to force the rotor axially along the shaft. At starting the rotor is in the position indicated by the dotted lines in Figs. 1 and 3, but when the motor starts the pressure between the members H and *c* tends to force the rotor toward the position shown in full lines. This tendency is opposed at starting by the repulsion effect on the low resistance member produced by the primary field. As the motor speeds up this repulsion effect diminishes and allows the rotor to shift so as to bring the low resistance member into the field, as shown in full lines in Fig. 1. When the motor circuit is opened the rotor is returned to the dotted line position by the tension spring I, one end of which is attached to the member H and the other to the sleeve F.

As has been stated above, it is desirable to assist the automatic action in shifting the

rotor when the motor starts certain kinds of loads. For this purpose a handle J is provided pivoted on the motor frame and held normally in the position shown by a spring *j*. The handle carries a roller K on the end of a crank *k*, which roller, when the rotor is in starting position, is in engagement with the rotor so that if the handle is moved in a clockwise direction, as shown in Fig. 1, pressure is exerted on the rotor which assists the driving pressure between members H and *c* in shifting the rotor axially.

I do not desire to limit myself to the particular construction and arrangement of parts shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

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

1. An induction motor having a stator winding, a rotor axially movable with respect to the stator having high and low resistance members, said members being axially displaced from each other, means for moving the rotor axially while the rotor is coming up to speed, and means for automatically returning the rotor when the motor stops.

2. An induction motor having a stator winding, a rotor axially movable with respect to the stator having high and low resistance members, said members being axially displaced from each other, means for producing automatically an axial movement of the rotor while the rotor is coming up to speed, and means for automatically returning the rotor when the motor stops.

3. An induction motor having a stator winding, a rotor having high and low resistance members, said members being axially displaced from each other, a shaft on which the rotor is axially movable, a member fixed on the shaft through which the rotor drives the shaft, said rotor and said member having engaging surfaces shaped to force the rotor axially along the shaft by the driving pressure between them, and a spring for moving the rotor along the shaft in the opposite direction.

4. An induction motor having a stator winding, a rotor axially movable with respect to the stator having high and low resistance members, said members being axially displaced from each other, means for producing automatically an axial movement of the rotor while the rotor is coming up to speed, manually operated means for assisting said automatic means to move the rotor, and means for automatically returning the rotor when the motor stops.

5. An induction motor having a stator winding, a rotor having high and low resistance members, said members being axially displaced from each other, a shaft on which the rotor is axially movable, a member fixed on the shaft through which the rotor drives the shaft, said rotor and said member having engaging surfaces shaped to force the rotor axially along the shaft by the driving pressure between them, a handle for assisting in forcing the rotor along the shaft, and a spring for moving the rotor along the shaft in the opposite direction.

6. An induction motor having a stator winding, a rotor having high and low resistance members, said members being axially displaced from each other, a shaft on which the rotor is axially movable, said rotor and said shaft having engaging surfaces through which the rotor drives the shaft and said surfaces being adapted to force the rotor axially along the shaft by the driving pressure between them, and a spring for moving the rotor along the shaft in the opposite direction.

7. An induction motor having a stator winding, a rotor having high and low resistance members, said members being axially displaced from each other, a shaft on which the rotor is axially movable, means for producing automatically an axial movement of the rotor on the shaft while the rotor is coming up to speed, a handle for assisting said automatic means to move the rotor, means on the handle for engaging the rotor adapted to permit the movement of the rotor by said automatic means without movement of the handle, and means for automatically returning the rotor when the motor stops.

8. An induction motor having a stator winding, a rotor having high and low resistance members, said members being axially displaced from each other, a shaft on which the rotor is axially movable, said rotor and said shaft having engaging surfaces through which the rotor drives the shaft and said surfaces being adapted to force the rotor axially along the shaft by the driving pressure between them, a handle for assisting in forcing the rotor along the shaft, means on the handle for engaging the rotor adapted to permit movement of the rotor along the shaft without movement of the handle, and a spring for moving the rotor along the shaft in the opposite direction.

In witness whereof, I have hereunto set my hand this seventh day of May, 1909.

JOHN B. WIARD.

Witnesses:
JOHN A. McMANUS, Jr.,
CHARLES A. BARNARD.