W. E. REED.

INDUCTION MOTOR.

APPLICATION FILED AUG. 2, 1906.

1,013,218.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 1.

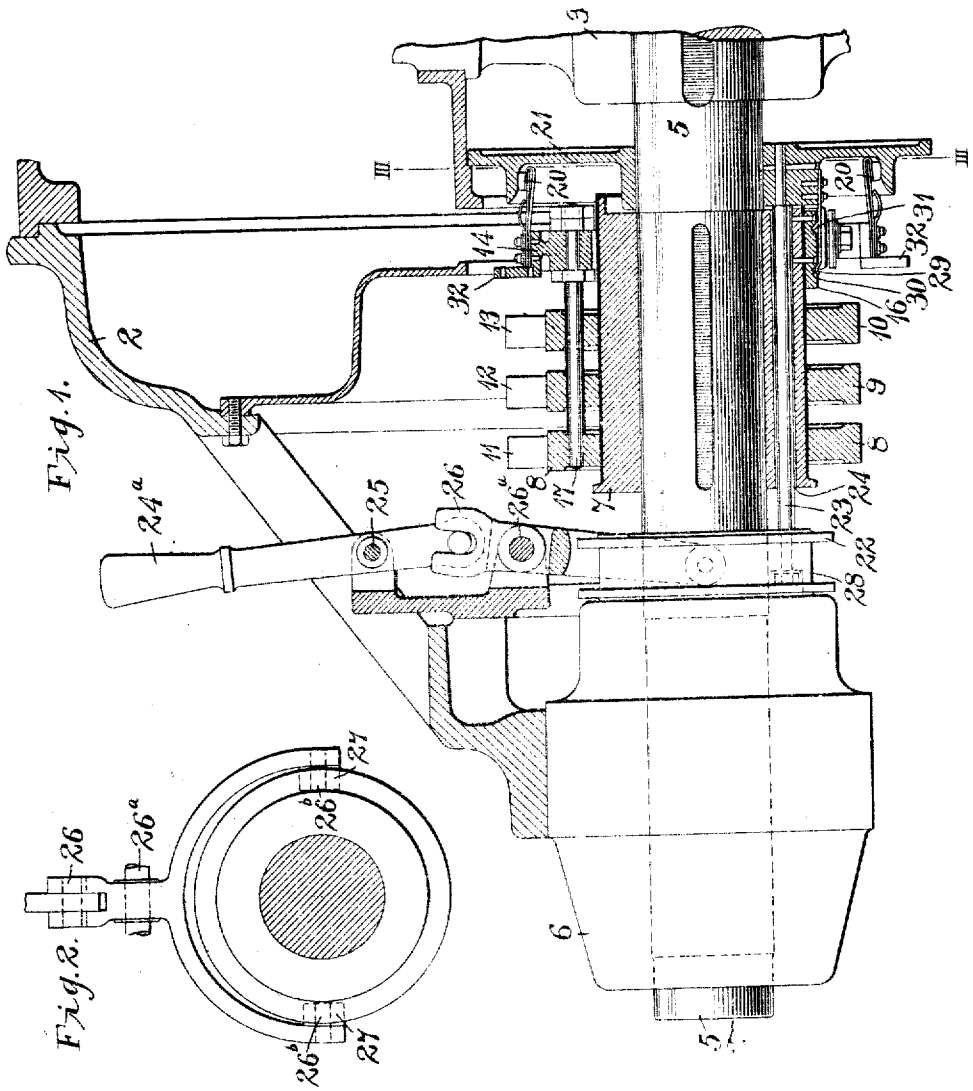


Fig. 1.

Fig. 2.

WITNESSES:

Fred A. Miller

R. J. Dearborn

INVENTOR

William E. Reed

BY

Wesley G. Carr

ATTORNEY

W. E. REED.

INDUCTION MOTOR.

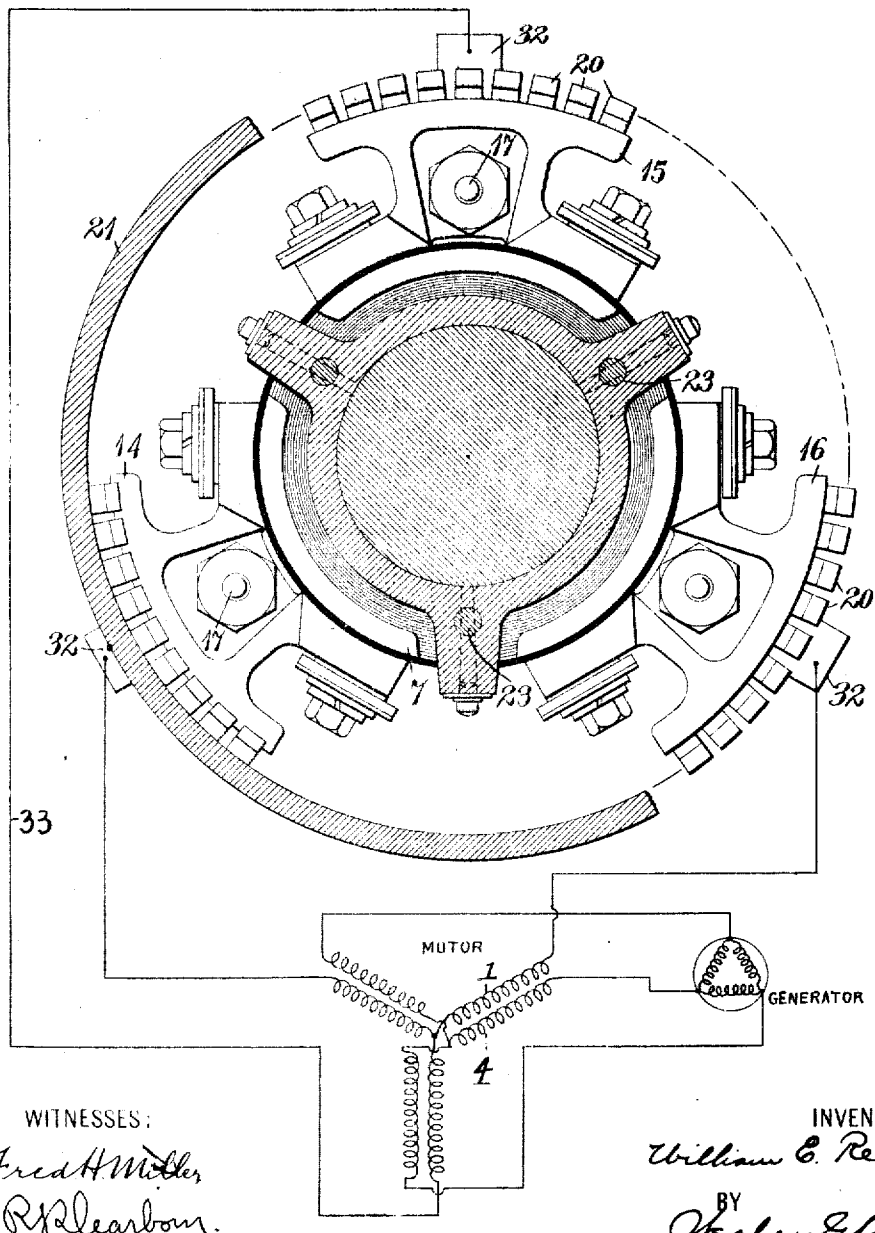
APPLICATION FILED AUG. 2, 1906.

1,013,218.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 2.

Fig. 3.



WITNESSES:

Fred H. Miller

R. F. Dearborn.

INVENTOR

William E. Reed

BY

Wesley G. Carr

ATTORNEY

W. E. REED.

INDUCTION MOTOR.

APPLICATION FILED AUG. 2, 1906.

1,013,218.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 3.

Fig. 4.

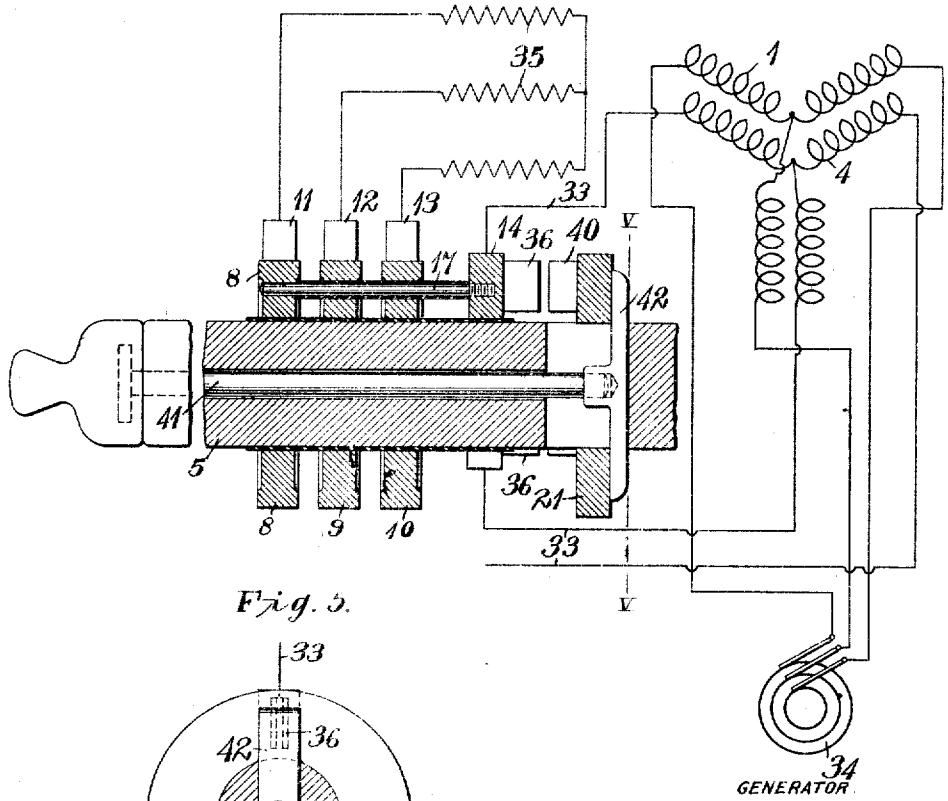


Fig. 5.

WITNESSES:

Fred H. Miller

R. J. Clearbon.

INVENTOR

William E. Reed

BY

Oakley & Coan

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM EDGAR REED, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY A CORPORATION OF PENNSYLVANIA.

INDUCTION-MOTOR.

1,013,218. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed August 2, 1906. Serial No. 328,885.

To all whom it may concern:

Be it known that I, WILLIAM EDGAR REED, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Induction-Motors, of which the following is a specification.

My invention relates to dynamo-electric machines, and has special reference to motors of the induction type, the rotating windings of which are adapted for connection to external stationary resistances.

The object of my invention is to provide means for short-circuiting a plurality of current collectors in a machine of the aforesaid class that shall be simple and durable in construction and that shall be operative when the motor is either at rest or in motion.

In order to avoid an overload upon the supply circuits when induction motors are started, it has been usual to provide means for including a suitable resistance in circuit with the secondary winding of the motor which may be short-circuited after the motor has attained a desired speed. This resistance has sometimes been mounted upon the rotating member of the machine and an automatic means has been provided for short-circuiting the resistance which was dependent upon the centrifugal force exerted when the motor attained a predetermined speed, but a device of this character is necessarily confined to use with relatively small motors because of the tendency of the co-operating contact members to vibrate or stick together.

For starting relatively large induction motors when the resistance occupied a considerable amount of space, slip rings or current collectors have been provided on the rotating members which were engaged by suitable stationary contact brushes, the resistances being of any convenient form, located in any desirable position and connected to the stationary brushes. This is a very satisfactory starting arrangement, but relatively large values of current must be carried by the current collectors when the motor is in operation, since the stationary brushes are then interconnected.

The brushes themselves usually offer relatively high resistance to the flow of current, so that the slip of the motor is increased, and the brushes and the collector rings are subjected to such vibration in service that sufficient sparking often occurs to seriously impair the contact surfaces and materially diminish the efficiency of the motor.

In accordance with my present invention, I provide means for so short-circuiting the current collecting devices that no current will traverse the sliding contact members during the normal operation of the motor.

In the accompanying drawings, Figure 1 is a view partially diagrammatic and partially in sectional elevation, of a motor constructed in acordance with my invention. Fig. 2 is a detail view of the operating lever and Fig. 3 is a sectional elevation of the short-circuiting device on a line III—III of Fig. 1. Figs. 4 and 5 correspond to Figs. 1 and 3, and are partially diagrammatic views of a modified device which may be substituted for the device shown in Figs. 1, 2 and 3.

Referring to the drawings, the motor illustrated comprises a stationary member having a winding 1 and end-bells 2, and a rotatable member 3 which is provided with a winding 4. The rotatable member of the machine is fixed to a shaft 5 which is rotatably mounted in stationary bearings 6 and upon which a sleeve or bushing 7 is mounted. A plurality of collector rings 8, 9 and 10 are mounted upon and insulated from the bushing 7, concentric with the axis of rotation of the cylindrical core member, and are respectively engaged by stationary brushes 11, 12 and 13.

Near one end of the bushing 7, a plurality of similar segments of conducting material 14, 15 and 16 are equi-distantly disposed and are insulated from the bushing and from each other. These segments are respectively connected by rods 17, to the collector rings 8, 9 and 10 and each of them is provided with flexible contact fingers 20 that extend beyond the inner extremity of the bushing 7. All of the fingers are adapted to be simultaneously engaged by a short-circuiting ring 21 which is adjustably mounted upon the shaft 5 near one end of the bushing.

The short-circuiting ring 21 is connected to a collar 22, which is also adjustably mounted upon shaft 5, at the opposite end of the bushing 7, by means of bolts or rods 23 which are substantially parallel to and

equally disposed about the axis of the shaft and extend loosely through holes 24 in the bushing 7 so that any movement of the collar will be transmitted to the short-circuiting ring 21. In this way, the ring 21 may be moved into and out of engagement with the fingers 20 at the will of an attendant by means of a stationary operating handle lever 24^a which is fulcrumed upon a stationary shaft 25.

The lower extremity of the lever is pivotally connected to a forked link 26 that is fulcrumed upon a stationary shaft 26^a and is provided with inward projections 26^b on which rollers 27 are mounted. These rollers are adapted to engage an annular groove 28 in the outer surface of the collar 22.

The collar 22 is free to rotate in either of its two extreme positions which are accentuated by the engagement of the springs 29 with notches 30 and 31 in the segments 14, 15 and 16, with no appreciable resistance between the rollers 27 and the sides of the groove 28, since the lever projections tend to center themselves in the groove. The extreme positions of the handle lever may also be accentuated by any convenient means, if this is found to be advantageous.

A specially good electrical connection is effected between the fingers 20 and the short-circuiting ring 21, since these parts are relatively stationary at all times, and since the centrifugal forces exerted during the operation of the motor tend to increase the pressure between the fingers and the interconnecting ring on account of the spring structure of the fingers.

By connecting a suitable resistance to the stationary brushes 11, 12 and 13 and separating the short-circuiting ring from the brushes, the motor may be accelerated, and when the current supplied to the motor is sufficiently decreased, the resistance and also the collector rings may be short-circuited by moving the ring 21 into engagement with the brushes 20.

The segments 14, 15 and 16 are provided with projections 32 which may be connected by conductors 33 to suitable points in the winding 4.

Special reference may now be had to Figs. 4 and 5, in which three-phase alternating current energy is supplied from a generator 34 to the primary windings 1 of the motor. Suitable points in the secondary winding 4 are connected to the conducting segments 14, 15 and 16 and the slip rings 8, 9 and 10 are severally connected by stationary brushes 11, 12 and 13 to external resistances 35. Each of the conducting segments is provided with a forked switch blade 36 that is adapted to be engaged by a knife blade 40, disposed upon the conducting ring 21. The ring 21 may be moved so as to effect the engagement and disengagement of the coöperating contact members by means of a plunger 41 which is located in a hole in the shaft and is connected to the ring by means of a cross strip 42 that extends through a slot in the shaft 5 and is attached at its middle point to the end of the plunger 41.

It may be found desirable to provide a quick-acting circuit making and breaking device for these contacts but, as such arrangements are well known, I deem it unnecessary to show a device of this character applied to the contacts in question.

It will be understood that the device described is not restricted in its use to a three-phase winding and that various modifications may be effected. For example, it may be desirable to ground one of the collector rings and to provide similar means for interconnecting the other collectors.

Variations in the size and arrangement of parts may also be effected within the scope of my invention, and I desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In an electric motor, the combination with a stationary member having a primary winding, a rotatable member having a secondary winding and collector rings connected thereto, stationary brushes for the rings and an external resistance connected to the brushes, of contact fingers having supporting members that are electrically connected to the several rings and are provided with longitudinally spaced notches, of interconnecting means for the fingers comprising an adjustable short-circuiting ring having an internal cylindrical contact surface, non-rotatable means for adjusting the ring to make and break engagement between its contact surface and the outer faces of the fingers and accentuating fingers secured to the short circuiting ring to engage either the inner or the outer notches in the supporting members for the contact fingers.

2. In a dynamo-electric machine, the combination with a plurality of collector rings, and stationary engaging contact brushes therefor, of a short-circuiting means for said rings comprising a plurality of groups of resilient contact fingers having supporting members that are severally connected to the collector rings and are provided with longitudinally spaced notches, a short-circuiting ring having an internal cylindrical contact surface, means for moving said ring to make and break engagement between its contact surface and the outer faces of said contact fingers and accentuating fingers carried by said short-circuiting ring to engage said notches.

3. In an electric motor, the combination with a rotatable member, a plurality of collector rings which are stationary relative thereto and are insulated therefrom and

from each other, groups of flexible contact fingers having supporting members that are severally connected to the collector rings and are severally provided with two longitudinally spaced notches, and a short-circuiting ring having a cylindrical contact surface, of means for moving said short-circuiting ring to make and break engagement between its contact surface and the faces of the contact fingers, independently of the operation of the machin ' and fingers carried by the short-circuiting ring to engage said notches for accentuating the adjustment positions thereof.

4. In a dynamo-electric machine, the combination with a rotatable core member having a cylindrical shaft, a bushing or sleeve fixed to the shaft and collector rings mounted on said bushing, of a plurality of conducting segments disposed about the bushing and having longitudinally spaced notches in their outer surfaces, groups of resilient contact fingers attached to the respective segments and projecting therefrom substantially parallel to the shaft, adjustable interconnecting means for engaging the outer surfaces of the fingers and accentuating fingers secured to the adjustable interconnecting means and adapted to engage the notches in the conducting segments.

5. A dynamo-electric machine comprising a stationary member, a rotatable core member having a cylindrical shaft, a bushing or sleeve fixed to the shaft, collector rings mounted on said bushing and insulated therefrom, a plurality of conducting segments equally disposed about the bushing and corresponding in number to the rings to which they are severally connected and having notches in their outer surfaces, groups of contact fingers attached to the respective segments and projecting therefrom substantially parallel to the shaft, a ring adjustably mounted upon the shaft and having an internal cylindrical contact surface, means for moving the ring to effect simultaneous engagement between its contact surface and the outer faces of the fingers and accentuating fingers secured to the adjustable ring and adapted to engage the notches in the conducting segments.

6. A dynamo-electric machine comprising a stationary member, a rotatable core member having a cylindrical shaft, a bushing or sleeve fixed to the shaft, collector rings mounted upon said bushing and insulated therefrom, conducting segments symmetrically disposed about the bushing and corresponding in number to the rings to which they are severally connected, contact fingers attached to the respective segments and projecting therefrom, a ring adjustably mounted upon the shaft at one end of the bushing, a collar adjustably mounted upon the shaft at the other end of the bushing, rods which connect the adjustable members and extend through holes in the bushing, and means for moving said ring into and out of engagement with the contact fingers.

7. In a dynamo-electric machine, the combination with a stationary member, of a rotatable core member having a cylindrical shaft, a bushing or sleeve fixed to the shaft, collector rings mounted on said bushing and insulated therefrom, conducting segments symmetrically disposed about the bushing and corresponding in number to the rings to which they are severally connected, contact fingers attached to the segments and projecting therefrom, a ring adjustably mounted upon the shaft at one end of the bushing, a collar adjustably mounted upon the shaft at the other end of the bushing and provided with an annular groove, rods which connect the adjustable members and extend through holes in the bushing, and a forked lever which projects into the groove in the collar and by which the ring may be moved into or out of engagement with the contact fingers.

In testimony whereof, I have hereunto subscribed my name this 30th day of July, 1906.

WILLIAM EDGAR REED.

Witnesses:
GEO. A. SAATHOFF,
BIRNEY HINES.