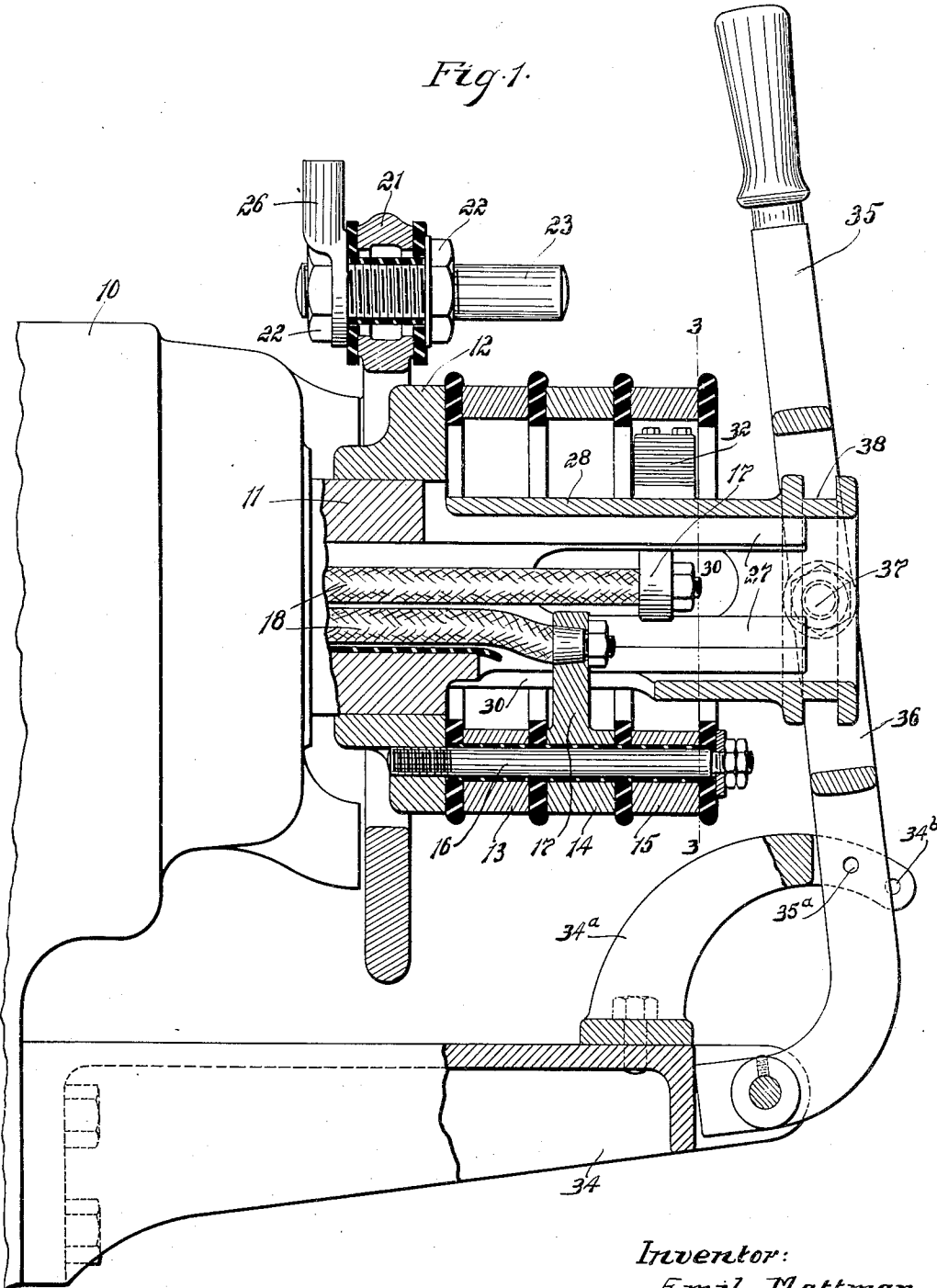


E. MATTMAN.
INDUCTION MOTOR.
APPLICATION FILED SEPT. 5, 1905.

932,625.

Patented Aug. 31, 1909.
3 SHEETS—SHEET 1.

Fig. 1.



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Fig. 3.

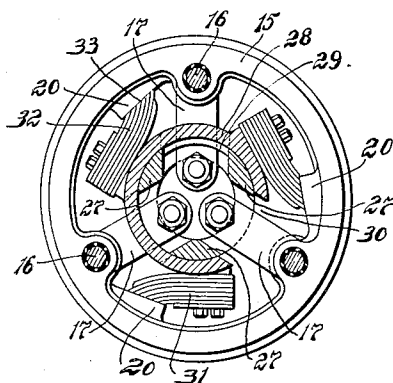
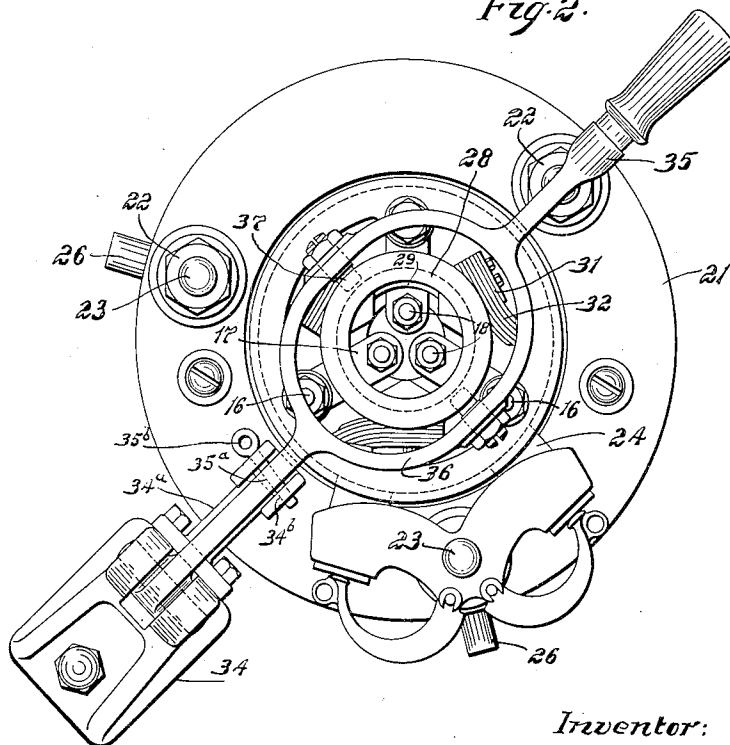


Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 5.

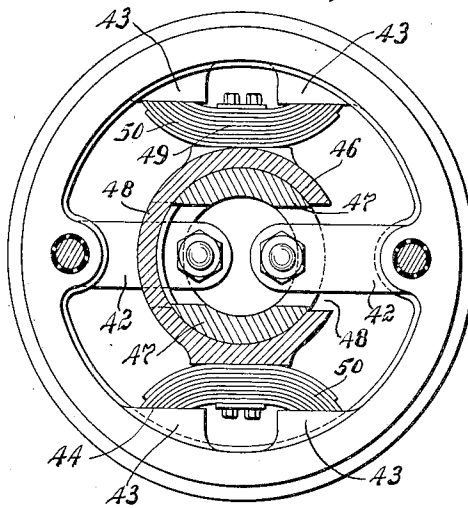
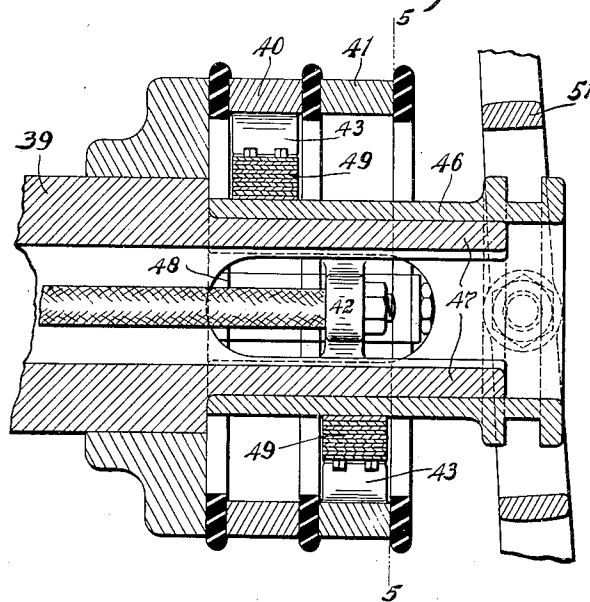


Fig. 4.



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UNITED STATES PATENT OFFICE.

EMIL MATTMAN, OF NORWOOD, OHIO, ASSIGNOR TO THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

INDUCTION-MOTOR.

932,625.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed September 5, 1905. Serial No. 277,087.

To all whom it may concern:

Be it known that I, EMIL MATTMAN, citizen of the Republic of Switzerland, residing at Norwood, in the county of Hamilton and State of Ohio, 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 dynamo-electric machines, and particularly to induction-motors.

It is desirable for the best running conditions of induction-motors that the resistance of the closed secondary windings be very low. The low resistance is not advantageous, however, for starting, owing to the fact that the currents induced in the secondary windings are so large that they react upon the field and greatly weaken the same, giving a very low starting torque. If a resistance is inserted in the secondary windings upon starting, the strength of the induced currents is correspondingly reduced and an effective starting torque is obtained. It is, therefore, common to insert resistance in circuit with the secondary windings on starting, and to cut this resistance out gradually as the motor comes up to speed. In this manner the requirements for best starting and running conditions are fulfilled.

The object of my invention is to provide a simple, positive and easily-controlled means for inserting resistance in the circuit of the secondary or rotor windings upon starting and for short-circuiting the windings after the motor has attained full speed.

My invention may be briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the drawings, which show the preferred form of construction, Figure 1 is a vertical sectional view of a portion of an induction-motor showing my invention applied thereto, parts being shown in elevation; Fig. 2 is an end elevation of the same; Fig. 3 is a vertical section along the line 3-3 of Fig. 1 on a reduced scale; Fig. 4 is a section similar to Fig. 1, of a modification; and Fig. 5 is a section along the line 5-5 of Fig. 4.

Mounted in bearings, one of which is shown at 10, is the horizontal shaft 11 of

the rotor of an induction motor. This shaft carries at its outer end by means of a sleeve 12, three collector rings 13, 14 and 15, which are secured to the sleeve by axial bolts 16 being suitably insulated from each other 60 and from the sleeve 12. Extending inward from each collector ring is a lug 17, the three lugs being preferably arranged 120° apart. Connected to the inwardly extending lugs are terminals 18 of a three phase 65 rotor winding. The terminals or leads extend for a suitable distance axially through the shaft and may be connected to the rotor windings in any suitable manner. Each collector ring has also on its inner periphery 70 a lug 20 having a flat contact face. The three contact lugs are arranged angularly 120° apart for a three phase motor.

Supported in any desired manner on the frame of the machine is the stationary ring 75 21 in which are secured by nuts 22 three insulated brush studs 23 arranged preferably 120° apart. The three brush studs each support a brush holder, one of which is shown in Fig. 2, having one or more brushes 24, 80 adapted to bear on the collector rings. Secured to the studs 23 by the nuts 22 are terminal members 26, to which the starting resistance (not shown) is adapted to be connected. The end of the shaft is cut away and 85 hollowed out for a suitable distance leaving three V shaped parallel extensions or arms 27.

Fitting closely around the shaft extensions and adapted to move in an axial direction is the contact carrying sleeve 28, made 90 of good conducting material as brass or copper. Secured to the inner periphery of the sleeve is a block 29, which engages closely the sides of two of the extensions or arms 27 and prevents relative rotary movement be- 95 tween the sleeve and the supporting arms. These shaft extensions are sufficiently flexible to hold the sleeve 28 with a yielding spring like action, so that the sleeve always tightly engages the shaft but yet can be 100 easily moved axially along the latter. The sleeve 28 has three longitudinal slots 30, 120° apart and of a width slightly greater than that of the inwardly extending lugs 17, so that the latter will not interfere with the 105 axial movement of the sleeve.

Supported on the outer surface of the sleeve and suitably arranged 120° apart in position to engage the contact lugs on the collector rings, are the three contact mem- 110

bers 31. The contact members are composed of groups of laminae 32, which are in this instance mounted tangentially on the sleeve, and are provided with contact faces 33 adapted to engage the contact lugs 20, of the collector rings. Pivoted to a supporting bracket 34, is a hand lever 35, having an enlarged substantially circular portion 36, from the inner surface of which extend two fingers or lugs 37, adapted to engage a grooved flange 38 of the sleeve 28. Thus by means of the hand lever the sleeve can be moved axially a sufficient distance to bring the contact members 32 into or out of engagement with the contact lugs 20 in the collector rings so as to short-circuit or open-circuit the secondary or rotary windings.

It has been found desirable to provide means for securely holding the lever in either the inner or outer positions in order that the windings may not be accidentally short circuited, or open circuited at the wrong time, and furthermore to hold the lever in such a manner that when in a normal stationary position the fingers 37 will not rub or engage the sides of the groove 38, thus avoiding the disagreeable noise which would otherwise result. To this end I provide a locking device for the lever consisting of a casting 34^a, bolted to the bracket 34. The casting is forked at its outer end, which forked end is provided with two perforations 34^b. The lever is also provided with a perforation 35^a, adapted to aline with one of the two perforations in the casting when the lever is in either its inner or outer position. A pin 35^b is inserted through the alined perforations to lock the lever in place. There is sufficient lost motion between the fingers 37 and the sides of the groove 38, and the holes are so arranged in the casting, that when the locking pin is in place the fingers 37 will not engage the sides of the groove 38.

It is evident that my short circuiting device can be applied with slight modifications to machines having any number of collector rings. Thus in Figs. 4 and 5, I have shown a shaft 39, provided with two collector rings 40 and 41, each provided with an inwardly extending terminal lug 42 and a pair of lugs 43 having flat contact faces 44. Both the terminal lugs and the contact lugs on the two rings are oppositely disposed or are 180° apart as clearly shown in Fig. 5. The contact sleeve 46, is mounted to slide on two extensions or arms 47 of the shaft 39. As in the construction first described, this sleeve is provided with slots 48 to receive the terminal lugs 42, the slots being in this case oppositely disposed. The sleeve carries two opposite contact members 49, each composed of laminae 50, having two contact faces adapted to engage the lugs 43 of one of the rings. The sleeve is adapted to be recip-

rocated by a hand lever 51 as in the construction previously described.

It will be seen that in the constructions described above, wherein tangential contacts or brushes are employed on the movable sleeve, that there will always be good electrical engagement between the contact members. By this arrangement and construction of the contacts on the sleeve, the pressure between the contact faces will be increased as the speed is increased on account of centrifugal action.

The operation and purpose of my device are as follows: Before starting the motor the switch handle is thrown outward to move the contacts away from or out of engagement with the contact lugs on the collector rings. The rotor windings are now in circuit with the starting resistance. As soon as the motor has reached a suitable speed the switch handle is moved inward, thereby bringing the movable contacts into engagement with the contact lugs on the collector rings. The windings are now short circuited through the contacts and contact carrying sleeve, and, if desired, the brushes may be lifted from the collector rings in any desired manner.

What I claim as new and desire to secure by Letters Patent is:—

1. In an induction motor, a shaft, a plurality of collector rings carried thereby, winding terminals extending through the shaft and electrically connected to the rings, said shaft having openings through which the connections are made, and means for short-circuiting the rings comprising a member surrounding the shaft and slidable axially thereof, said member having openings which permit relative movement between said member and the connections.

2. In an induction motor, a shaft having a slotted portion at one end, a plurality of collector rings carried by the shaft, said rings having lugs or projections extending through the slots of said shaft, winding terminals extending through the shaft and connected to said lugs or projections, and means for short-circuiting said rings comprising a sleeve formed of conducting material and slidable axially on the slotted portion of the shaft.

3. In an induction motor, a shaft having a plurality of slots at one end, a plurality of collector rings rotatable with the shaft, winding terminals extending through the shaft and electrically connected to the rings, the connections being made through the slots in the shaft, and means for short-circuiting said rings comprising a sleeve which is slidable axially on the slotted portion of the shaft and is provided with openings which permit movement of the sleeve relative to the connections between the terminals and rings.

4. In an induction motor, a shaft slotted at one end, a plurality of collector rings car-

ried by the shaft, lugs extending inwardly from said rings through said slots, winding terminals connected to the lugs, and an axially movable short-circuiting sleeve mounted on the slotted portion of the shaft and having openings which receive said lugs and permit axial movement of the sleeve relative to the same.

5 5. In an induction motor, a shaft, a plurality of collector rings carried thereby, winding terminals connected to the rings, and means for short-circuiting said rings comprising a sleeve carrying brushes adapted to engage the rings and having slots which receive the connecting means between the terminals and rings and permit axial movement of the sleeve relative to said connecting means.

10 6. In an induction motor, a shaft slotted at one end, a plurality of rings carried by

the shaft and surrounding the slotted portion thereof, winding terminals extending through the shaft and electrically connected to the rings through the slots in the shaft, means for short-circuiting said rings comprising a sleeve slidable axially on the slotted portion of the shaft and provided with brushes adapted to engage the rings, said sleeve having elongated slots which receive the connecting means between the terminals and rings and permit the sleeve to move relatively thereto, and means for shifting said sleeve. 25 30

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

EMIL MATTMAN.

Witnesses:

FRED J. KINSEY,

CHAS. F. W. TATGENHORST, Jr.