Sept. 6, 1927. 1,641,908

B. STECHBART

STARTING MEANS FOR INDUCTION MOTORS

Filed Nov. 30, 1925

Fig. 1

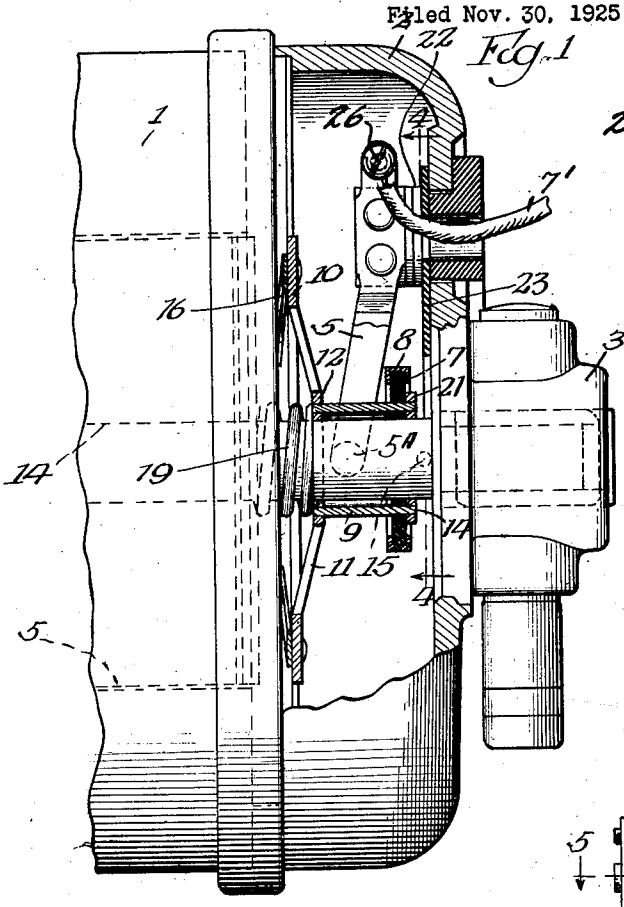


Fig. 5

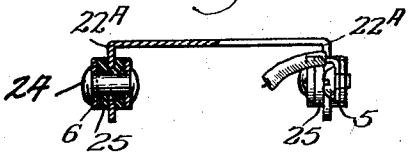


Fig. 3

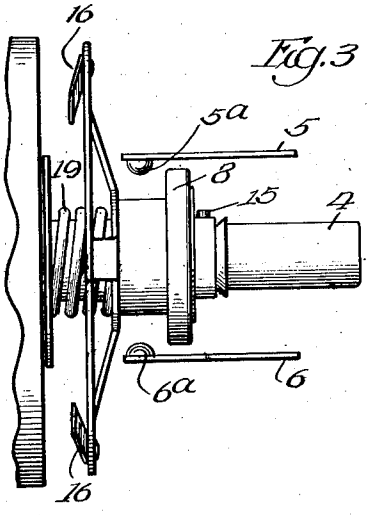


Fig. 4

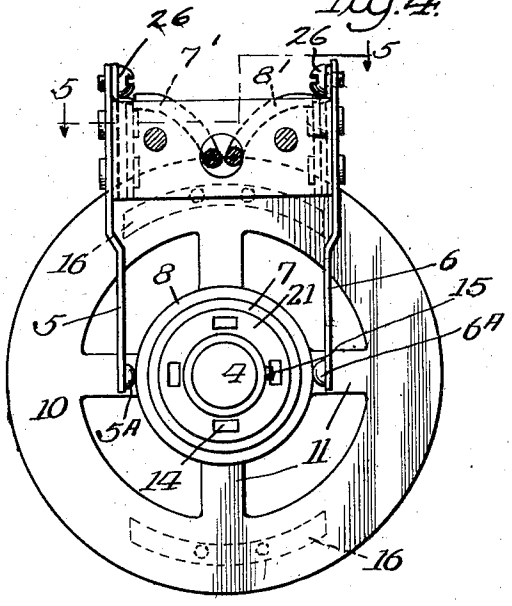


Fig. 2

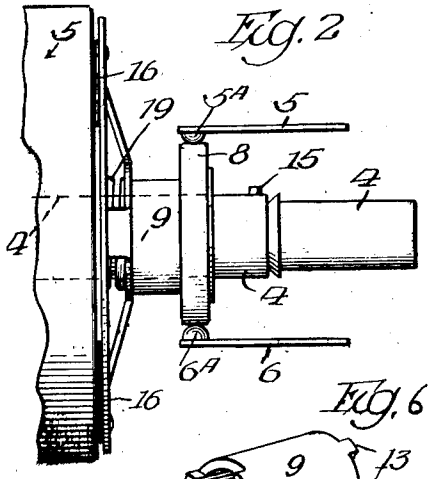
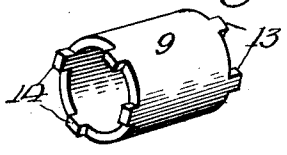


Fig. 6



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UNITED STATES PATENT OFFICE.

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STARTING MEANS FOR INDUCTION MOTORS.

Application filed November 30, 1925. Serial No. 72,365.

My invention relates to the class of induction motors in which an auxiliary or starter winding is provided in the stator or field of the motor and in which the circuit through this starter winding is controlled in response to variations in the magnetic field induced in the armature.

Generally speaking, the objects of my invention are those of providing simple, durable and positive means responsive to stray lines of magnetism from the armature for closing the circuit through such a starter winding and for holding this circuit closed until the said stray magnetic field is weakened to a predetermined extent when the armature approaches its normal speed of rotation, providing simple and positive means for rupturing the said starter circuit when the armature has approached this speed, providing simple and effective means for cushioning the movement of the switching member to its circuit-closing position, and providing simple and effective mountings for the switching member and for the contact members which engage the switching member.

More particularly, my invention provides a mounting for the switching member which will permit the latter to rotate freely on the armature shaft, so as to reduce friction and so as to distribute the points of engagement of this switching member with the contact members; provides simple bumper springs for affording the said cushioning action; and provides a mounting for the contact members which can readily be secured to the frame of a standard induction motor of the said general class.

Still further and also more detailed objects will appear from the following specification and from the accompanying drawings, in which—

Fig. 1 is a side elevation of one end of an induction motor equipped with my invention, with a portion of the motor casing broken away to show the switching mechanism and with the switching member in central and longitudinal section.

Fig. 2 is a side elevation of the same end of the armature and armature shaft, the switching member, and the contact members, showing the switching member in its circuit-closing position.

Fig. 3 is an elevation similar to Fig. 2, but showing the switching member in its circuit-opening position.

Fig. 4 is a side elevation of the switching member, the contact members and the contact carrier, taken from the line 4—4 of Fig. 1 but with the switching member in its circuit-closing position of Fig. 2.

Fig. 5 is a section taken along the line 5—5 of Fig. 4.

Fig. 6 is a perspective view of the tubular body of the slidable switching member.

In the drawings, Fig. 1 shows one end of the field frame 1 of a motor, carrying an end housing portion 2 which supports a bearing 3 for the adjacent end portion of the shaft 4 of the armature 5′. Mounted upon, but insulated from, the housing end portion 2 are a pair of resilient contact fingers 5 and 6 which extend past the axis of the shaft 4 at opposite sides of the latter and which are spaced by a distance greater than the diameter of these shafts, these contact fingers being respectively connected to wires 7′ and 8′ which form part of the circuit through the auxiliary or starter winding.

To control this circuit, I provide a switching member slidably mounted on the armature shaft and including a metal ring 8 which is adapted to engage the contact tips 5A and 6A of the two contact arms when the carrier is slid out of idle position of Figs. 1 and 3 to its operative or circuit-closing position of Figs. 2 and 4.

As here illustrated, the switching member includes an insulating disc 7 bored to slidably fit a part of the shaft 4 and having the metal ring 8 spun over its periphery, and a tubular body 9 connecting this insulating disc 7 with a soft iron part which is also slidable on the shaft. This soft iron part comprises a flat annular rim 10 connected by arms 11 to a hub portion 12 and the tubular body 9 (which may be of brass) has at its opposite ends fingers 13 and 14 anchored respectively in corresponding perforations in the said hub portion and the insulating disc. To insure a firm clinching of the fingers 14 to the insulating disc, I may extend these fingers also through a metal washer 21 bearing against the outer face of the said disc. Interposed between the said hub portion of the soft iron part and the armature 5 is a compression spring 19 which tends to move the slidable switching mem-

ber away from the armature, such movement being limited by the engagement of the insulating disc with a stop pin projecting radially from the shaft. The soft-iron member is centrally dished so as to receive the spring 19.

When the motor is standing still, the spring holds the switching member in its outward position of Figs. 1 and 3 in which the metal ring 8 is out of engagement with the contact arms, which form the terminals of the circuit through the starter winding. As soon as current is supplied to the motor, the armature is energized and the stray magnetic lines adjacent to its ends attract the soft iron member, thereby sliding the switching member towards the armature, or into the position of Figs. 2 and 4 in which it closes the circuit through the starter winding. To prevent the soft iron member from sticking to the armature, I interpose non-magnetic spacer elements between the two and I desirably provide these in the form of copper or brass springs 16 secured to the iron ring 10 and formed so that they will be compressed between this ring and the armature, thereby also cushioning the impact and preventing a loud slamming action when the switching member is magnetically drawn to its circuit-closing position.

During the increase in speed of the armature, the stray magnetism which has the above described effect decreases in strength until the magnetic pull becomes weaker than the thrust of the spring 19, whereupon this spring retracts the switching member to its inoperative position of Fig. 3 so as to open the circuit through the starter winding, and in practice the speed at which this opening of the circuit occurs can readily be determined by selecting a spring of suitable stiffness.

As an effective mounting for the contact arms 6, I am showing a V-shaped support 22 having its back spaced from the housing end 2 by an insulating plate 23 and having perforated arms 22A. The two contact arms 5 and 6 are respectively secured to these perforated arms 22A by rivets 24, each of which rivets is insulated from the adjacent perforated arm by a bushing 25 as shown in Fig. 5, and each contact arm carries a binding screw 26 for securing the corresponding circuit wire (such as the wire 27 of Fig. 1) to it.

With the construction as above described, the annular form of the contact ring 8 permits this to make an effective connection to both of the contact arms 5 and 6 regardless of the rotational position of the contact ring with respect to the shaft, and in practice I desirably also spin this ring loosely over the periphery of the insulating disc so as to leave it free to revolve about the latter. By thus mounting the contact ring, I reduce the friction between the contact arms and this ring, as even a relatively slight pressure of the arms on the ring will hold the latter against rotation while leaving the other parts of the switching member (including the inner soft iron portion) to rotate with the armature. So also, this freedom of rotation of the contact ring causes the latter to present new points of engagement successively to the contact tips or nubs 5A and 6A of the contact arms, thereby insuring good electrical connections.

However, while I have illustrated and described my invention in an embodiment including numerous highly desirable details of construction and arrangement, I do not wish to be limited to these, since many changes might obviously be made without departing either from the spirit of my invention or from the appended claims.

I claim as my invention:

1. In a motor of the class described, a pair of contact members forming terminals of the starter winding, a slidable member slidable upon the shaft of the motor, the said member including an iron element at its inner end and a conductor adapted to be moved into and out of engagement with the contact members by a sliding of the slidable member on the shaft, a spring continuously tending to slide the slidable member outwardly of the motor, and means for cushioning the impact of the slidable member when moved inwardly of the motor through the attraction of the iron element by the armature.

2. A motor construction as per claim 10, in which the cushioning means comprise elements secured to the iron element and arranged symmetrically about the axis of the motor shaft.

3. In an induction motor having an auxiliary starter winding, means for controlling the circuit through said winding including an iron bearing member slidable on the motor armature shaft and disposed adjacent to an end of the armature, means normally urging the member away from the armature, spaced contacts included in said circuit, switching means connected to the member and engageable with the contacts to close the circuit when the member is moved toward the armature, and combined means carried by said member and engageable with said end of the armature for cushioning the member and for preventing the iron from adhering to the armature composed of flat springs secured at their central portions to the member and having their ends free and extending at an angle toward the armature.

4. In an induction motor having an auxiliary starter winding, an end member spaced from an end of the motor, a substantially U-shaped support disposed to one side

of the armature shaft and secured at its base to and insulated from said end member, contact arms included in the circuit and secured to the free ends of the U-shaped support and extending transversely of the armature shaft, and magnetic responsive means engageable with the contact arms to close the circuit upon energizing of the armature.

5. In an induction motor having an auxiliary starter winding, means for controlling the circuit through said winding including contact means included in the circuit, and means to close the circuit through the contact arms including a magnetic responsive member having a hub slidable on the armature shaft, said member being centrally dished, and a coil spring arranged in the dished portion and engaging the armature for normally holding the member spaced from the armature.

6. In an induction motor having an auxiliary starter winding, means for controlling the circuit through said winding including a magnetic responsive member having a rim and a hub, a coil spring between the hub and the adjacent end of the motor armature, a sleeve slidable on the motor shaft and secured at one end to said hub, an insulating ring secured to and about the opposite end of the sleeve, a contact ring encircling the insulating ring, a housing for the motor having an end spaced from the said armature end and enclosing said sleeve and the said parts connected thereto, contact arms arranged transversely of the shaft and included in the circuit, and means to insulatingly mount the contact arms on said housing end and at points to one side of the shaft.

7. In an induction motor having an auxiliary starter winding, means for controlling the circuit through said winding including a magnetic responsive member slidable on the armature shaft, means to normally hold the member spaced from an end of the armature, circuit-closing means operable by the member, means included in the circuit and engageable with the circuit-closing means to close the circuit, and combined means carried by said member and engageable with said end of the armature for cushioning the member and for preventing the iron from adhering to the armature.

Signed at Chicago, Illinois, November 23rd, 1925.

BRUNO STECHBART.