

June 26, 1934.

J. J. JANCA, JR

1,964,581

MOTOR CENTRIFUGAL CUT-OUT SWITCH

Filed Sept. 6, 1930

2 Sheets-Sheet 1

Fig. 1-

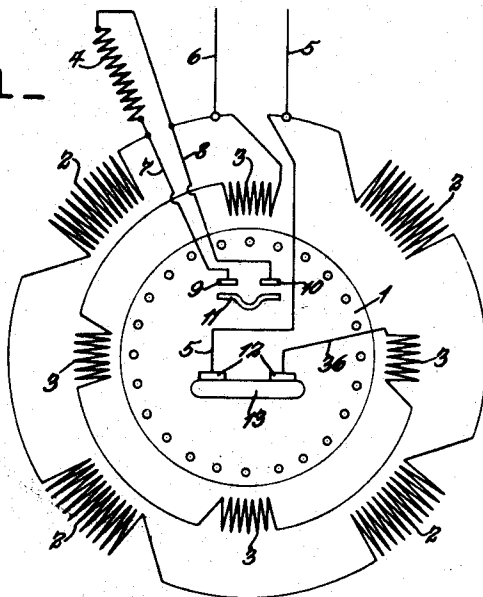
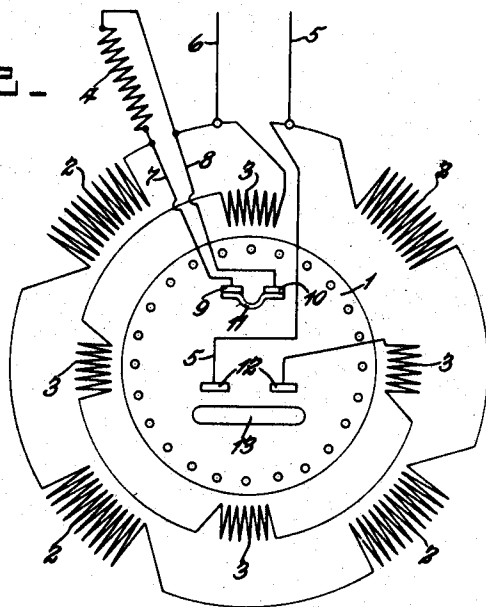


Fig. 2-



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Fig. 3.

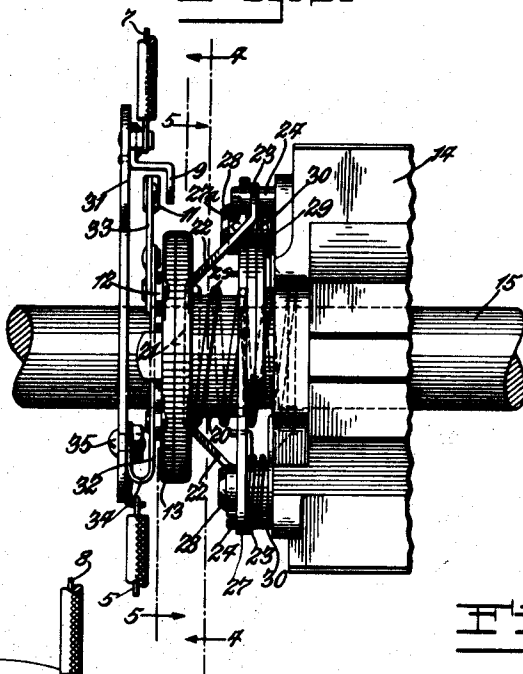


Fig. 4.

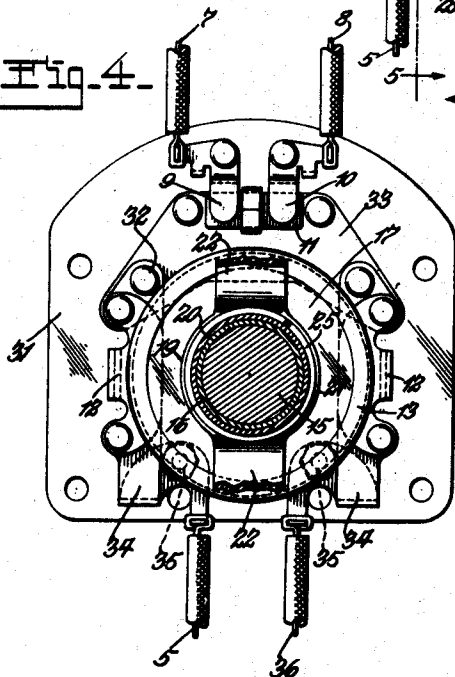
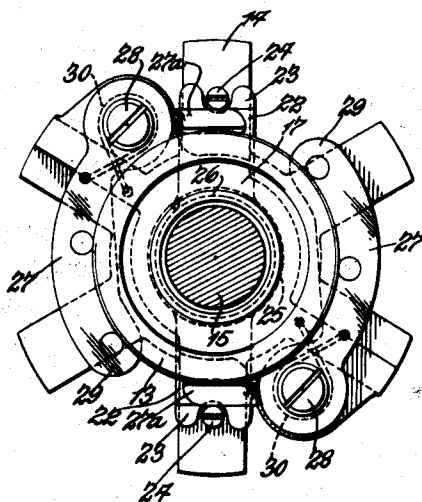


Fig. 5.



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MOTOR CENTRIFUGAL CUT-OUT SWITCH

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8 Claims. (Cl. 172-279)

This invention relates to an improvement in cut out switches for split phase induction motors, and particularly to a switch adapted to automatically cut out the starting windings and to shunt out a reactance coil after the motor has attained a predetermined speed.

One of the objects of this invention is to provide an improved automatic switch to shunt out a reactance coil which is arranged in circuit with the main windings at starting and at low speed.

Another object of this invention is to provide improved mechanism automatically operable at substantially the same time to cut out the starting windings and shunt out a reactance coil in an induction motor.

Other objects will be apparent from the following detail description and the accompanying drawings.

Fig. 1 is a circuit diagram of an induction motor including the switches organized in accordance with this invention, with the switch connections in the positions assumed at starting and at low speeds.

Fig. 2 is a view similar to Fig. 1 with the switch connections in their positions at high speeds.

Fig. 3 is a side elevation of the switch mechanism.

Fig. 4 is a vertical section on line 4-4, Fig. 3.

Fig. 5 is a vertical section on line 5-5, Fig. 3.

The invention can best be described by first describing the motor circuits and the switch connections. In this preliminary description reference may be made principally to Figs. 1 and 2 in which are shown diagrammatically the windings, their connections and the switch connections. Fig. 1 illustrates the positions of the switch terminals at starting and at low speeds, and Fig. 2 at high speeds.

The secondary of the motor may comprise the ordinary squirrel cage armature 1. The primary comprises the main windings 2 and the auxiliary starting windings 3. A reactance coil 4 is connected in series with the main windings 2. As specifically illustrated in the drawings, one main line lead 5 is connected to one side of one winding 2 and the other main line lead 6 is connected to one side of the reactance coil 4. The leads 7 and 8 are provided on each side of the reactance coil 4 and connected respectively to the terminals 9 and 10. A conductor bar 11 is provided to connect the terminals 9 and 10 and thus shunt out the reactance coil 4. The details of the mechanism for automatically accomplishing this result will be more particularly described in later paragraphs.

The auxiliary windings 3 are connected in series to the leads 5 and 6 through a switch including the terminals 12 and a conductor ring 13. The arrangement is such that at starting and at low speeds the conductor ring 13 connects the terminals 12, thus putting the auxiliary windings 3 in circuit with the main leads 5 and 6, and the bar 11 is retained away from the terminals 9 and 10, so that the reactance coil 4 is in circuit with the main windings. Upon an increase in speed, mechanism is provided which will be presently described, that automatically causes the conductor ring 13 to move away from and break contact between terminals 12, and to move the conductor bar 11 into contact with the terminals 9 and 10, thus shunting out the reactance coil 4. The utility of the auxiliary windings and the reactance coil in starting is well known and need not be described in detail.

In the drawings, Figs. 3, 4 and 5, representing the details of the switch mechanism, an armature core 14 is secured to and supported by a shaft 15. A sleeve 16 mounted on one end of the shaft 15 carries a disk 17 of non-conductive material which in turn supports the conductor ring 13 concentric with the armature shaft, and adapted to contact with the terminals 12.

A yoke element 19 includes a central sleeve portion 20 rigidly secured to and about the sleeve 16, an annular flange 21 which fits against the non-conductive disk 17, and the inclined legs 22 which have bifurcated ends 23 fitting about and guided by the pins 24 secured to the armature core 14. A spiral spring 25 fits about the sleeve 16 and the sleeve portion 20 of the yoke element and has one end abutting the flange portion 21 of the yoke element and the other end abutting the armature core 14. An outer flange 26 on the sleeve 16 together with the flange 21 on the yoke element 19 serves to hold and position the non-conductive disk 17 and its supported conductor ring 13. It will thus be seen that the conductor ring 13 is normally held in extended position away from the armature core 14, but by pressure upon the inclined portions 22 of the yoke element 19 the conductor ring 13 will be withdrawn inwardly towards the armature core against the tension of the spring 25.

A pair of levers 27 are each fulcrumed on a pin 28 which is secured to the armature core 14. Each of the levers 27 has an arm 27a, which rests upon the inclined portion 22 of the yoke element, and a weighted arm 29. A spring 30 holds the lever normally in a position in which the edge of the arm 27a engages the pin 24. Upon rotation

of the armature, the arm 29 of the lever 27 tends to swing outwardly against the tension of the spring 30, causing the arm 27a to press against the inclined portion 22, thus withdrawing the conductor ring 13.

A plate 31 formed of non-conductive material is secured to the inner side of the end plate of the motor and carries the overhanging terminals 9 and 10 which are attached, respectively, to the leads 7 and 8. A yoke member 32 is resiliently secured to the plate 31 and comprises a top member 33 of non-conductive material and a pair of legs 34 of resilient conductive material which have ends bent over and secured to the plate 31 by screws 35, as best shown in Fig. 3. Each of the legs 34 supports a terminal 12 adapted to contact with the conductor ring 13. The lead 5 is attached to one of the legs 34 and a lead 36 connected to one side of the auxiliary windings is attached to the other leg 34. Thus, when the conductor 13 forms a connection between the terminals 12 the auxiliary windings are connected in circuit to the main leads.

The plate 33 carries at its upper end the conductor bar 11 adapted to contact with the terminals 9 and 10. The construction and mounting of the yoke element 32 is such that when unrestrained the conductor bar 11 contacts with the terminals 9 and 10, thus shunting out the reactance coil 4 and this is the position of the switch mechanism when the conductor ring 13 is withdrawn due to the action of the weight 29 flying outwardly due to centrifugal force upon fast rotation of the armature. At starting and at low speeds the conductor ring 13 contacts with the terminals 12 pressing the yoke element 32 out of its normal position so that the conductor bar 11 is out of contact with the terminals 9 and 10.

It will thus be seen that in starting the conductor ring 13 is in contact with the terminals 12 pressing the yoke element which carries the terminals 12 out of its normal position breaking the contact between the terminals 9 and 10 and the conductor bar 11. In this position, as illustrated in Fig. 1, the auxiliary windings are in circuit with the main line leads and the reactance coil 4 is in circuit with the main windings. At high speeds, due to the action of the weighted arm 29, the conductor ring 13 is withdrawn from the terminals 12, permitting the yoke member 32 to assume its normal position making contact between the terminals 9 and 10 and the conductor bar 11, thus cutting out the auxiliary windings and shunting out the reactance coil 4; the position of the mechanism being such as is diagrammatically illustrated in Fig. 2.

It is apparent that parts of the invention may be used without the whole, and that various changes may be made in the details of construction within the scope of the appended claims without departing from the spirit of this invention.

I claim:

1. In an electric motor having a reactance coil in circuit with the main windings on the stator and a pair of leads adapted when connected to shunt out the coil, a starting switch comprising a terminal attached to each of the leads, a frame resiliently mounted on the stator, a conductor secured to the frame and adapted in the released position of the frame to contact with said terminals, and means on the rotor responsive to centrifugal force adapted at starting and at low speeds to contact with the frame and hold the conductor out of contact with the terminals and

at high speeds to permit the frame to assume its released position.

2. In an electric motor having a reactance coil in circuit with the main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a pair of terminals connected to said leads respectively, a support resiliently mounted on the stator and having a conductor yieldingly held against the terminals, a ring concentric with the motor shaft and adapted for movement therealong, a resilient member for normally holding the ring against the support to disengage the conductor for the terminals, and means responsive to centrifugal force induced by rotation of the motor armature to withdraw the ring and release the support.

3. In an electric motor having a reactance coil in circuit with main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a support resiliently mounted on the stator and having a conductor yieldingly held against the terminals, a sleeve about the motor shaft supporting a ring concentric with the shaft, movable weights pivotally supported on the armature of the motor, engaging arms on the sleeve and the weights whereby due to centrifugal force the weights cause the sleeve and the ring to move longitudinally along the shaft and release the support.

4. In an electric motor having a stator, a rotor, a shaft, main windings, auxiliary windings, a reactance coil in circuit with the main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a frame yieldingly mounted on one end of the stator, a pair of terminals connected to said leads respectively, a contact member on the support yieldingly held in contact with the terminals, a plurality of contacts fixed to the frame and adapted when connected to close a circuit to the auxiliary windings, a conducting ring concentric with the shaft and movable therealong adapted to engage the contacts and move the frame, and means responsive to centrifugal force induced by rotation of the armature to move the ring along the shaft.

5. In an electric motor having a stator, a rotor, a shaft, main windings, auxiliary windings, a reactance coil in circuit with the main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a non-conductive plate secured to the stator, a support resiliently mounted on the plate and having a plurality of contacts adapted when connected to close the circuit to the auxiliary windings, a pair of terminals secured to the plate and attached to said leads respectively, a conductor secured to the support and adapted when the support is released to contact with the terminals, a conducting ring slidably mounted on the shaft and adapted to engage said contacts and to move the support out of its released position, and means operable by centrifugal force induced by rotation of the rotor to move the ring along the shaft.

6. In an electric motor having a stator, a rotor, a shaft, main windings, auxiliary windings, a reactance coil in circuit with the main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a yoke resiliently mounted on the stator and having a plurality of contacts adapted when connected to close the circuit to the auxiliary windings, a conductor secured to the yoke and adapted when the yoke is released to contact with a pair of overhanging terminals non-conductively secured to

the stator and attached to said leads respectively, a conducting ring slidably supported on the shaft and adapted for movement therealong, said ring being positioned to engage said contacts and to
5 move the yoke out of its normal position, and means operable by centrifugal force induced by rotation of the motor to move the ring.

7. In an electric motor having a stator, a rotor, a shaft, main windings, auxiliary windings, a
10 reactance coil in circuit with the main windings and leads adapted when connected to shunt out the reactance coil, a starting switch comprising a non-conductive plate secured to the stator, a support yieldingly secured to the plate and having a
15 plurality of contacts adapted when connected to close a circuit to the auxiliary windings, a conductor secured to the support and adapted when the support is released to contact with a pair of
20 overhanging terminals secured to the plate and conductively attached to said leads respectively, a conducting ring slidably mounted on the shaft and adapted for movement therealong, said ring being positioned to engage said contacts and to
25 move the support out of its normal position, resilient means to hold the ring in engaging position,

and means operable by centrifugal force induced by rotation of the rotor to withdraw the ring.

8. In an electric motor having a stator, a rotor, a shaft, main windings, auxiliary windings, a reactance coil in circuit with the main windings and
80 leads adapted when connected to shunt out the reactance coil, a starting switch comprising a non-conductive plate secured to the stator, a yoke resiliently mounted on the plate and having a plurality of contacts adapted when connected to
85 close a circuit to the auxiliary windings, a conductor secured to the yoke and adapted when the yoke is released to contact with a pair of overhanging terminals secured to the plate and conductively attached to said leads respectively, a
90 conducting ring non-conductively supported by a sliding sleeve on the shaft and adapted for movement therealong, said ring being positioned to engage said contacts and to move the yoke out of its normal position, resilient means to hold the
95 ring in engaging position, and means operable by centrifugal force induced by rotation of the rotor to withdraw the ring.

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