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SPEED RESPONSIVE SWITCH FOR ELECTRIC MOTORS

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FIG. 1.

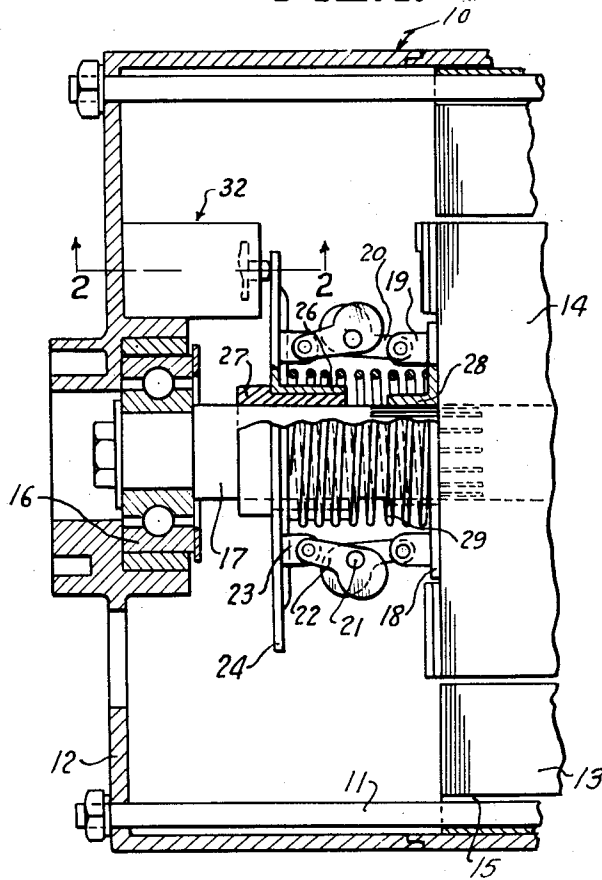


FIG. 2.

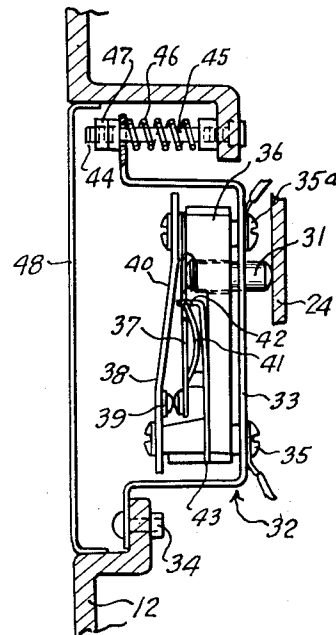


FIG. 3.

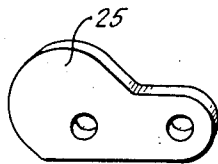
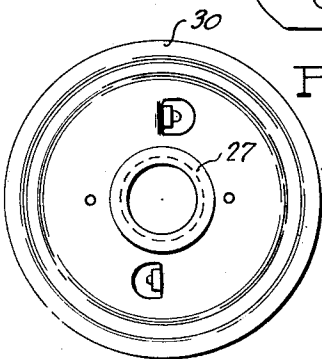


FIG. 4.



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SPEED RESPONSIVE SWITCH FOR ELECTRIC MOTORS

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2 Claims. (Cl. 200—80)

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This invention relates to electric motors of the type having starting and running windings, the construction being such that after the motor attains a predetermined speed, it automatically disconnects its starting winding, and an object is to produce a new and improved switch mechanism for such motor which operates automatically in response to the attainment of a predetermined speed to disconnect the starting winding and vice versa.

Another object is to produce a switch mechanism of the above character which is speed-responsive and which incorporates the so-called microswitch which is operative upon very slight movement of the centrifugal device, thereby to prolong the life of the contacts and to provide an exceedingly sturdy, efficient and reliable assembly adapted for large scale production.

Other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown in the accompanying drawings, in which

Figure 1 is a vertical sectional elevation of a portion of an electric motor equipped with automatic or speed responsive switch mechanism, some of the parts being broken away for purposes of clarity;

Figure 2 is an enlarged sectional view substantially on the line 2—2 of Figure 1, showing particularly the microswitch mechanism and associated parts;

Figure 3 is a perspective view of one of the links or weighted arms which are adapted to swing outwardly in response to centrifugal force; and

Figure 4 is an end view of the disc and sleeve assembly showing the struck-out bracket portions for receiving the inner end of the adjacent weighted arm or link.

The electric motor comprises a casing 10 which, as shown, is in two parts, held together by stay bolts 11 which pass through apertures in integral end plates 12, only one of which is shown. The motor has an outer or stationary winding 13 and an inner or rotating winding 14, the outer winding having apertures 15 through which the stay bolts 11 pass. The end plate 12 is provided with a ball bearing unit 16 to provide an anti-friction mounting for the armature shaft 17 on which the armature or inner windings 14 are fixed. Fixed to the armature shaft 17 for rotation therewith and also secured to an end of the armature winding 14 is a metal plate 18 from which are struck a pair of diametrically opposed integral

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brackets 19 to which the inner ends of the arms 20 are pivoted. The outer end portions of the arms 20 are pivoted at 21 to a similar arm 22 which, in turn, is pivoted at its inner end to diametrically opposed brackets 23 which are struck from a metal disc 24.

The arms 20 and 22 are similarly formed, and, as shown in Figure 3, each is formed with an enlarged portion 25 in the region of its outer end. The purpose of the enlargement is to cause the outer ends of the arms 20 and 22 to fly outward or in a direction away from the armature shaft 17 after the motor has attained a predetermined speed, thereby moving the disc 24 axially in a direction toward the armature winding 14 as will hereinafter appear.

The disc 24 is provided with a tubular axial extension 26 and the diameter of the extension 26 is somewhat greater than the outside diameter of the armature shaft 17. Slidable on the armature shaft 17 is a flanged sleeve 27 and the tubular extension 26 has a press fit with the sleeve 27, the disc abutting against the external shoulder on the sleeve 27. The sleeve 27 is preferably of a plastic or other non-conducting material such, for example, as Bakelite. The axial movement of the disc 24 and sleeve 27 toward the mounting plate 18 is limited by a tubular extension 28 integral with the plate 18. Interposed between the plate 18 and the disc 24 is a helical coiled spring 29 which normally urges the disc 24 to the left of Figure 1.

As shown particularly on Figure 4, the disc 24 is embossed to provide an annular rim portion 30 which is adapted to engage a plunger or pin 31 forming a part of a microswitch 32 which is of the type to make and break an electrical contact upon exceedingly short travel. The arrangement is such that when the electric motor is idle, the coil spring 29 insures that the rim 30 of the disc 24 will be in contact with the pin or button 31 to hold the electrical contacts in engagement with the microswitch thereby enabling the motor to start rotating. As the speed of the motor increases, the arms 20 and 22 are urged in a radially outward direction by centrifugal force, and this outward movement of these arms is translated into axial movement of the disc 24 against the force of the coil spring 29. After sufficient axial movement of the disc 24 so that the pin or button 31 is released, the contacts associated with the microswitch are opened, and flow of current to the starting winding of the motor is thereby stopped. Further rotation of the motor is caused by current passing to the running winding of the

motor, as will be readily understood by those skilled in this art.

From an inspection of Figure 2, it will be understood that the pin or button 31 of the microswitch passes through an opening in a bracket arm 33, one end of which is anchored by a bolt and another assembly to a portion of the casing end plate 12. The bracket plate is generally U-shaped in form, and secured thereto by screws 35 and 35a is an insulating block 36. The inner end of the pin or plunger 31 is engageable with a spring metal contact arm 37, one end of which is anchored by the screw 35a, the opposite end of which carries a contact button 38 for engagement with a contact button 39 carried by a rigid arm 40. Integral with the arm 37 and struck from an intermediate portion thereof is a spring finger 41 which engages in a notch in the upturned arm 42 of a bracket arm 43, the latter being held in clamped position by the screw 35. The upper end of the upturned arm 42 is disposed intermediate the side edge portions of the contact arm 37 and does not interfere with the free flexing movement of the contact arm 37 and it will be understood that the integral spring arm 41 normally urges the contact arm 37 away from the rigid arm 40, so as normally to separate the contact points 38 and 39. Manifestly, when the disc 24 moves to the right of Figure 1 sufficiently to enable the pin or plunger 31 to move slightly to the right, the contact points 38 and 39 will be separated from each other and the circuit thereby broken. The fixed end of the contact arm 37 is insulated from the arm 40 and the wires for the starting winding are attached to the screws 35 and 35a respectively.

As above pointed out, one end of the bracket arm 32 is held in fixed position by the bolt and nut assembly 34. The opposite end terminates in an outwardly flanged portion 44 which is formed with an enlarged opening through which a bolt 45 passes, one end of which is secured to a portion of the casing end plate 12. Encircling the bolt 45 is a coil spring 46 which tends to urge the bracket arm 33 to the left of Figure 2. Lock nuts 47 on the other end of the bolt 45 hold the parts in adjusted position. The cavity in the end plate 12 receiving the microswitch is closed by a removable plate 48 and after removing the plate 48, the nuts 47 may be adjusted to rock the bracket arm 33 in a direction toward or away from the axially movable disc 24. In this manner, the time at which the microswitch 32 operates may be regulated. Manifestly, by rocking the bracket arm 33 to the right of Figure 2, the time for operation will be delayed, but by moving the bracket arm 33 to the left of the figure, the time may be accelerated.

From the above description, it will be manifest that I have produced an exceedingly simple and efficient automatic switch, which is respon-

sive to very slight movements or speed variations, enabling the motor to operate thereafter on its running winding at a predetermined speed. As above pointed out, adjustment can be very readily made by removing the cover 48 and adjusting the nuts 47 to move the pin or plunger 31 closer to or farther away from the axially shiftable disc 24. Inasmuch as the electrical contact points are not engaged themselves by a rotating part, wear is greatly reduced and as a consequence, the life of the parts substantially prolonged.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What I claim is:

1. In an electric motor having an armature shaft, pairs of pivotally connected weighted arms adapted to be thrown outwardly by centrifugal force, a member rotatable with the motor and held from axial movement providing a fixed pivotal mounting for one end of one of the arms of each pair, a disc shiftable along the armature shaft, a pivotal connection between the other arm of each pair and one side of said disc, a spring urging said disc in one direction, a normally open resilient microswitch arranged at one side of the armature shaft and electrically connected to the motor and engaged by said disc under the influence of said spring for holding the switch closed, the arrangement being such that after the motor has attained a predetermined speed, the weighted arms impart movement of the disc in a direction away from the microswitch for opening same, a support for said microswitch, and adjustable means for moving the support for shifting the microswitch toward or away from said disc.

2. The organization as claimed in claim 1, comprising a fixed mounting for one end of the support for the microswitch, and a spring-tensioned adjustable mounting for the opposite end of said support.

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