Sept. 22, 1925. 1,554,694

R. J. WOLFE

STARTING SWITCH FOR SINGLE PHASE MOTORS

Filed June 7, 1920 2 Sheets-Sheet 1

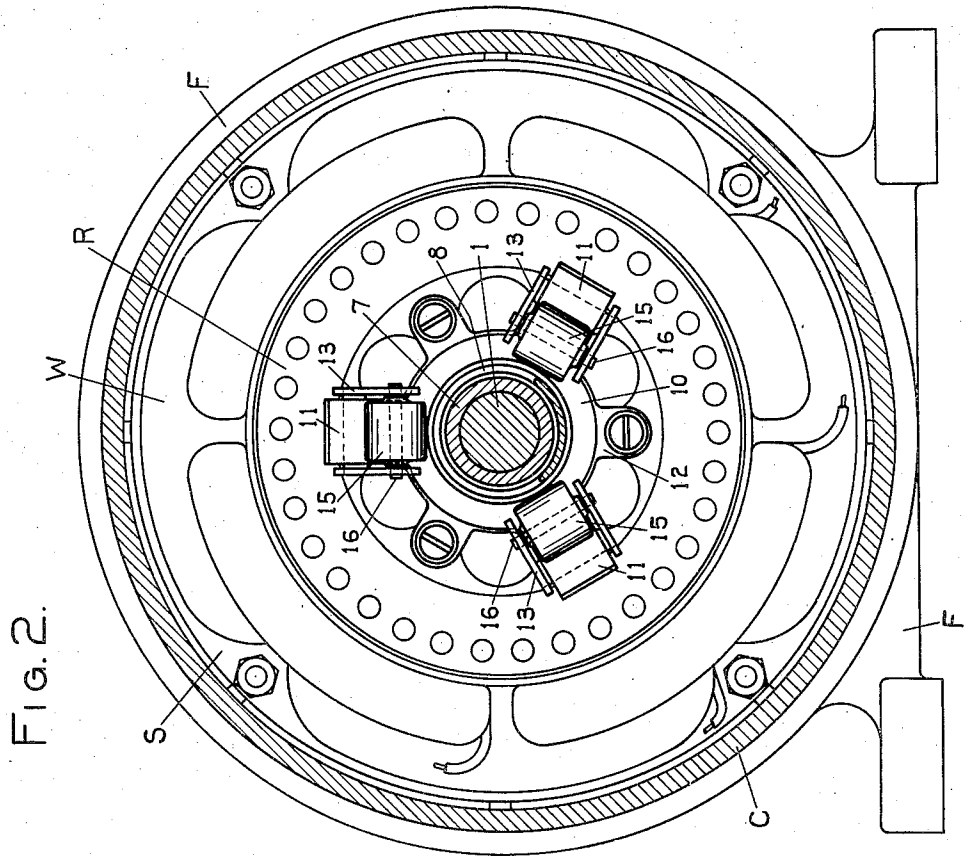


FIG. 2.

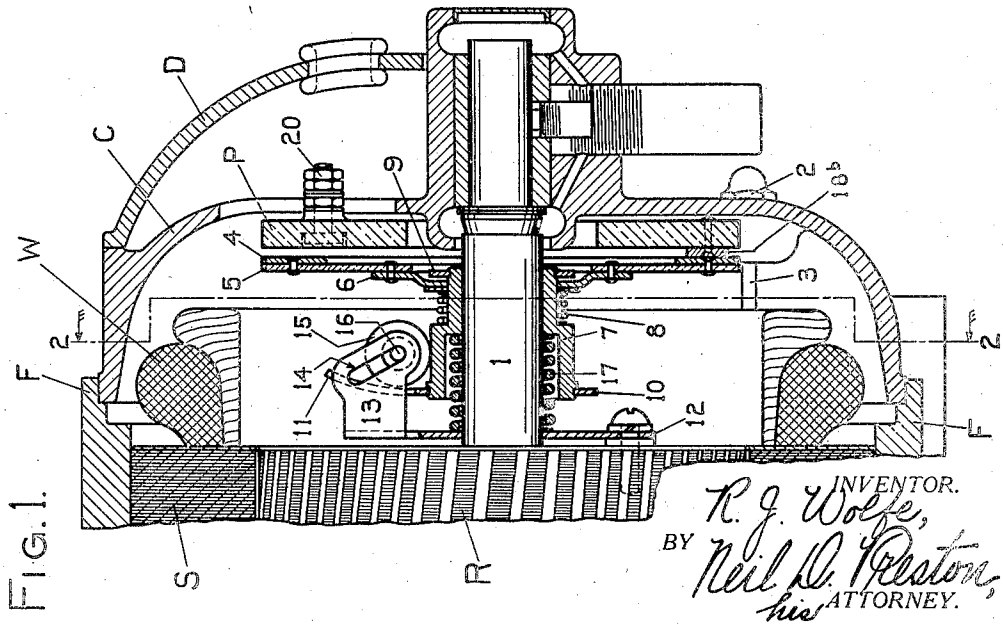


FIG. 1.

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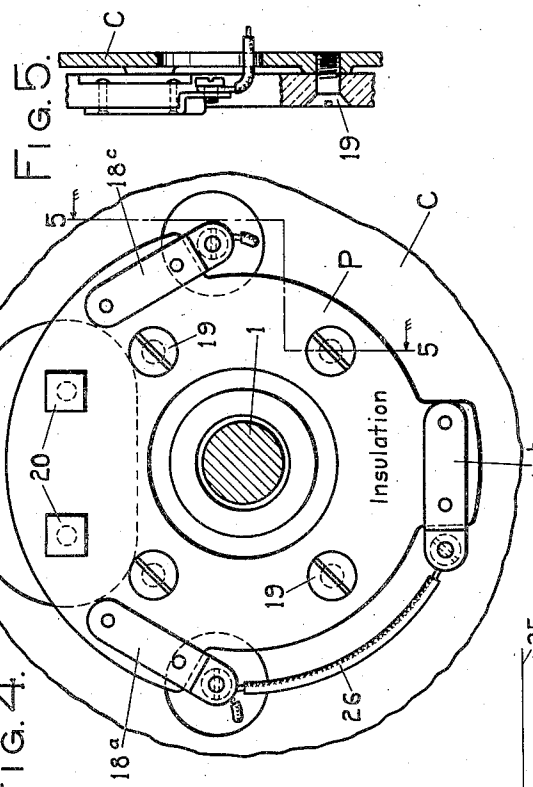


FIG. 5.

FIG. 4.

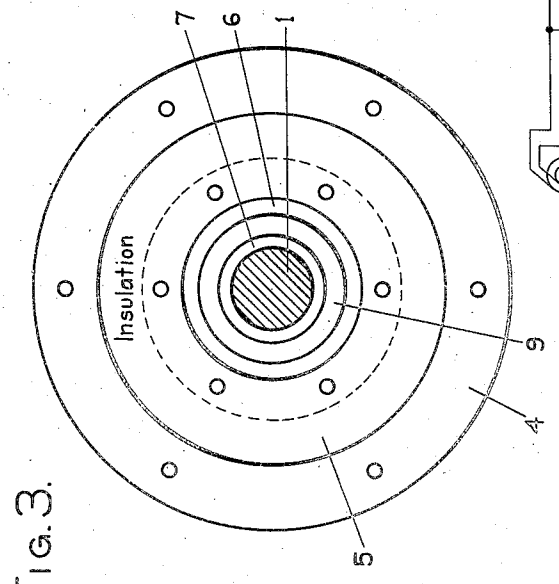


FIG. 3.

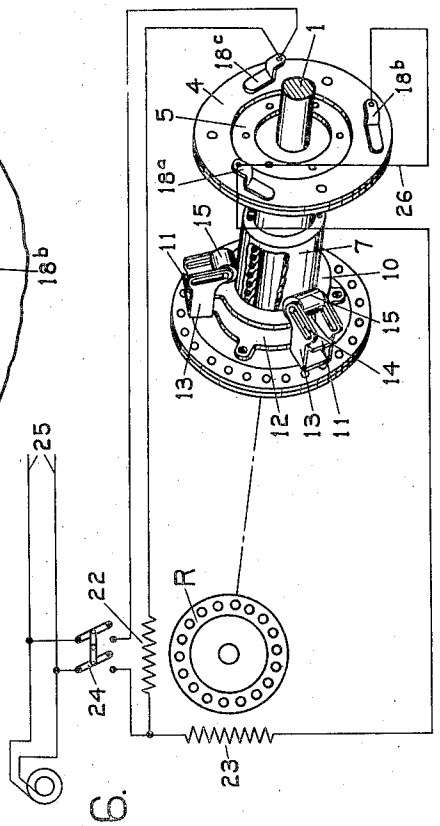


FIG. 6.

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Patented Sept. 22, 1925. 1,554,694

UNITED STATES PATENT OFFICE.

ROSWELL J. WOLFE, OF ROCHESTER, NEW YORK, ASSIGNOR TO GENERAL RAILWAY SIGNAL COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

STARTING SWITCH FOR SINGLE-PHASE MOTORS.

Application filed June 7, 1920. Serial No. 387,128.

To all whom it may concern:

Be it known that I, ROSWELL J. WOLFE, citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Starting Switches for Single-Phase Motors, of which the following is a specification.

This invention relates to centrifugal switches and more particularly to switches of this type arranged and constructed for starting single phase induction motors.

The primary objects of this invention are to improve and simplify the construction of centrifugal switches used for starting single phase motors, to devise such a switch comprising few and simple parts which can be cheaply manufactured and assembled, and to provide a switch of this character which will possess the necessary wearing qualities to give reliable and satisfactory operation under severe conditions.

Other specific objects and features of the invention will appear hereinafter.

In describing the invention in detail, reference will be made to the accompanying drawings in which,

Figure 1 is a diametrical section through part of a conventional single phase induction motor having my improved starting switch applied thereto;

Fig. 2 is a transverse section through the motor and switch taken substantially on the line 2—2 in Fig. 1;

Fig. 3 is a face view of the contact ring and associated parts;

Fig. 4 is a fragmentary end view of the end cap of the motor showing the stationary contacts of the switch associated therewith;

Fig. 5 is a detail section on a line 5—5 in Fig. 4; and

Fig. 6 is a diagrammatic view showing the switch in perspective, certain parts being broken away and spread apart, together with the circuit connections preferably employed with the switch.

Referring to the accompanying drawings, the motor illustrated comprises the usual frame F, supporting the stator S, which is provided with the usual coils or windings W, constituting the starting and running winding, and a rotor R fixed to a shaft 1. An end cap C, with a splash cover or shield D, is attached to the end of the frame F by nuts 2 on the ends of threaded rods 3 extending through the motor.

The centrifugal switch embodying the invention comprises, in general, a contact ring 4 surrounding the shaft 1 and supported in the manner hereinafter described so as to move axially on said shaft; stationary insulated contacts carried by a panel P of insulating material and arranged to cooperate with said contact ring 4; and speed responsive mechanism, including centrifugal members opposing a spring, for moving the contact ring 4 axially out of engagement with its cooperating contacts.

Referring to the construction in detail the contact ring 4 is riveted or otherwise suitably fastened to an annular member 5 of suitable insulating material; and this member 5 in turn is riveted to a smaller metallic ring 6. The ring 6 fits loosely on a sleeve 7 surrounding the shaft 1 and slidable thereon. A small compression spring 8 on the sleeve 7 presses against the ring 6, with a suitable intervening washer; and a collar 9, secured to the end of the sleeve 7, limits the outward movement of the ring 6. Fastened to the inner end of the sleeve 7 is a circular member 10 provided with a plurality of radially projecting curved arms 11. In the construction illustrated there are three of these arms 11 disposed 120° apart around the shaft 1. A plate 12 is fastened by screws or the like to the end of the rotor R, and this plate is provided with three pairs of ears 13, in each of which is an inclined slot 14. Between each pair of ears 13 is disposed a centrifugal element in the form of a roller 15 which is carried on a pin or shaft 16 guided at its ends in the slots 14. A spring 17 around the shaft 1 opposes inward movement of the sleeve 7.

The contact ring 4 cooperates with three fixed contacts 18^a, 18^b and 18^c, carried by the insulated panel or plate P. This panel P is fastened by screws 19 to the end cap C. In the construction illustrated (see Figs. 4 and 5) contacts 18^a—18^c are in the form of strips or plates fastened by rivets or other suitable means to the panel P, said plates being provided with perforated ears for

facilitating the attachment of wires. The panel P also supports binding posts 20 by means of which the necessary wiring connections may be made.

Operation.—When the motor is at rest the parts are in the position shown. The spring 17 presses the sleeve 7 outward and moves the contact ring 4 into engagement with the three contacts 18^a—18^c. These three contacts afford a three-point support for the contact ring 4 and assure intimate contact between said ring and each stationary contact. The spring 8 is provided to assure intimate and uniform contact pressure regardless of slight variations occurring in commercial manufacture and increased wear of the parts in service.

When the motor is started and the shaft 1 revolves, the contact ring 4 is held stationary by the friction between it and the stationary contact pieces 18^a—18^c; and the ring 6 slips on the sleeve 7. When the shaft 1 attains the critical speed for which the device is designed, the centrifugal force developed by the rollers 15 acts against the curved arms 11 to move the sleeve axially on shaft 1 in opposition to the spring 17. This movement is accomplished by a sort of cam or wedging action as a result of the curve of the arms 11 and the incline of the slots 14, these factors being preferably selected so that, as the rollers 15 move outward, they exert an increasing pressure against the arms 11. Thus when the sleeve 7 starts to move, it completes its movement quickly. The outward movement of the rollers 15 is limited by the outer ends of the slots 14. When the sleeve 7 moves inward, the contact ring 4 is pulled out of engagement with the stationary contact pieces 18^a—18^c; and as soon as this occurs, the contact ring 4 and associated parts is free to revolve with the shaft 1, so that when the motor is running there is no rubbing contact. As the shaft 1 slows down, the rollers 15 are forced by the spring 17 to their inner position shown, and the ring 4 rubs over the contact pieces 18^a—18^c until it stops.

Referring to Fig. 6, 22 designates the running winding for the motor and 23 the starting winding. When the switch 24 is closed, the running winding 22 is connected across the supply wires 25, and the starting winding 23 is also connected to the supply between the contact pieces 18^a—18^b and 18^c, the two contact pieces 18^a and 18^b being preferably connected together by a wire 26.

It will be observed that my inmproved centrifugal switch comprises few parts which can be easily and cheaply manufactured and assembled. The movement of the contact disc 4 is quick and no long arcs are drawn. Also, since the contact ring 4 is entirely out of engagement with its cooperating contact pieces while the motor is running, wear and depreciation of the contact surfaces is avoided, and any squeak or noises incident to the use of brushes or other collecting devices is prevented.

Other advantageous features of my improved construction will be obvious.

The particular construction shown and described is merely illustrative of the invention, and I desire to have it understood that my invention is not limited to this exact construction and arrangement of parts.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a centrifugal switch, a shaft, a spring-pressed sleeve movable axially on the shaft and provided with radially extending arms, a member rotating with the shaft and having a plurality of pairs of projecting ears each provided with an inclined slot therein, and rollers guided by said slots and bearing against said arms.

2. In a centrifugal switch, a shaft an element movable axially with reference to the shaft and having a radially extending curved arm, a spring acting to move said element in one direction, a roller engaging said arm, and means rotating with the shaft for causing the roller to move axially with respect to the shaft as said roller moves outward by centrifugal force.

3. In a centrifugal switch, a shaft, a member rotating with the shaft and provided with a pair of radially extending arms each having an inclined slot therein, a roller guided by said slots, said roller when thrown out by centrifugal force also moving axially with respect to the shaft, and circuit controlling means operated by said roller.

4. In a centrifugal switch for starting single phase motors, in combination, a rotor shaft, an insulated contact ring movable axially on the shaft, a panel of insulating material fastened to the end cap of the motor, three contact strips fastened to said panel and arranged to engage the contact ring, and speed-responsive means including rollers adapted to roll outwardly due to centrifugal force for moving the contact ring into and out of engagement with said strips.

5. In a centrifugal switch for starting single phase motors, a shaft, a sleeve movable axially on the shaft and having three radially projecting curved arms, a member rotating with the shaft and provided with three pairs of ears straddling said arms, each ear having an inclined slot therein, a roller disposed between each pair of ears and guided by said slots, said rollers bearing against the corresponding arms, whereby the movement of the rollers outward by centrifugal force acts to move the sleeve axially on the shaft in one direction, a spring opposing such movement, and circuit controlling means operated by the sleeve.

6. In a centrifugal switch, the combina-

tion with a shaft, a member rotating with the shaft and provided with a pair of radially extending arms each having a slot therein, a roller guided by said slots, a circuit controlling device, and means actuated when said roller is thrown out by centrifugal force to operate said circuit controlling device.

7. In a centrifugal switch for starting a single phase motor, in combination with a rotor shaft; a contact ring comprising a disc shaped annulus of insulating material, and an inner metallic ring and an outer conducting ring fastened to opposite surfaces of said annulus; the outside diameter of said inner ring being smaller than the inside diameter of the outer conducting ring; stationary contacts fastened to the end cap of the motor; and speed responsive means including movable rollers for moving the contact ring into and out of engagement with said contacts.

8. A centrifugal switch comprising, in combination with a shaft, a sleeve movable axially on the shaft, insulated stationary contacts, a contact ring movable axially on said sleeve and biased against said contacts, a spring for moving said sleeve in one direction, and a centrifugal device comprising rollers guided in slots in arms extending from said shaft for moving the sleeve in the other direction.

9. A centrifugal starting switch for single phase motors comprising, in combination with the motor shaft, a sleeve movable axially on the shaft, a spring moving the sleeve in one direction, a centrifugal device including rollers for moving the sleeve in the opposite direction, three rigid contacts around the shaft, a contact ring arranged to engage said contacts and rotatably and axially movable on said sleeve, and another spring for pressing said ring axially towards said contacts.

10. In a centrifugal starting switch for single phase motors, the combination with the rotor and its shaft, of a spring-pressed sleeve axially movable on the shaft and having three radially projecting curved arms, three rollers bearing against said arms, and a member fastened to the end of the rotor and guiding said rollers axially as they move radially with respect to the shaft.

11. In a centrifugal switch for single phase motors, the combination with a rotor and its shaft, a spring pressed sleeve axially movable on the shaft, arms extending from said rotor each terminating in a bifurcated end having slots, rollers supported by said arms and guided by said slots, and means extending from said sleeve engaging said rollers, the relation of the slots in said arms and said last mentioned means being such that centrifugal force acting on said rollers will produce a force acting on said sleeve in opposition to the spring.

In testimony whereof I have affixed my signature.

ROSWELL J. WOLFE.