Nov. 14, 1933. V. WEBER 1,935,304

CENTRIFUGAL SWITCH

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Fig. 1.

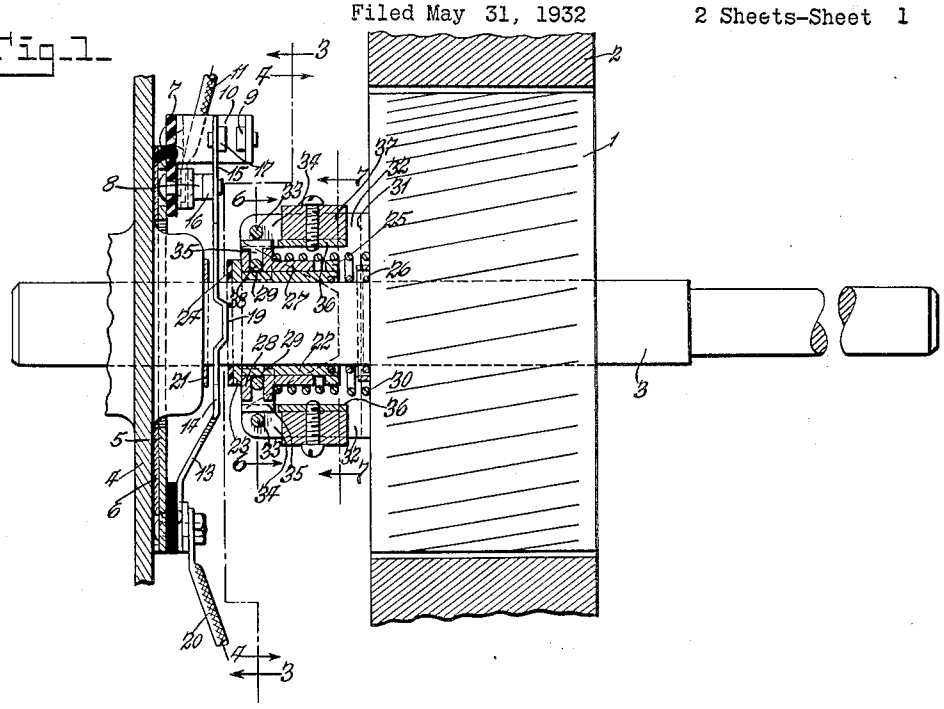
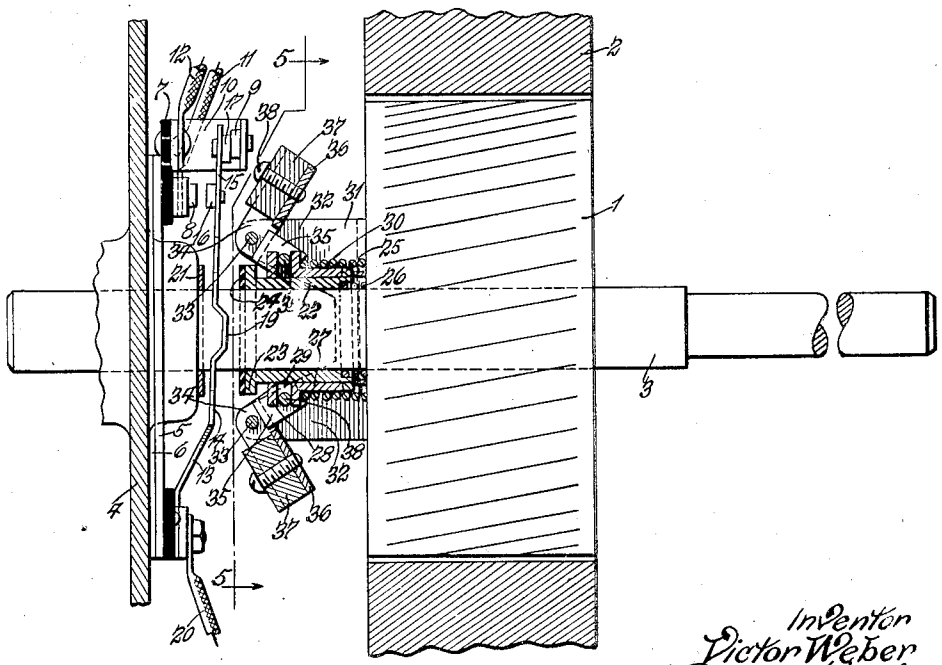


Fig. 2.



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Fig. 3.

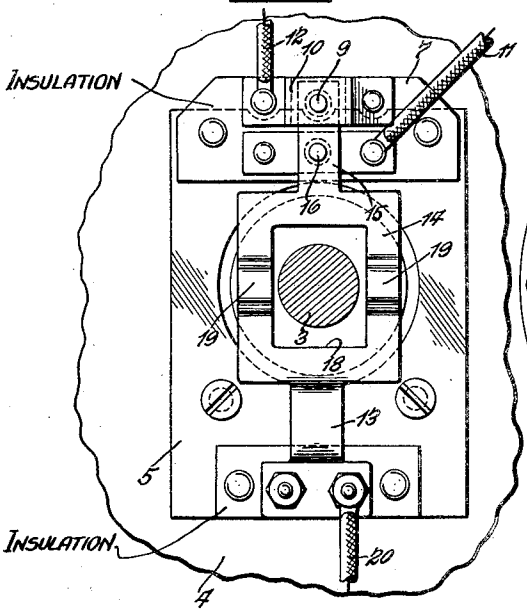


Fig. 4.

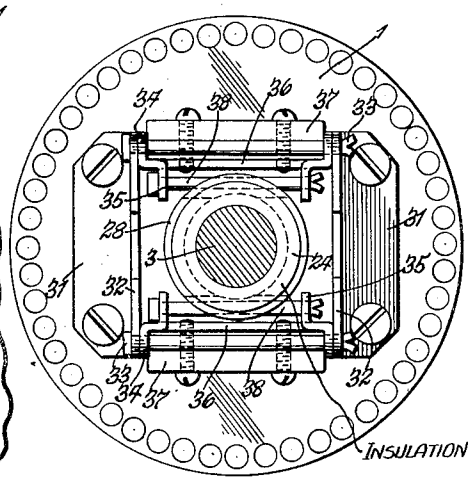


Fig. 6.

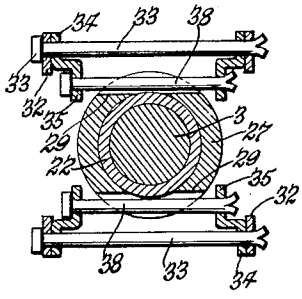


Fig. 5.

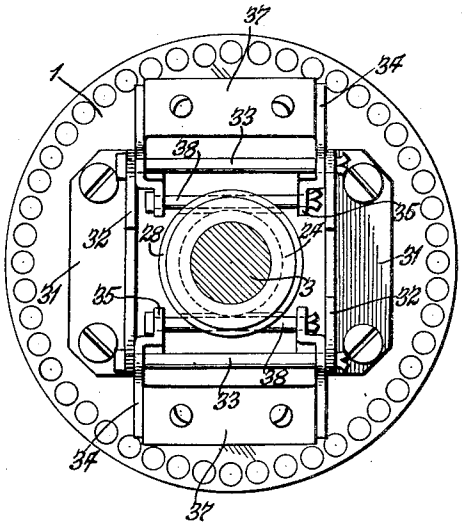
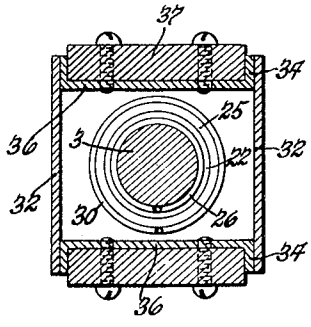


Fig. 7.



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UNITED STATES PATENT OFFICE

1,935,304

CENTRIFUGAL SWITCH

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Application May 31, 1932. Serial No. 614,353

6 Claims. (Cl. 200—80)

This invention relates to improvements in centrifugal switches; and consists in the novel construction hereinafter disclosed.

An object of the invention is to provide a centrifugal switch for a motor which is simple in construction and which may be assembled with a reasonable range of tolerance in the relative position of the parts without impairing successful operation of the device; which will provide for an efficient starting contact and which will hold the contact during the acceleration of the motor; which will break rapidly at a critical speed and within a minimum speed differential; and which will operate with a minimum degree of friction, thus prolonging the life of the switch construction.

Additional advantages will be apparent from the following detail description, taken in connection with the accompanying drawings, in which—

Fig. 1 is a longitudinal section illustrating the position of the parts in contact relation.

Fig. 2 is a view of the same parts illustrating the switch in the position assumed when the motor is under speed.

Fig. 3 is a cross-section on the line 3—3 of Fig. 1.

Fig. 4 is a cross-section on the line 4—4 of Fig. 1.

Fig. 5 is a cross-section on the line 5—5 of Fig. 2.

Fig. 6 is a cross-section on the line 6—6 of Fig. 1.

Fig. 7 is a cross-section on the line 7—7 of Fig. 1.

In the embodiment of the invention illustrated in the drawings, the switch is shown as associated with a motor which includes an armature 1 operating in a field structure 2 and an armature shaft 3, which shaft extends at one end through a cover plate 4 of the motor housing.

The switch construction, which is designed, in the embodiment shown, to alternately open and close separate circuits, is supported by the inner face of the cover plate 4. A plate 5 is attached to the inner face of the cover with an insulating strip 6 interposed between the plate 5 and the face of the cover plate 4. The plate 5 carries at its upper margin an insulating plate 7 which forms a support for the contact members and for the circuit leads extending therefrom. There are two contacts 8 and 9, the contact 8 being supported by the face of the insulating plate 7 and the contact 9 being supported by a bracket 10 that extends inwardly toward the face of the armature. The contacts 8 and 9 are, therefore, spaced apart and positioned in different vertical planes. A lead 11 is connected with the contact 8 and a lead 12 is connected with the contact 9. The lead 11 is a part of the motor-starting circuit and the lead 12 is a part of the motor-running circuit. Thus, as illustrated in the drawings, there are two circuits controlled by the switch, the starting circuit being in series, for example, with a high voltage tap of a transformer and the running circuit being in series with a low voltage tap of a transformer.

The movable switch member, as illustrated in the drawings, is in the form of an irregularly shaped spring plate having a lower leaf 13, a central rectangular portion 14 and an upper leaf 15, the upper leaf carrying the two contacts 16 and 17. The central portion 14 of the movable contact member has a rectangular cut-out portion 18 through which the armature shaft extends, and the walls at the sides of the opening are deflected inwardly to form the shoulders 19. The spring plate is supported by attaching the lower margin of the leaf portion 13 of the spring to the bottom part of the plate 5. The spring plate is on conductive relationship with a lead 20 for completing the circuits controlled by the movable switch member. The resilient tendency of the spring plate is to throw inwardly toward the face of the armature, the movement, of course, being limited by the extent of the lateral space between the faces of the contacts 8 and 9. In order to prevent the spring from short-circuiting against the housing of the motor, an insulating washer 21 is mounted over the armature shaft forward of the face of the spring member.

The movable switch member is actuated to its forward position against its resilient tendency to move backwardly by a centrifugally controlled construction which includes a sleeve 22 slidably mounted over the armature shaft. The sleeve 22 is provided at its outer end with a flange 23. The diameter of the flange 23 is in excess of the cross-dimension of the opening 18 in the movable switch member so that, when the sleeve is in its outermost adjustment, the flange will exert pressure against the shoulders 19 of the movable switch member and force the switch member against its normal spring tendency outwardly to cause the contacts 8 and 16 to maintain contact adjustment.

In order to insulate the sleeve from the plate constituting the movable switch member, an insulating washer 24 is interposed between the forward face of the flange 23 and the spring plate. The sleeve 22 carries at its inner end an annular

flange 25, and the inner face of the sleeve is recessed to constitute a seat for a coil spring 26 interposed between the inner end of the sleeve 22 and the face of the armature. The tendency of the spring 26 is to move the sleeve 22 outwardly with sufficient force to overcome the tendency of the movable switch member to move inwardly, with sufficient excess pressure to hold the contacts 8 and 16 in contact engagement to effect a satisfactory conductive contact.

A collar 27 is slidably mounted over the sleeve 22 and between the inner faces of the flanges 23 and 25. The longitudinal dimension of the collar 27 is somewhat less than the space between the opposed faces of the flanges 23 and 25, so that the collar may move a limited distance without contacting the faces of said flanges 23 and 25. The collar 27 is provided at its forward end with a flange 28, which flange has oppositely disposed grooves 29 in its peripheral face. A coil spring 30 is mounted over the collar 27 and bears against the inner face of the flange 28 at one end and against the face of the armature at the opposite end. The tendency of the spring 30 is to press the collar outwardly so that the flanges 23 and 28 are normally in contact when the motor is at rest. The spring 30 is of sufficient strength to resist the initial force of the centrifugal weights by which it is actuated.

The centrifugal lever members are supported between plates 31 having spaced arms 32, said plates 31 being supported by the face of the armature and opposed to each other on opposite sides of the armature shaft. Each centrifugal member has a pivot pin 33, which pivot pins extend through the lever members comprising long arms 34 and short arms 35. The arms 34 are laterally connected by a plate 36 to which is attached a weight 37.

Extending transversely between the short arms of each of the weight levers is a pin 38. The pins 38 traverse the peripheral face of the flange 28 of the collar 27 and seat, respectively, in the grooves 29. When the motor is at rest, the long arms of the centrifugal weight members lie parallel with the axis of the armature shaft, and the short arms extend normal to the axis of the shaft. When the armature shaft is rotated, the weight arms of the centrifugal levers move outwardly, which action initially moves the collar 27 against the tendency of the spring 30 longitudinally of the sleeve 22. The initial outward movement of the weights does not cause a movement of the sleeve 22, but the sleeve 22 remains in its forward position, preserving the movable contact member in its restrained contact position. After the collar 27 has traversed the space betwen the inner face of the flange 25 and the inner face of the collar 27, the collar abuts against the flange 25, and further outward movement of the weights moves the sleeve 22 inwardly a sufficient distance, with a slight excess movement, to release the movable switch member, whereupon the spring tendency of said member snaps it to its innermost adjustment, thereby effecting contact between the contacts 9 and 19, which position is held by an excess spring pressure of the movable contact member.

When the speed of the armature shaft reduces below a speed holding the weight members in their outermost adjustment, the collar 27 moves outwardly and the sleeve 22 is thus released for outward movement and is pressed outwardly by the spring 26.

The characteristic of the governing mechanism is such that for a critical speed the weights either fly out or return without stopping in any intermediate position. For practical purposes, this action is true even for a slight increase or decrease in speed during the functioning of the device to open or close the contacts. A rapid break or make of the contacts is thus assured.

It is thus clear that the construction of the switch and the means by which it is operated are such as to provide an efficient contact in either position of the movable switch member, and that the centrifugal actuator for the switch member will operate to produce a rapid breaking and making of the contacts, thus minimizing the tendency to arc when the contacts are broken.

It will also be clear that the contacts are so actuated as that sufficient pressure to preserve an efficient contact will be maintained until the break of the contacts occurs, thereby avoiding increase in resistance in the circuits before breaking contact is initiated.

It should be understood that the advantages of the invention are preserved whether the switch is designed as a double contact switch or a single contact switch, as the fundamental advantages of a quick break and constant contact pressure would be present if the switch was used as a single contact cut-out switch.

I am also aware that the invention may be modified in numerous details without departing from the spirit of the invention. I, therefore, do not limit myself to the exact construction shown and described, but what I claim and desire to secure by Letters Patent is:—

1. In a centrifugal switch having a revolving shaft, a stationary contact, and a movable contact carried by a spring plate, an actuator for said spring plate comprising a sleeve slidably mounted on the shaft, a spring moving said sleeve toward said plate, a collar fitted for sliding movement in respect of said sleeve, abutments on the sleeve limiting the sliding movement of said collar, and centrifugal weight levers operatively connected with said sleeve for controlling the movement thereof and thereby of said collar to restrain and release said spring plate.

2. In a centrifugal switch having a revolving shaft, a stationary support, a pair of spaced contacts carried by said support, and a movable contact member having a pair of contacts cooperating with the first named contacts, said member being resiliently movable to one contact position; an actuator for said movable contact member comprising a sleeve slidably mounted on the armature shaft, a spring tending to move said sleeve into contact with said movable contact member, a collar loosely fitted on said sleeve, a spring for said collar, means for cooperatively connecting said collar with said sleeve, and centrifugal weight levers operatively connected with said collar tending to move the sleeve out of contact with said movable switch member when the armature shaft has attained a predetermined speed.

3. In a centrifugal switch having a revolving shaft and a stationary contact, the combination including a flexible contact blade actuated in one direction by its inherent resiliency, a spring operated member on the shaft moving said blade in opposition to its normal spring tendency, centrifugal weights supported for revoluble movement with the armature shaft, and a connection between said centrifugal weights and said spring operated member whereby said member is moved in opposition to its spring tendency with a de-

layed action in respect of the movement of said centrifugal weights.

4. In a centrifugal switch having a revolving shaft and a stationary contact, the combination including a flexible contact blade actuated in one direction by its inherent resiliency, a spring operated member on the shaft moving said blade in opposition to its normal spring tendency, an insulating connection between said spring operated member and said blade, centrifugal weights supported for revoluble movement with the shaft, and a connection between said centrifugal weights and said spring operated member whereby said member is moved in opposition to its spring tendency with a delayed action in respect of the movement of said centrifugal weights.

5. In a centrifugal switch having a revolving shaft, a stationary contact, a movable contact and a movable contact support movable in one direction by its inherent resiliency; an actuator for said movable support comprising a member slidably mounted on the shaft, a second member having telescopic relationship with said first named member, a pair of centrifugally operated weights disposed on opposite sides of the shaft and revoluble therewith, and lever connections between said weights and said second named member for moving said member longitudinally of said first named member and then moving said members longitudinally as a unit.

6. In a centrifugal switch having a revolving shaft, a stationary contact and a resilient contact member, an actuator for moving said resilient contact member comprising a member slidably mounted on the armature shaft of the motor, a spring connected with said member and resisting the normal spring tendency of said resilient switch member, pivoted weight levers revoluble with the shaft, and a resiliently actuated connection between said weight levers and said slidable member for imparting to said member a movement in the direction of the spring tendency of said resilient switch member after said pivoted weight levers have completed a part of their outward travel.

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