Jan. 6, 1953 R. K. SHEWMON 2,624,814

SWITCH LOCATOR

Filed May 2, 1951 2 SHEETS—SHEET 1

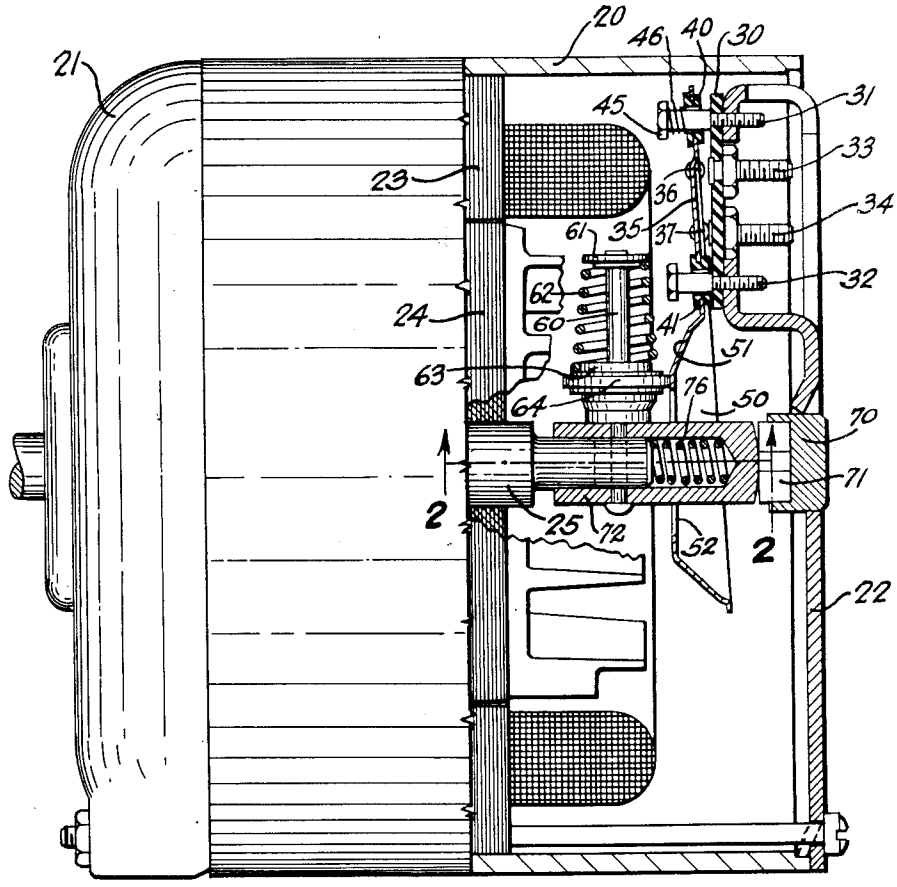

Fig. 1.

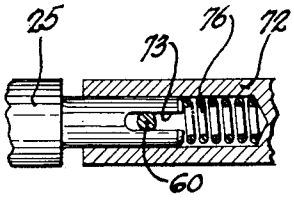

Fig. 2.

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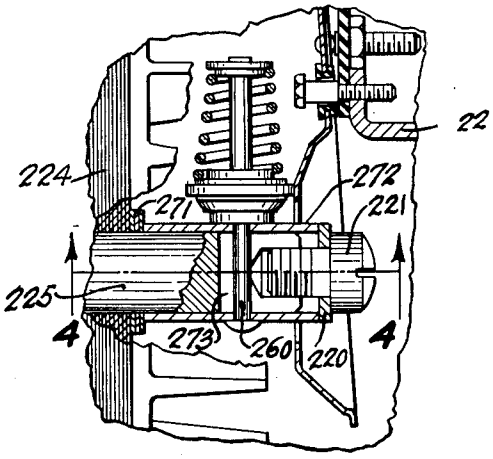

Fig. 3.

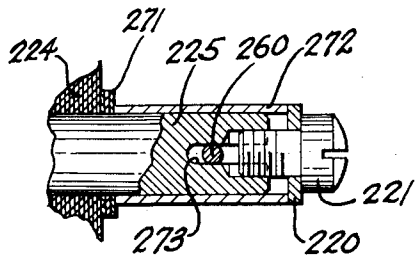

Fig. 4.

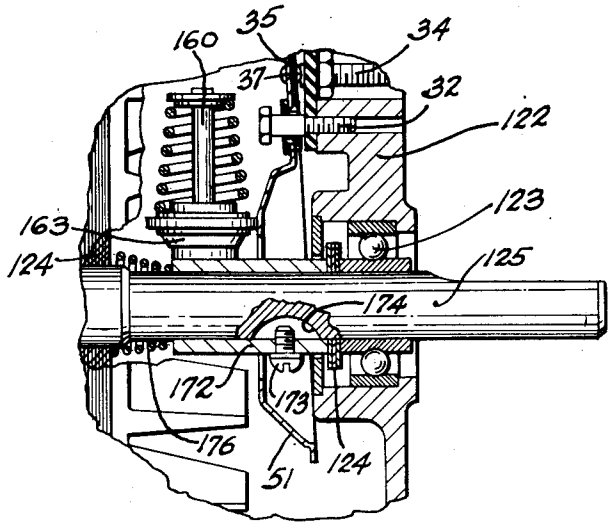

Fig. 5.

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SWITCH LOCATOR

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Application May 2, 1951, Serial No. 224,158

8 Claims. (Cl. 200—80)

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This invention relates to improvements in centrifugally actuated switches and particularly of the type used in electric motors.

The centrifugal switch to which this invention is applied is disclosed in the U. S. Patent 2,182,977 issued to Calvin J. Werner, December 12, 1939, which shows the centrifugal switch controlling member carried by a rod rigidly secured to the shaft of the rotor of the motor, the switch itself being supported by the end frame of the motor. Such construction necessitates precise relative location between the rotor axially and the end frame, for if the centrifugal switch controlling member and the switch are not properly spaced, proper operation of the switch will not be obtained.

The present invention has for one of its objects the provision of an axially adjustable connection between the driving shaft and the centrifugal member which permits varying axial positions of the drive shaft relatively to the centrifugal member without disturbing the proper position of said centrifugal member relatively to the control device it is intended to operate.

A further object of the present invention is to hold the element supporting the centrifugal member in spaced position relatively to the control device it is adapted to operate by the provision of locating elements and then provide a driving connection between the shaft and the element supporting the centrifugal member which secures them together rotatably but permits relative longitudinal movements therebetween to compensate for variable positions of the shaft endwise.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a part sectional view of an electric motor equipped with the present invention.

Fig. 2 is a fragmentary sectional view taken along the line and in the direction of the arrows 2—2 in Fig. 1.

Fig. 3 is a fragmentary, sectional view showing a modified form of the invention.

Fig. 4 is a detail sectional view taken along the line and in the direction of the arrows 4—4 in Fig. 3 and

Fig. 5 is another fragmentary, sectional view illustrating another modified construction embodying the invention.

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Referring to the drawings and particularly Fig. 1 thereof the invention as shown is applied to an electric motor having a cylindrically shaped housing 20 provided with an end cover 21 at one end and 22 at the other, both of which are rigidly attached to the frame 20 in any suitable manner. Within the housing 20 the stator 23 is secured generally by a press fit within the cylindrical housing. A rotor 24 is positioned within the stator 23, said rotor being supported by a shaft 25 journaled in any suitable supporting member carried by the end cover 21.

The end cover 22 provides a platform upon which the switch mechanism for control of the motor is rigidly mounted. This switch mechanism consists of an insulating plate 30 secured to the platform of the end cover 22 by studs 31 and 32, this insulating plate carrying the stationary switch terminals 33 and 34. Studs 31 and 32 not only secure the insulating plate 30 to the platform of the end cover 22, but they also provide means loosely supporting the movable contact carrying member 35 of the switch. The numeral 33 in Fig. 1 designates one of a pair of stationary terminals secured in alignment on the plate 30. Likewise, the numeral 34 designates one of a pair of stationary terminals secured in alignment on the insulating plate 30. Movable member 35 of the switch carries two contacts 36 which are adapted to cooperate with and engage terminals 33 when the movable member of the switch is in one position, contacts 37 on said movable member being arranged thereon to cooperate and engage the stationary terminals 34 of the switch when said movable member is in the other of its operative positions. Terminals 33 are electrically connected with the running winding of the motor and terminals 34 are connected with the starting winding of the motor, all electrical connections being of the usual type so that when the switch is in the position as shown in Fig. 1, both starting and running windings of the electric motor will be operative to start the motor, the switch being operated by the centrifugal member when the speed of the motor reaches a predetermined value to disconnect the starting winding of the motor and render only the running winding thereof operative.

Movable member 35 of the switch has two insulating collars 40 and 41 attached thereto, the insulating collar 40 fitting loosely over the body portion of the stud 31 while the insulating collar 41 fits loosely over the body portion of the stationary terminal 32, whereby said movable switch

member is loosely supported by these terminal posts or studs 31 and 32. Stud 31 has a head 45 providing an abutment for the spring 46, the other end of the spring engaging the insulating collar 40 secured to the movable member of the switch 35. Stud 32 also has an enlarged head portion which acts as a stop against which the insulating collar 41 on the movable member of the switch may abut. Spring 46 exerts a yieldable force against the one end of the movable member 35 of the switch urging it away from the head portion 45 of stud 31 and toward the insulating plate 30. This spring effort thus urges the movable member 35 of the switch, with contact 37 on terminal 34 first acting as a pivot, clockwise as regards Fig. 1, and later the contact 36 on said movable member engaging terminal 33 acts as the pivot about which this clockwise movement of the movable contact member 35 under the effect of spring 46 continues. Under these circumstances contact 37 would be out of electrical engagement with its terminal 34 to open the starting circuit.

The movable member 35 of the switch has a dish shaped end portion 50 representing a frustoconical, tapered surface 51, the dish-shaped end being centrally apertured as at 52 to permit the shaft 25 of the motor to extend therethrough.

As previously stated, movable contact carrying member 35 of the switch is actuated and controlled by a centrifugal member driven by the shaft 25. This centrifugal member consists of a central pin or standard 60, one end of which is drivingly connected with the shaft 25, the other end having an enlarged head portion 61 providing an abutment for one end of the spring 62, the opposite end of the spring engaging a weight member 63 slidable on the pin or standard 60. The weight member 63 has a disclike element 64 of any suitable fabric, such as felt or the like, larger in diameter than any adjacent portion of the weight member 63 and engageable with the outer surface of the dish-shaped portion 50 of the movable contact member 35 of the switch. When the centrifugal member is inactive and the spring 62 maintains the weight member in normal position adjacent the driving shaft 25 the felt portion 64 of the weight member 63 engages the dished portion 50 of the switch member 35 to hold it in the position as shown in Fig. 1 in which the contact 37 engages terminal 34 and acts as the initial pivot for movement of the switch member 35, contact 36 being held out of engagement with its cooperating stationary terminal 33 and the spring 46 compressed. Thus in this inactive position the starting and running windings of the motor are interconnected so that when electrical energy is connected therewith these windings will become active to start the electric motor.

It has been stated previously that the switch illustrated in the present invention is the one disclosed in the United States Patent 2,182,977, issued to Calvin J. Werner on December 12, 1939. In this patented switch the pin or standard supporting the centrifugal weights is secured to the driving shaft by extending through a hole in said shaft. In the patented construction the center of the weights supporting pin or standard is not shiftable longitudinally of the shaft but on the contrary is fixed lengthwise of the shaft. This type of construction is disadvantageous, especially where the electric motor is commercially produced in large numbers. By securing the weight supporting pin on the shaft in the manner as shown in the Werner patent the shaft 25 of the motor must be exactly located longitudinally in the motor so that the required spacing between the axis of the standard or pin 60 is predeterminedly spaced relatively to the switch carried on the end cover 22. If, under high commercial production, the stator 23 and consequently rotor 24 and shaft 25 were pressed into the motor housing 20 too far the predetermined spacing between the pin or standard 60 relative to the switch would not obtain, this pin 60 being too close to the switch in this instance, thus causing the felt portion 64 of the weight member 63 to pinch the movable contact member 35 of the switch and therefore seriously affect its operation as well as increasing the wear between the felt washer or disc 64 and the dish portion 50 of the switch upon which said felt washer 64 rides continually in a circular path during the operation of the motor. If on the other hand the shaft 25 of the motor were not positioned inwardly of the frame sufficiently then too great a spacing between the pin or standard 60 and the switch would obtain thereby materially affecting the operation of the switch by the centrifugal member. Thus, it may be seen that to maintain the highest efficiency of switch operation and to reduce wear to a minimum the predetermined spacing between the centrifugal weight supporting pin or standard 60 and the switch itself must be maintained, a difficult and expensive requirement, particularly where electric motors are produced in great numbers commercially.

The present invention provides means for drivingly attaching the centrifugal element to the shaft while maintaining the predetermined spacing between the pin or standard 60 and the switch regardless of the variations in the position of the stator 23, rotor 24 and its shaft 25 in the motor housing. In Fig. 1, the end cover 22 has a central cup shaped member 70 rigidly secured thereto coaxial of the housing and substantially of the shaft 25 of the motor. The inner end of this cup is recessed to receive a spacing element or washer 71, the exposed end surface of said washer 71 being predeterminedly spaced relatively to the switch and its component parts, particularly the movable contact member 35 and its associated stationary contact terminals 32 and 33. This spacing collar 71 provides an abutment for the end of a sleeve member 72 slidably fitting upon the shaft 25. Fig. 2 shows the inner end of the shaft 25, which extends into the sleeve 72, as being bifurcated providing a slot 73 extending lengthwise of the shaft. The weight supporting pin or standard 60 extends through aligned openings in the sleeve 72 and through the elongated slot 73 in the shaft, thus operatively connecting the centrifugal element with the shaft 25 so that it must rotate with said shaft but, due to the elongated slot 73, relative lengthwise movement between the shaft and its surrounding sleeve 72, may obtain. A spring 76 is interposed between the end of the shaft 25 and an abutment formed within the sleeve 72, this spring substantially urging the sleeve 72 to engage and ride upon the spacing collar 71. The holes in the sleeve 72 through which the weight supporting pin or standard 60 extends are definitely located relatively to the end of the sleeve 72 engageable with the spacing collar 71. Thus, the axis of the pin or standard 60 is predeterminedly spaced and held in said predetermined space by the spacing collar 71. Therefore, if the motor parts 23, 24 and 25 are moved into the housing 20 beyond the proper location therein the shaft 25 merely slides within sleeve 72 and in no way effects the predetermined spacing between the centrifugal weight

supporting post or standard 60 and the switch. If, on the contrary, parts 23, 24 and 25 are not pushed into the housing 20 a sufficient distance then shaft 25 will not extend into the sleeve 72 the same amount. However, said sleeve 72 will still be maintained against the spacing collar 71 by the spring 76 and thus the predetermined spacing between the switch and the post or standard 60 of the centrifugal element is maintained. If at any time it is necessary to vary this predetermined spacing, the spacing washer 71 may be replaced with a thicker or a thinner one, dependent upon the necessary or desired spacing between the centrifugal element and the switch.

Fig. 5 is a modified construction slightly different from the one illustrated in Fig. 1. In the construction in Fig. 5 the end cover plate 122 of the motor has a ball bearing 123 in which the shaft 125 is rotatably journaled. The sleeve 172 is secured to shaft 125 by a screw 172 threaded in the sleeve and extending into a keyway 174 in the shaft 125, whereby said sleeve is secured to the shaft so that it must rotate therewith but may move longitudinally thereon. The weight member 153 of the centrifugal element is slidably carried on the pin or standard 160 which is rigidly secured to sleeve 172 in any suitable manner and extends radially therefrom. In assembling this construction, proper shim washers 124 are placed about the shaft 125, said shim washers engage the inner race of the ball bearing 123 and being in turn engaged by the one end of the sleeve 172. The proper thickness of shims 124 will therefore predeterminedly space the axis of the post or standard 160 of the centrifugal device relatively to the switch and its elements 35 and 30. A spring 176 is interposed between the sleeve 172 and the rotor body 124 on shaft 125, this spring constantly urging the sleeve 172 into engagement with the spacing shim washers 124 so as to maintain the proper spacing between the centrifugal element and the switch. Thus, the position of the shaft and its rotor may vary axially without effecting the predetermined spacing between the centrifugal element and the switch. If this spacing is to be altered different shim washers 124 are applied so as to provide the proper spacing.

In Fig. 4 a further modification of the construction is illustrated. Here the sleeve 272, slidable on shaft 225, has the pin or standard 260 extending through aligned holes therein and through the slotted end 273 of the shaft 225. This pin is secured to sleeve 272 a predetermined distance from its end engageable with spacing shim washers 271 fitted about the shaft 225 and engaging the rotor body 224 secured to the shaft 225. The sleeve 272 is held against these spacing shim washers 271 by an end thrust washer 220 engaged by a screw 221 threaded into the end of the shaft 225. Thus the proper selection of spacing shim washers 271 will maintain the centrifugal element in desired spaced relation with the switch supported on the end housing 222.

From the aforegoing it may be seen that the present invention provides an improvement for centrifugally actuated switches, particularly of the type shown in the Werner patent supra, this improvement being of a simple nature and eliminating the expensive and time requiring necessity of absolute location of the rotating parts of the motor relatively to the electric switch on the motor adapted to be actuated by the mechanism carried and rotated by said rotating portions of the motor. Variations, if necessary, may easily be provided for by the mere changing of the spacing washers, certain ones being standard for certain required spacing between centrifugal elements and the switch and others being necessary for variations in other spacings.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a device of the character described, a stationary housing; a rotatable shaft; a control device attached to the housing said control device having a shiftable member; of centrifugal means driven by said shaft and engaging said shiftable member, said means being operative in response to centrifugal force to actuate said shiftable member; a sleeve slidably carried by the shaft; means fixedly attaching the centrifugal actuating means to the sleeve and connecting the sleeve to the shaft for causing the sleeve to rotate with the shaft and be slidable longitudinally relatively thereto; an immovable locating spacer presenting a surface predeterminately located relatively to the control device, said surface being engaged by one end of the sleeve; and means engaging the other end of the sleeve for holding it against the spacer.

2. A locating device for a centrifugal switch actuated by a rotating shaft, said switch comprising stationary contacts supported upon a stationary frame, cooperating movable contacts carried by a spring loaded actuator, and a spring loaded weight slidable on a rod driven by said shaft said weight engaging the actuator to control it; a spacer bearing carried by said stationary frame in predetermined relation to said stationary contacts thereon; a sleeve slidably mounted upon said shaft and having the rod extending diametrically through it and through a slot in said shaft, rotatably securing said sleeve to said shaft; and a spring interposed between said shaft and sleeve and urging the latter against the spacer bearing for predeterminately locating the rod relatively to the stationary contacts.

3. A locating device for a centrifugal switch in which a spring loaded centrifugal member is driven by a rotating shaft and engages a spring loaded contact carrier for controlling its operation in accordance with the rotating speed of said shaft; a stationary frame supporting terminal contacts of the switch; a predeterminately sized spacing member on said frame; and a sleeve slidable on said shaft and operatively connected to said shaft to rotate therewith, said sleeve having said centrifugal member attached thereto and being yieldably urged against said spacing member for predeterminately locating said centrifugal member relatively to the contact carrier regardless of the longitudinal location of said driving shaft.

4. In a device for predeterminately locating a centrifugal switch actuator carried and driven by a rotating shaft, relatively to the actuated member of the switch which is carried by a stationary housing in which the shaft is journalled, the combination with a sleeve on said shaft secured thereto so as to be rotated therewith and capable of longitudinal movement relatively thereto; said sleeve having said centrifugal switch actuator, fixed thereto so as to rotate therewith and be spaced predeterminately from said one end of the sleeve; spacer means on the housing, providing an abutment surface predeterminately located relatively to said actuated member of the switch; and a spring engaging

said sleeve and urging its said one end into engagement with said spacer means.

5. In a device of the character described, the combination with a stationary housing in which a rotatable shaft is journalled, of a control device secured within said housing said device having a shiftable member spring actuated into its one position; a spring loaded centrifugal actuator driven by said shaft and engaging said shiftable member for controlling its operation; a sleeve slidably fitting upon said shaft; a pin secured to said sleeve and extending through a longitudinal slot in said shaft for securing said sleeve to said shaft to permit relative longitudinal movement therebetween and cause said sleeve to rotate with said shaft, said pin supporting said centrifugal actuator; and means for securing said sleeve upon said shaft so that said centrifugal actuator is predeterminately located relatively to said shiftable member.

6. In combination with a housing having a cover and a rotatable member journalled therein, of a switch secured to the cover and having a movable contact arm; a spring loaded centrifugal element engaging said movable contact arm for actuating it, said element being driven by said rotatable member; a sleeve slidably carried by said rotatable member and yieldably urged to engage said cover; and means secured to said sleeve at a predetermined distance from its portion engaging said cover, said means connecting said sleeve with said rotatable member to permit sliding movement thereof relatively to said sleeve but causing said sleeve to be rotated with said member, said means supporting said centrifugal element.

7. In combination with a housing having a cover and a rotatable member journalled therein, of a switch secured to the cover and having a movable contact arm; a spring loaded centrifugal element engaging said movable contact arm for actuating it, said element being driven by said rotatable member; supporting means for said centrifugal element, adapted to be placed on said rotatable member so as to be driven thereby yet to be slidable longitudinally thereof; and means operative predeterminately to locate said supporting means on said rotatable member and secure it thereto whereby said centrifugal member is predeterminately located relatively to said movable contact arm of the switch.

8. In combination with a housing having an attachable cover and a shaft rotating in said housing, of a switch consisting of stationary contacts insulatingly attached to said cover and cooperating, shiftable contacts attached to a lever movably carried by said cover; a spacer disc in the cover, said disc having an exposed surface predeterminately located relatively to said switch lever; a spacing member telescopically engaging said shaft; resilient means interposed between said shaft and spacing member, said means constantly maintaining said spacing member against said spacer disc; and a centrifugal device operative to actuate the switch lever, said device having a rigid, supporting pin radially anchored to the spacing member in predetermined relation to the end of said member engaging the spacer disc and extending through an elongated slot in said shaft so said spacing member is rotated thereby and is slidable longitudinally thereof.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,048,494	Diehl	July 21, 1936