

Feb. 16, 1954

E. M. SCHEID ET AL

2,669,619

CENTRIFUGAL SWITCH

Filed May 12, 1950

FIG. 1.

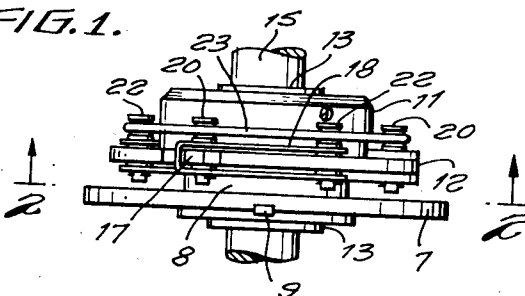


FIG. 2.

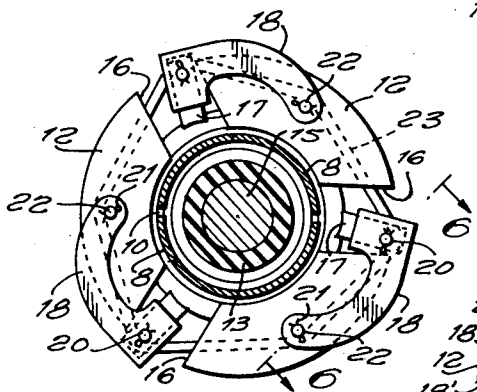


FIG. 5.

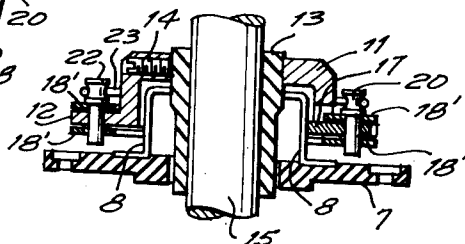


FIG. 3.

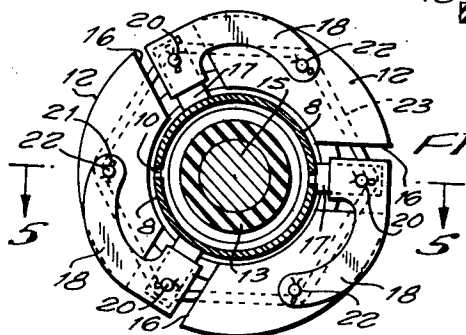


FIG. 6.

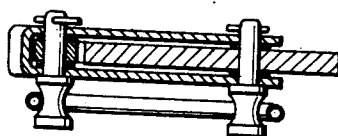
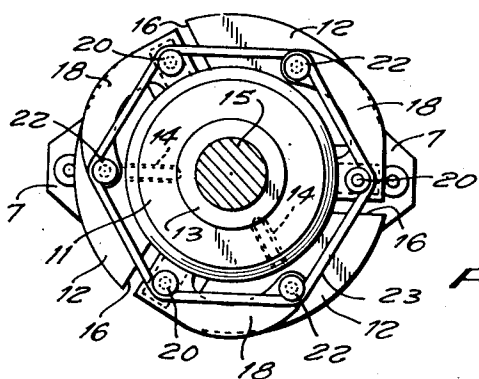


FIG. 4.



INVENTORS:  
ERICH MITTELSTEN SCHEID  
AND PAUL PREIS  
BY  
*[Signature]*

## UNITED STATES PATENT OFFICE

2,669,619

## CENTRIFUGAL SWITCH

Erich Mittelsten Scheid, Wuppertal-Barmen, and  
Paul Preis, Wuppertal-Elberfeld, Germany

Application May 12, 1950, Serial No. 161,548

Claims priority, application Germany  
May 27, 1949

16 Claims. (Cl. 200—80)

1

The auxiliary phases of electrical motors, especially small type motors, used for the formation of the starting torque, are generally switched off automatically by a centrifugal switch when a sufficient working speed has been reached. Such a centrifugal switch consists generally of a stationary part with slip ring and a rotating switch part provided with centrifugal pendulums. Owing to the reduced room available and the required small weight the constructive parts of the switch can only be of small dimensions.

The main object of the invention is to provide a centrifugal switch, which on the one hand gives in spite of its small dimensions unobjectionable contact, easy swinging-out of the pendulums and an exact guidance of the same and which is especially adapted to be made of light metal and which is on the other hand of easy and cheap construction.

According to the invention this is obtained essentially by the fact, that the centrifugal pendulums are of U-shaped section and born at a flange of the rotating part of the switch in such a way, that the two legs of the pendulum surround the flange at two sides and are guided on the same. These pendulums may be formed in an easy and simple manner of a band of sheet metal and they give in consequence of the good contact on both sides of the flange an exact guidance in the swinging-out process.

The pendulums according to the invention are especially adapted to support carbon-brushes, which, according to a further proposition of the invention are fixed in such a way, that the carbon is in touch with the two legs and the transverse web of the U-shaped pendulum and are kept in place by a pin which is stuck transversely through them. The fixing of the pendulum at the flange may equally take place by a bolt extending through the legs of the pendulum and the flange. It is recommendable to load the centrifugal pendulums by a common endless draw spring which tries to keep the carbon brushes in contact with the slip ring. The spring may be guided around the pins and bolts protruding laterally over the flange and which serve to keep in place the carbon-brushes respectively as bearing for the pendulum or it may surround in any other manner the switch levers and bring them into contact.

In the accompanying drawings a centrifugal switch according to the invention is shown in one form of execution.

Fig. 1 is a side view of the centrifugal switch;

Fig. 2 is a cross section along the line II—II of Fig. 1, with the contact arms swung out;

2

Fig. 3 is a view according to Fig. 2 in switching-in position;

Fig. 4 is a plan view of the centrifugal switch; Fig. 5 is a cross section taken along the line V—V in Fig. 3;

Fig. 6 is a partial section along the line VI—VI in Fig. 2 on a larger scale.

The stationary part or portion of the switch consists essentially of a disc of insulating material 7 on which a divided slip ring 8 is fixed, the two portions of which are provided each with a terminal 9 for the supply of current. The dividing butt-joint 10 is inclined to the axis of the switch to obtain a smooth gliding.

The slip ring 6 of the stationary switch-portion is overlapped by a metallic switch-ring 11/12. This ring has a somewhat Z-shaped section, i. e. it consists essentially of a cup-shaped part 11 and a flange 12 being a part of the same. In the bottom of the cup 11 is mounted a sleeve 13 of insulating material and fixed with two threaded pins 14. This sleeve 13 is fixed on the one hand on a shaft 15 driven by a motor and connected with it as to turn with said shaft. On the other hand said sleeve extends through the bottom of the stationary switch portion in the interior of the slip ring 8.

The flange 12 of the rotating switch-portion or part 11/12 is provided with three radial grooves or gaps 16, offset by 120°, into which engage the carbon-brushes 17 of three swinging contact-arms 18, the so-called centrifugal pendulums. These swinging arms 18 (Fig. 6) consist essentially of a long U-shaped bent band of sheet-metal, the legs 18' of which are in contact on each side of the flange 12 and are equally bent according to the curvature of said flange. The two leg portions 18 of the U have at their curved portion 18'' the carbon-brush 17 in such a way, that the carbon-brush 17 on the one hand is formed according to the curvature or angle of the bow and that on the other hand the two legs 18' of the bow and the carbon-brush 17 are pierced by a pin 20 fixed by a cotter 19 which protrudes on the upper side of the flange 12. The contact-bows or arms 18 are fixed in equal manner at the flange 12 so as to be swung by a pin 22, secured by a cotter 21, said pin piercing the bow-legs 18' and the flange 12, said bolt 22 protruding equally on the upper side of the flange 12.

An endless draw-spring 23 which tries to keep the carbon-brushes 17 of the swinging-arms 18 against the contact-segments 8 of the stationary switch-portion, is placed around the pins 20 of the fastening of the carbon-brushes as well as around the bearing-bolts 22.

3

The centrifugal switch is working in such a way, that at the start of the motor the load of the draw-spring 23 is sufficient to keep the carbon-brushes 17 in contact with the segments of the slip ring 8 and so to close the circuit of the auxiliary phase between the two terminals 9. When the speed of the motor is augmented above a predetermined value the centrifugal force exceeds the load of the spring and the pendulums 13, bearing the carbon-brushes 17 swing out, so that the carbon-brushes 17 are lifted off the segments 8 and the circuit is interrupted.

The described embodiment represents only an example and the invention is not limited to the described form but may be executed in any other manner. Especially the stationary portion 7 of the switch may be subject to numerous variations.

I claim:

1. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member pivotally connected to said rotating part and having a first position and a second position, said U-shaped member including a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part; and an element rigidly connected to said U-shaped member at a distance apart from the pivot thereof so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said element having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

2. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member pivotally connected to said rotating part and having a first position and a second position, said U-shaped member including a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion; resilient means urging said U-shaped member into said first position thereof, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part against the force exerted by said resilient means; and an element rigidly connected to said U-shaped member at a distance apart from the pivot thereof so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said element having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

3. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member consisting of sheet metal, said U-shaped member being

4

pivotally connected to said rotating part and having a first position and a second position, said U-shaped member including a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part; and an element rigidly connected to said U-shaped member at a distance apart from the pivot thereof so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said element having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

4. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member consisting of sheet metal, said U-shaped member including a curved portion and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion and connected with each other by said curved portion; a pivotal connection between the ends of said leg portions of said U-shaped member and said flange portion, said U-shaped member having a first position and a second position with respect to said flange portion, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part; and an element rigidly connected to said curved portion of said U-shaped member so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said element having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

5. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member consisting of sheet metal, said U-shaped member including a curved portion and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion and connected with each other by said curved portion; a pivotal connection between the ends of said leg portions of said U-shaped member and said flange portion, said U-shaped member having a first position and a second position with respect to said flange portion; resilient means urging said U-shaped member into said first position thereof, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part against the force exerted by said resilient means; and an element rigidly connected to said curved portion of said U-shaped member so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said element having a small weight in com-

parison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

6. A centrifugal switch, comprising in combination, a stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member consisting of sheet metal, said U-shaped member including a curved portion and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion and connected with each other by said curved portion; a pivotal connection between the ends of said leg portions of said U-shaped member and said flange portion, said U-shaped member having a first position and a second position with respect to said flange portion; resilient means urging said U-shaped member into said first position thereof, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part against the force exerted by said resilient means; and a carbon brush rigidly connected to said curved portion of said U-shaped member so as to make contact with said stationary part in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said carbon brush having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

7. A centrifugal switch, comprising in combination, a stationary part; a divided slip ring rigidly connected to said stationary part; a rotating part having a flange portion arranged substantially at right angles to the axis of rotation of said rotating part; a substantially U-shaped member consisting of sheet metal, said U-shaped member including a curved portion and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portion and connected with each other by said curved portion; a pivotal connection between the ends of said leg portions of said U-shaped member and said flange portion, said U-shaped member having a first position and a second position with respect to said flange portion; resilient means urging said U-shaped member into said first position thereof, said U-shaped member taking said second position thereof under the influence of the centrifugal force exerted on said U-shaped member by the rotation of said rotating part against the force exerted by said resilient means; and a carbon brush rigidly connected to said curved portion of said U-shaped member so as to make contact with said slip ring in said first position and to separate it therefrom in said second position of said U-shaped member, said U-shaped member and said carbon brush having a small weight in comparison to that of said rotating part and said flange portion, said leg portions of said U-shaped member being guided, respectively, on opposite sides of said flange portion.

8. A centrifugal switch, comprising in combination, a stationary part; a divided slip ring rigidly connected to said stationary part; a rotating part having a plurality of flange portions arranged at right angles to the axis of rotation of said rotating part and being separated from

one another by gaps; a plurality of substantially U-shaped members consisting of sheet metal, each of said U-shaped members including a curved portion arranged in one of the gaps separating said flange portions, and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portions and connected with each other by said curved portion; a plurality of pivotal connections between the ends of said leg portions of each of said U-shaped members and one of said flange portions, respectively, said U-shaped members having each a first position and a second position with respect to said flange portions; resilient means urging said U-shaped members into said first positions thereof, said U-shaped members taking said second positions thereof, respectively, under the influence of the centrifugal force exerted on said U-shaped members by the rotation of said rotating part against the force exerted by said resilient means; and a plurality of carbon brushes rigidly connected, respectively, to said curved portions of said U-shaped members so as to make contact with said slip ring in said first positions and to separate the same therefrom in said second positions of said U-shaped members, said U-shaped members and said carbon brushes having a small weight in comparison to that of said rotating part and said flange portions, said U-shaped members being guided by said leg portions thereof arranged, respectively, on opposite sides of said flange portions.

9. A centrifugal switch, comprising in combination, a stationary part; a divided slip ring rigidly connected to said stationary part; a rotating part having a plurality of flange portions arranged at right angles to the axis of rotation of said rotating part and being separated from one another by gaps; a plurality of substantially U-shaped members consisting of sheet metal, each of said U-shaped members including a curved portion arranged in one of the gaps separating said flange portions, and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of, and being in contact with, said flange portions, and connected with each other by said curved portion; a plurality of pivotal connections between the ends of said leg portions of each of said U-shaped members and one of said flange portions, respectively, said U-shaped members having each a first position and a second position with respect to said flange portions; resilient means urging said U-shaped members into said first positions thereof, said U-shaped members taking said second positions thereof, respectively, under the influence of the centrifugal force exerted on said U-shaped members by the rotation of said rotating part against the force exerted by said resilient means; and a plurality of carbon brushes rigidly connected, respectively, to said curved portions of said U-shaped members so as to make contact with said slip ring in said first positions and to separate the same therefrom in said second positions of said U-shaped members, said U-shaped members and said carbon brushes having a small weight in comparison to that of said rotating part and said flange portions, said U-shaped members being guided by said leg portions thereof arranged, respectively, on opposite sides of said flange portions.

10. A centrifugal switch, comprising in combination, a stationary part; a divided slip ring rigidly connected to said stationary part; a ro-

tating part having a plurality of flange portions arranged at right angles to the axis of rotation of said rotating part and being separated from one another by gaps; a plurality of substantially U-shaped members consisting of sheet metal, each of said U-shaped members including a curved portion arranged in one of the gaps separating said flange portions, and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of said flange portions and connected with each other by said curved portion; a plurality of pivots connecting, respectively, the ends of said leg portions of each of said U-shaped members and one of said flange portions; a plurality of carbon brushes secured to said curved portions of said U-shaped members, respectively; a plurality of pins connecting, respectively, said carbon brushes to said curved portions; and a tension spring arranged around said pivots and said pins so as to urge said carbon brushes into contact with said slip ring and allowing said carbon brushes to become separated therefrom under the influence of the centrifugal force exerted on said U-shaped members by the rotation of said rotating part against the force of said tension spring, said U-shaped members and said carbon brushes having a small weight in comparison to that of said rotating part and said flange portions, said U-shaped members being guided by said leg portions thereof arranged, respectively, on opposite sides of said flange portions.

11. A centrifugal switch, comprising in combination, a stationary part; a divided slip ring rigidly connected to said stationary part; a rotating part having a plurality of flange portions arranged at right angles to the axis of rotation of said rotating part and being separated from one another by gaps; a plurality of substantially U-shaped members consisting of sheet metal, each of said U-shaped members including a curved portion arranged in one of the gaps separating said flange portions, and a pair of substantially parallel leg portions arranged, respectively, on opposite sides of, and being in contact with, said flange portions and connected with each other by said curved portion; a plurality of pivots connecting, respectively, the ends of said leg portions of each of said U-shaped members and one of said flange portions; a plurality of carbon brushes secured to said curved portions of said U-shaped members, respectively; a plurality of pins connecting, respectively, said carbon brushes to said curved portions; and a tension spring arranged around said pivots and said pins so as to urge said carbon brushes into contact with said slip ring and allowing said carbon brushes to become separated therefrom under the influence of the centrifugal force exerted on said U-shaped members by the rotation of said rotating part against the force of said tension spring, said U-shaped members and said carbon brushes having a small weight in comparison to that of said rotating part and said flange portions, said U-shaped members being guided by said leg portions thereof arranged, respectively, on opposite sides of said flange portions.

12. A centrifugal switch, comprising in combination, a first switch member being stationary; a second switch member being in contact with said first switch member arranged for rotation with respect to said first switch member, said second switch member moving radially under the influence of the centrifugal force upon rotation

so as to interrupt the contact with said first member; a rotatably mounted flange; a lever pivotally connected to said flange for supporting said second member, said lever having two legs embracing the circumferential margin of said flange on both sides thereof and being guided thereby, the pivotal axis of said lever being substantially parallel to the axis of rotation of said flange; and means for yieldingly holding said second member in contact with said first member.

13. A centrifugal switch, comprising in combination, a first switch member being stationary; a second switch member being in contact with said first switch member and arranged for rotation with respect to said first switch member, said second switch member moving radially under the influence of the centrifugal force upon rotation so as to interrupt the contact with said first member; a rotatably mounted flange; a U-shaped lever pivotally connected to said flange for supporting said second member, said lever having two legs and a transverse end portion, said legs embracing the circumferential margin of said flange on both sides thereof and being guided thereby whilst said transverse end portion is adapted to receive said second member, said flange being provided with a radial gap for engagement of said transverse portion and said second member, the pivotal axis of said lever being substantially parallel to the axis of rotation of said flange; and means for yieldingly holding said second member in contact with said first member.

14. A centrifugal switch, comprising, in combination, a stationary switch member; a rotating switch member having a flange; a centrifugal pendulum electrically connected to said rotating switch member and having two oscillating legs adjoining, respectively, the sides of said flange so as to be guided by the same over almost the entire length of said legs so that the latter remain, respectively, substantially in their plane of oscillation; and a contact element arranged on said centrifugal pendulum, said contact element being in contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal force being below a predetermined limit, said contact element being out of contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal force being larger than said predetermined limit.

15. A centrifugal switch, comprising, in combination, a stationary switch member, a rotating switch member having a flange; a centrifugal pendulum electrically connected to said rotating switch member, said centrifugal pendulum consisting of a sheet metal strip having the shape of a U having a bridge and two oscillating legs adjoining, respectively, the sides of said flange so as to be guided by the same over almost the entire length of said legs so that the latter remain, respectively, substantially in their plane of oscillation; a pivot arranged at the free ends of said two legs and connecting said central pendulum with said flange; and a contact element arranged at the ends of said two legs adjoining said bridge, said contact element being in contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal force being below a predetermined limit, said contact element being out of contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal

gal force being larger than said predetermined limit.

16. A centrifugal switch, comprising, in combination, a stationary switch member, a rotating switch member having a flange; a centrifugal pendulum electrically connected to said rotating switch member, said centrifugal pendulum consisting of a sheet metal strip having the shape of a U having a bridge and two oscillating legs adjoining, respectively, the sides of said flange so as to be guided by the same over almost the entire length of said legs so that the latter remain, respectively, substantially in their plane of oscillation; a pivot arranged at the free ends of said two legs and connecting said centrifugal pendulum with said flange; a contact element enclosed by said bridge and the ends of said two legs adjoining said bridge; and a pin arranged in aligned borings of said two legs and said contact element so as to hold the same in posi-

tion, said contact element being in contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal force being below a predetermined limit, said contact element being out of contact with said stationary switch member when said centrifugal pendulum is subjected to a centrifugal force being larger than said predetermined limit.

ERICH MITTELSTEN SCHED.  
PAUL PREIS.

References Cited in the file of this patent  
UNITED STATES PATENTS

| Number    | Name        | Date          |
|-----------|-------------|---------------|
| 1,049,703 | Gray        | Jan. 7, 1913  |
| 1,535,766 | Cook        | Apr. 28, 1925 |
| 1,761,786 | Gilburg     | June 3, 1930  |
| 2,459,984 | West et al. | Jan. 25, 1949 |