

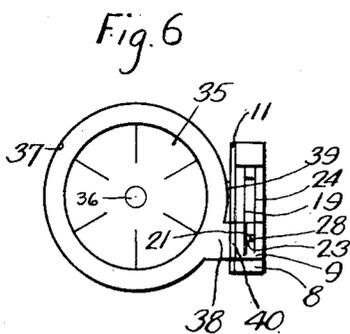
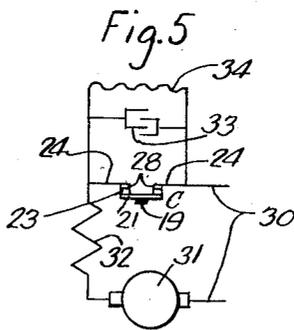
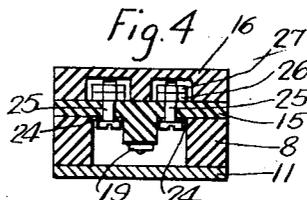
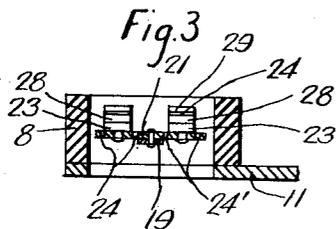
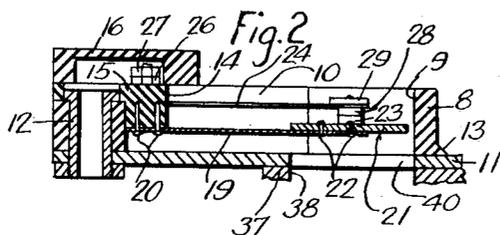
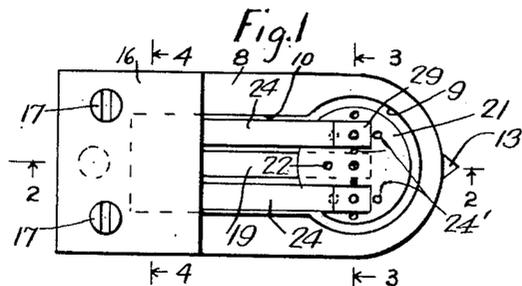
April 11, 1950

L. O. FRENCH

2,503,581

MOTOR CONTROLLER SWITCH

Filed March 28, 1947



INVENTOR.

Louis O. French

# UNITED STATES PATENT OFFICE

2,503,581

## MOTOR CONTROLLER SWITCH

Louis O. French, Milwaukee, Wis.

Application March 28, 1947, Serial No. 737,908

4 Claims. (Cl. 200—81.9)

1

The invention relates to speed regulators for electric motors and more particularly to regulators or controllers of the fluid pressure operated type.

When an electrical circuit is broken substantially simultaneously in a plurality of places, the voltage across either break will be less than where only one break is used to stop the flow of current, and as a consequence switch contacts used in making and breaking the circuit will last longer in a multiple break switch than in a single break switch. The object of the present invention is to provide a motor speed controller switch mechanism having a multiple break to reduce contact wear and in which one of the switch elements preferably the bridging contact member is operable by the cooling air generated by the motor's fan and cooperates with a pair of vibratory contacts connected to a control circuit of the motor to maintain the speed of the motor substantially constant, means also being provided for varying the effective action of the cooling air on said bridging contact to vary the speed of the motor.

A further object of the invention is to provide a fluid pressure operated motor speed controller mechanism comprising a pair of freely vibratory contact members associated with a third freely vibratory air sensitive contact member whose frequency of vibration differs from said pair of contact members so that good governing action is obtained.

A further object of the invention is to provide a fluid pressure operated motor speed controller mechanism comprising a pair of freely vibratory contact members having the same or different frequencies of vibration associated with a third freely vibratory air sensitive contact member whose frequency of vibration differs from the frequency of either of said first named contact members so that good governing action is obtained.

A further object of the invention is to provide a fluid pressure operated motor speed controller mechanism comprising a pair of vibratory contacts associated with a third vibratory contact member in which the air sensitive target for this last named contact forms the bridge for its switch contacts to simplify assembly and aid in the cooling of said contacts.

2

A further object of the invention is to provide an air sensitive target forming a contact carrying bridge which is apertured adjacent said contacts to aid in cooling the same and in dissipating arcs that may form at the contacts.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a plan view of speed controller embodying the invention;

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a detailed vertical sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a detailed vertical sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a wiring diagram;

Fig. 6 is an outline view of the controller as associated with the motor to be controlled.

Referring to the drawings, the numeral 8 designates a support or housing of insulating material having a cylindrical opening 9 from which extends a slot 10, said support adapted to be pivotally mounted on a plate 11 by a pivot bolt 12 and which plate may be provided with a suitable speed indicator scale, not shown herein, but shown in my copending application Serial No. 722,604, filed January 17, 1947, now Patent No. 2,480,566, granted August 30, 1949, cooperating with a pointer 13 on said support.

The support 8 is recessed at its back end 14 to receive a contact mounting block 15 which with a cover 16 are secured to said support by screws 17, the block and cover being of suitable insulating material.

The block 15 has a depending centrally disposed boss to which the rear end of a resilient or vibratory contact carrying member 19 is anchored by nails 20 or other suitable fastening means. The front end of the member 19 has an air sensitive target 21 secured thereto by rivets 22. While this target may be of insulating material, it preferably is formed as a metal disk forming a conductor bridge for a pair of spaced contacts 23 riveted or welded thereto. This disk also preferably has a series of small holes 24 drilled or otherwise suitably formed in it radially disposed relative to and close to each

3

of said contacts 23 to permit cooling air streams to pass through said disk. On either side of the boss the rear ends of a pair of resilient or vibratory contact carrying members 24 are secured by terminal posts 25 in the form of bolts passing through apertures in said block 15 and carrying a clamping nut 26 and a conductor binding nut 27. Each member 24 has a contact 28 riveted thereto and to a metal plate or washer 29, and each contact is so disposed as to normally engage its cooperative contact 23 on the bridge member 21, said members 24 and the member 19 being biased to a normally closed contact position and their tensions so adjusted that the bridging member will simultaneously or substantially simultaneously open the circuit between both sets of contacts under the action of air pressure upon the target 21.

Referring to Fig. 5, the numeral 30 designates current supply wires, one of which is connected to the armature 31 of the motor whose speed is to be controlled and the other of which is connected with the field 32 of said motor through a circuit closure C embodying this invention whose contacts 28 through the bridging member 21 is in series with said field. A condenser 33 and a high ohmage resistor 34 may be connected in parallel across the terminals of the closure C to reduce arcing at the contact points.

The circuit closure C is arranged for actuation by the cooling system of the motor, and one such arrangement is diagrammatically or schematically shown in Fig. 6 wherein the cooling fan 35 mounted on the motor armature shaft 36 within the motor housing 37 draws air through the inlet 38 in said housing and forces this air through the motor and through an outlet at the other end of the motor to cool the same. The plate 11 is mounted on a boss 39 formed on the motor housing at its inlet and has an opening 40 alined with said inlet 38 and the opening 9 in the support 8, which support being pivotally mounted on said plate may be swung so as to partially or wholly displace the opening 9 relative to the openings 38 and 40.

With the above arrangement when current is supplied to the line wires 30, the motor is started and the cooling fan 35 set in motion to draw cooling air through the motor and past the openings 9, 40 and 38, some of this air acting on the target 21 and overcoming the normal closing bias of the contact carrying members 19 and 24 and causing the contacts 23 and 28 to separate, thus opening the current supply circuit to the motor and reducing its speed until the reduced suction effect permits the contacts to again engage. This action is rapidly repeated with the result that the speed of the motor is maintained substantially constant for any given suction effect on the target 21. If then the support 8 is swung from its initial position in which the opening 9 alines with the opening 40 to a position in which the target only partially overlaps said opening, the suction effect will be reduced and the speed of the motor will be increased until finally when the target 21 is moved completely out of the influence of the suction effect of the fan 35, the contacts 23 and 28 will remain closed or substantially closed and the motor will run at its highest speed. The contact carrying members 19 and 24 are all free to vibrate, and the member 19 due to the target 21 has a different frequency of vibration from that of the members 24. The members 24 may each vibrate at the same frequency or may have different frequencies of vibration

4

which coincide at different intervals, and as a result the motor circuit will be opened and closed both by the vibrating action of the member 19 and the members 24, so that for any given setting of the support 9 the speed of the motor will be maintained substantially constant, it being noted that the action of the fan produces a pulsating or vibratory effect on the air drawn into the motor, that the motor itself may set up vibrations in the contacts and possibly arcing effects between the contacts and the vibrations of one set of contacts will act to vibrate the other contacts. As in the present construction any arcing between the contacts is distributed over a relatively large contact area, and as the circuit may be simultaneously broken at a plurality of contacts instead of through one set of contacts, rapid deterioration of the contacts will be prevented. The holes 24 in target 21 in addition to permitting cooling streams of air to pass the contacts also permit said streams to dissipate arcs that may form at said contacts.

While the circuit closure C has been shown mounted at the inlet opening for the motor ventilating system, it may also, if desired, be mounted at the outlet opening in which instance the contact member 19 with its target would be mounted on a centrally recessed portion of the block 15 instead of the boss 18 and be disposed outwardly of the discharge or outlet opening of the motor housing and the members 24 mounted on spaced bosses similar to the boss 19 herein shown so the air pressure would tend to move the contacts 23 away from the contacts 28 in the same way that the suction pressure accomplishes this in the form shown and the shifting of the support 9 relative to said outlet will act in the same way to vary the speed of the motor. Instead of making the target 21 as a part of the bridging contact it could be of insulating material and arranged to act on the members 24 to tend to separate them from the bridging contact member without departing from the present invention.

The construction above described provides a simple form of speed controller connected in a control circuit for the motor to effect its change in speed through a wide speed range while maintaining its speed substantially constant at any selected speed within said range.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In a circuit control switch for controlling the speed of a fan cooled electric motor, the combination of a pair of freely vibratory resilient members having contacts at their outer free end portions, and a freely vibratory member having bridged contacts at its outer free end portion and cooperating with said first named contacts and having an air sensitive target for effecting its vibratory movement relative to said first named members under the air flow effect produced by the motor to maintain the speed of said motor substantially constant.

2. The control switch as defined in claim 1 in which the target carrying vibratory member has a frequency of vibration different from said pair of vibratory members.

3. The control switch as defined in claim 1 in which the pair of vibratory members have different frequencies of vibration.

4. The control switch as defined in claim 1 in which the pair of freely vibratory contact car-

2,503,581

5

rying members have different frequencies of vibration and the target carrying vibratory member has a frequency differing from those of said first named members.

LOUIS O. FRENCH. 5

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,494,189	Russell et al. -----	May 13, 1924

Number
2,092,955
2,239,738
2,292,567
2,312,241
2,389,880
2,425,178

10 Number  
67,967

6

Name	Date
Chamberlain -----	Sept. 14, 1934
Russell -----	Apr. 27, 1937
Jordan -----	Aug. 11, 1942
Brachenburg -----	Feb. 23, 1943
Weber -----	Nov. 27, 1945
Ellerbeck -----	Aug. 5, 1947

FOREIGN PATENTS

Country	Date
Austria -----	Aug. 1, 1914