May 27, 1947. J. L. MOODY 2,421,213

CENTRIFUGAL OPERATED SWITCH

Filed April 5, 1944 2 Sheets-Sheet 1

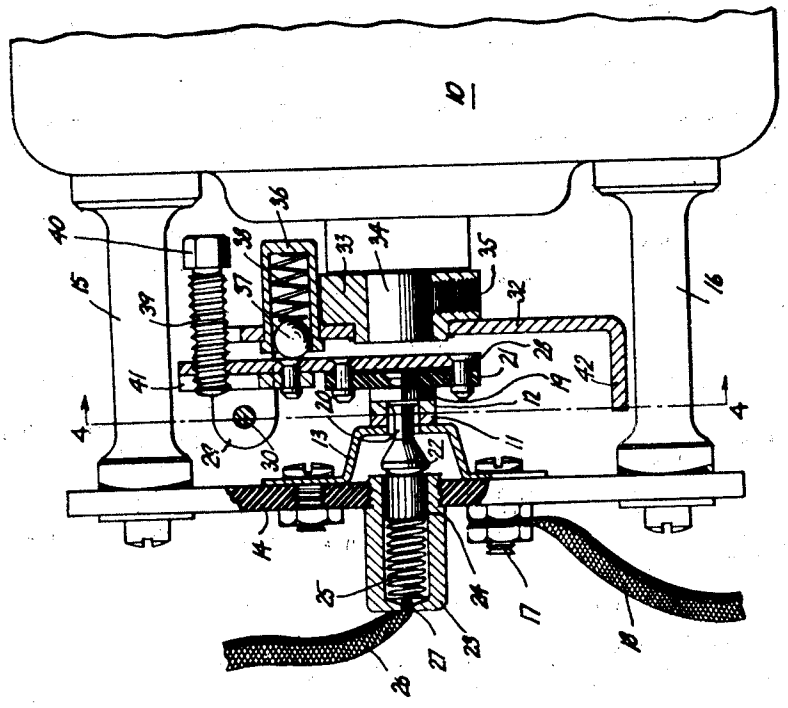

FIG_2

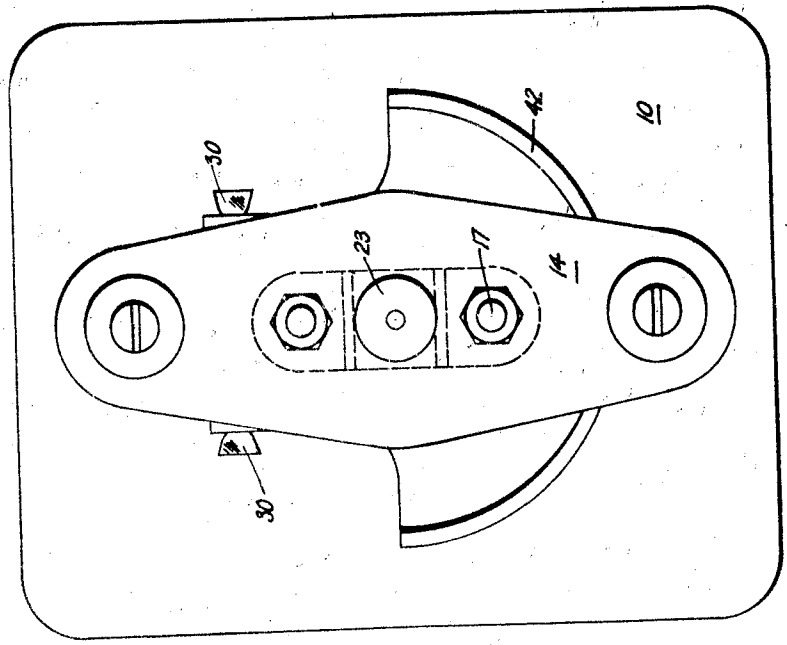

FIG_1

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Filed April 5, 1944 2 Sheets-Sheet 2

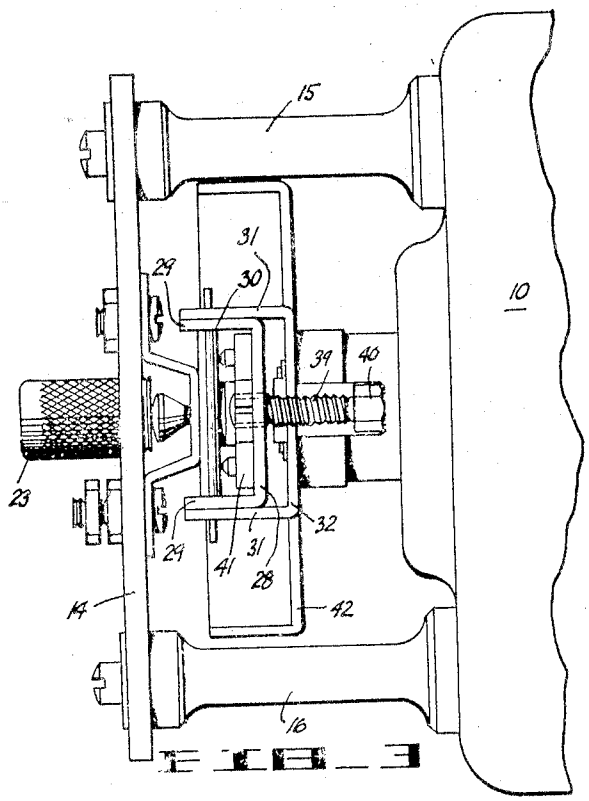

FIG_3

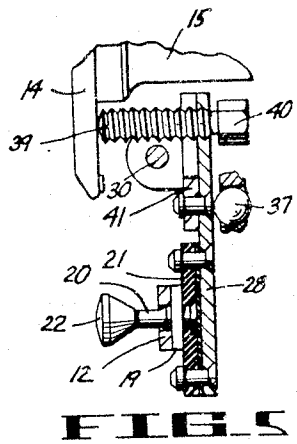

FIG_5

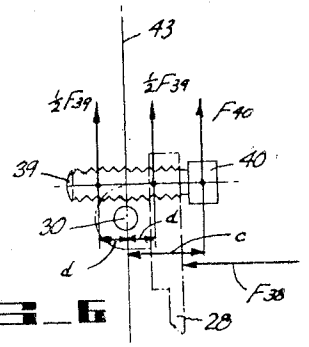

FIG_6

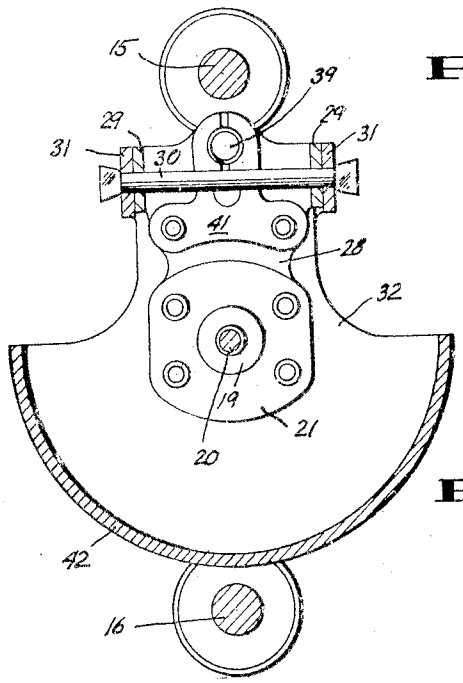

FIG_4

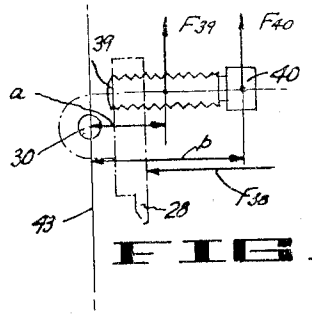

FIG_7

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UNITED STATES PATENT OFFICE

2,421,213

CENTRIFUGAL OPERATED SWITCH

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Application April 5, 1944, Serial No. 528,884

4 Claims. (Cl. 200—80)

1

This invention relates to governors for maintaining the speed of electric motors constant.

One object of this invention is to provide a governor which can be adjusted for different speeds but which employs a constant spring pressure on the part responsive to centrifugal force.

Another object of the invention is to vary the speed control of the governor by adjusting a weight to change the effective centrifugal force acting on the means which opens and closes the circuit.

Other objects will become evident after the following description.

In the drawings:

Fig. 1 is an end view of a motor having the governor installed thereon.

Fig. 2 is a side elevation with the governor parts in vertical section.

Fig. 3 is a side elevation with the governor rotated 90° from the position shown in Fig. 2.

Fig. 4 is a vertical transverse section taken on the line 4—4 in Fig. 2.

Fig. 5 is a detail view of the part responsive to centrifugal force.

Figs. 6 and 7 are diagrams to show how the effective centrifugal force is changed by adjusting a weight in the governor.

The speed of the motor 10 is maintained constant by opening and closing a pair of contacts in the form of annular discs 11, 12 (Fig. 2). The disc 11 is secured to a strap 13 which is mounted on a piece of insulating material 14 supported by posts 15, 16 from the casing of the motor. One end of the strap 13 is connected to a binding post 17 to which a wire 18 is connected.

The other contact 12 is secured to a collar 19 formed integrally with a stud 20 riveted at one end in a piece of insulating material 21 and provided with a button head 22. A cylinder 23 is threaded into an aperture in the piece of insulating material 14. A follower 24 slidable in the cylinder 23 is maintained in contact with the head 22 by a spring 25. A wire 26 has a soldered connection 27 with the cylinder 23.

The wires 18 and 26 are connected in the circuit of the motor 10 in the usual manner. When the contacts 11 and 12 are touching as shown in Fig. 2, the motor circuit is closed as follows: current may flow from the wire 18 through the binding post 17 to the strap 13 and the contact 11; from the contact 12 the current flows through the stud 20 to the follower 24 and the cylinder 23 to the wire 26.

The means for opening and closing the contacts will now be described. The piece of insulating

2

material 21 in which the stud 20 is mounted is secured by rivets to a plate 28 which has a pair of ears 29 (Figs. 3 and 4) formed thereon by means of which it is pivotally mounted on a pintle rod 30 supported in ears 31 formed on a bracket 32.

The bracket 32 (Fig. 2) is secured to a collar 33 which is mounted on the armature shaft 34 and held in place by a set screw 35 so that upon rotation of the motor shaft the bracket 32 and the plate 28 are caused to rotate in unison therewith.

The bracket 32 has a cup 36 mounted therein which contains a spring pressed ball 37. The spring 38 presses the ball 37 against the plate 28 tending to move the contact 12 into engagement with the fixed contact 11. The spring 38 is not adjustable in accordance with this invention but exerts a constant pressure against the ball 37.

The adjustable weight is provided by means of a screw 39 having a head 40 which is threaded into the plate 28 and also into a slotted plate 41 which is riveted to the plate 28. The purpose of the plate 41 is to provide friction on the threads to hold the screw 39 in any adjusted position. Turning the screw 39 will move it bodily with respect to the plate 28 and along a line substantially perpendicular to a plane passing radially through the axis of the pivot 30 and at a point radially offset from the axis of the pivot 30, thereby changing the effective centrifugal force as will now be explained more in detail. The bracket 32 has a counter balance portion 42 formed thereon.

A low speed adjustment of the screw 39 is shown in Figs. 2, 3 and 7 while a high speed adjustment is shown in Figs. 5 and 6. Referring to Fig. 7, the forces acting on the movable part 28 with reference to its pivot 30 comprise a force F_{39} acting through the center of gravity of the body 39 of the screw at a lever arm a and a force F_{40} acting through the center of gravity of the head 40 of the screw at a lever arm b. These forces tend to cause counterclockwise rotation which is opposed by the force of the spring F_{38} tending to cause clockwise rotation. It is to be noted in this adjustment that all of the screw is on one side of a plane 43 containing the pivotal axis 30 and the direction of centrifugal force.

The high speed adjustment shown in Figs. 5 and 6 results in a reduction in the effective centrifugal force for a given speed as compared to the adjustment shown in Fig. 7 as will now be explained. The force F_{40} still acts on the head 40 of the screw but at a shorter lever arm c so that

the moment is reduced. The body 39 of the screw, to facilitate this explanation, is shown as divided by the plane 43 so that the force F_{39} is represented as two arrows $\frac{1}{2}F_{39}$ as acting at lever arms d but on opposite sides of the plane 43 so that the resultant moment is "0." Thus the only centrifugal force moment is $F_{40} \times c$ which is opposed by the constant spring force F_{38}. It will be evident that the moment $F_{40} \times c$ is less than the moment $(F_{39} \times a) + (F_{40} \times b)$.

Although it is believed that the mode of operation of the governor will be apparent from the foregoing description taken in connection with the accompanying drawings, a brief description of the operation may be of some help. When the parts are adjusted, for example as shown in Figure 7, and are at rest, no centrifugal force will be acting and the spring 38 will press the ball 37 against the plate 28 with sufficient force to urge the contact 12 into engagement with the contact 11. When the motor circuit is completed by closing of a control switch (not shown) the motor will begin to run, causing the bracket 32 and the parts it carries to rotate. When a predetermined speed is attained the centrifugal force exerted by the weight 39—40 will cause the plate 28 to swing counterclockwise against the urge of the spring 38 so as to move the contact 12 out of engagement with the contact 11, thus opening the motor circuit and permitting the motor to slow down. The slowing down of the motor will diminish the centrifugal force exerted by the weight 39—40, again enabling the spring 38 to move the plate 28 clockwise and so close the contacts 11 and 12, again completing the motor circuit. The repeated making and breaking of the circuit by closing and opening of the contacts 11 and 12 maintains the actual operating speed substantially constant.

I claim:

1. A governor for an electric motor comprising contacts in the motor circuit, said contacts being relatively movable to open and close the motor circuit, means movable in response to centrifugal force for causing relative movement of said contacts, a member rotated by the motor, means for pivoting said movable means on said member, a weight mounted on said movable means and adjustable as a unit with respect to the pivotal axis of said movable means to position selected parts of the unitary weight respectively on opposite sides of said pivotal axis, centrifugal force acting on one part of said weight in one direction around said pivotal axis and centrifugal force acting on another part of said weight in the opposite direction around said pivotal axis.

2. A governor for an electric motor comprising contacts in the motor circuit, said contacts being relatively movable to open and close the motor circuit, means movable in response to centrifugal force for causing relative movement of said contacts, a member rotated by the motor, means for pivoting said movable means on said member, a weight mounted on said movable means and adjustable as a unit with respect to a plane containing the pivotal axis of said movable means and the direction of centrifugal force to selectively position all of said weight on one side of said plane or parts of said weight on opposite sides of said plane.

3. A governor for an electric motor comprising contacts in the motor circuit, said contacts being relatively movable to open and close the motor circuit, means movable in response to centrifugal force for causing relative movement of said contacts, a member rotated by the motor, means for pivoting said movable means on said member, a screw adjustable as a unit in said movable means, the axis of said screw being disposed at a distance from said pivotal axis and intersecting a plane containing said pivotal axis and the direction of centrifugal force, said screw being adjustable as a unit to selectively position the entire screw on one side of said plane or to position parts of said screw on opposite sides of said plane.

4. An electric motor governor comprising a bracket rotatable by the motor, a plate, pintle means offset radially from the axis of rotation of said bracket pivotally mounting said plate on said bracket to normally lie in a plane substantially perpendicular to said axis of rotation of said bracket, a fixed contact, a relatively movable contact carried by said plate and being engageable with and disengageable from said fixed contact by pivotal movement of said plate, a cup on said bracket offset radially from said axis of rotation, a spring pressed ball in said cup bearing against said plate for urging it to effect engagement of said contacts, and a screw threaded into said plate to be adjustable along a line substantially perpendicular to a plane passing radially through the axis of said pintle means and at a point radially offset from said pintle means axis whereby said screw can be adjusted as a unit to position it entirely on one side of said pintle means axis or to position selected parts of the screw on opposite sides of said pintle means axis.

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