

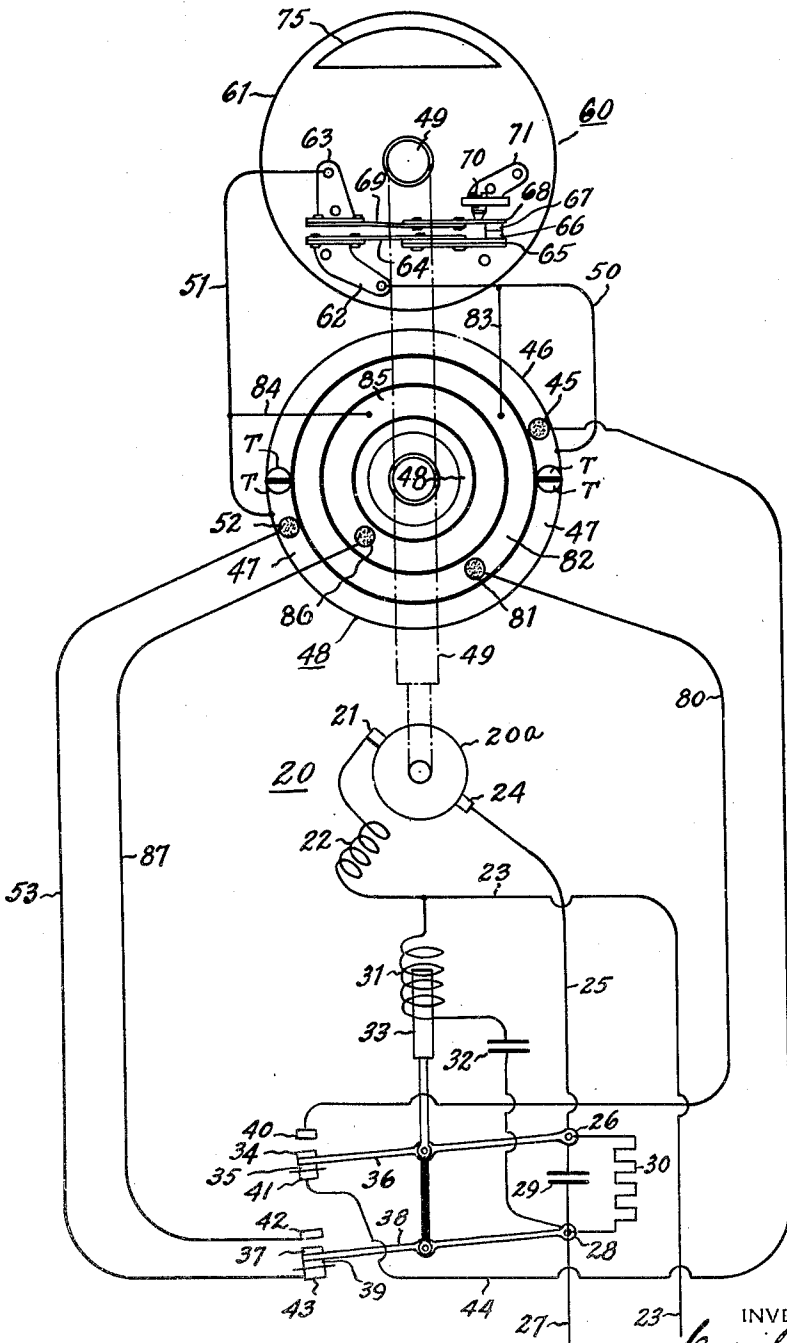
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MOTOR CONTROL SYSTEM

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MOTOR CONTROL SYSTEM

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1 Claim. (Cl. 171-222)

This invention relates to a governor for a universal motor which will operate either on direct or alternating current.

The type of universal motor speed control system to which the present invention relates is the type shown in the copending application of Stanley H. Swarthout S. N. 215,426 filed June 23, 1938, now Patent No. 2,157,640, issued May 9, 1939. The Swarthout application discloses a system which includes two speed responsive circuit breakers one of which is used when the motor operates on direct current and the other of which is used when the motor operates on alternating current. It is the aim and object of my invention to provide a system of control in which one speed responsive circuit breaker is used to control the speed of the motor when operating either on direct or on alternating current, and in which the circuits are controlled by a single relay.

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

In the drawing:

The figure of the drawing is a wiring diagram showing a motor control system embodying my invention.

In the drawing, 20 designates a commutator type series wound motor which operates either on direct or alternating current. The motor brush 21 is connected with the field 22 which is connected with line wire 23. The other brush 24 is connected by wire 25 with a contact arm pivot 26. The other line wire 27 is connected with a contact arm pivot 28. Pivots 26 and 28 are connected by means of a condenser 29 and also by a noninductive resistance 30. A relay magnet coil 31 which is energized only by alternating current is connected across line wires 23 and 27 through a condenser 32. Winding 31 surrounds a solenoid armature 33 which is connected with contact arms 36 and 38 pivoted respectively upon the pivots 26 and 28 and electrically connected therewith. Arms 36 and 38 are insulated from each other. Arm 36 carries a contact 34 engageable with a contact 40 but normally out of engagement therewith. Arm 36 carries a contact 35 which normally engages a stationary contact 41. Arm 38 carries a contact 37 engageable with a contact 42 but normally out of engagement therewith. Arm 38 carries a contact 39 normally engageable with a contact 43.

For direct current operation the relay switch is in the position shown in the drawing. The circuit

through the motor includes the line wire 23, field 22, brush 21, armature 20a, brush 24, wire 25, pivot 26, arm 36, contact 35, contact 41, wire 44, brush 45, engageable with either of two arcuate segments 46 and 47 insulatively supported by disc 48 driven by the motor armature shaft 49. The segment 46 is connected by wire 50 with one terminal 62 of a speed responsive switch 60 to be described later. The other terminal 63 of switch 60 is connected by wire 51 with the other segment 47. At the time segment 46 is engaged by the brush 45 segment 47 is engaged by brush 52 connected by wire 53 with relay contact 43 which at that time is connected with line wire 27 through relay contact 39, arm 38, and pivot 28. Thus by means of the commutating segments 46 and 47 and the cooperating brushes 45 and 52, the motor circuit is completed through the centrifugal switch 60 for direct current operation.

The centrifugal switch 60 comprises a disc 61 driven by the motor shaft 49 and supporting the terminal bracket 62 to which the wire 50 is connected and the terminal bracket 63 to which the wire 52 is connected. Bracket 62 carries a metal leaf spring member 64 the free end of which carries a laminated weight piece 65 carrying a contact 66 normally engaging a contact 67 carried by bar 68 riveted to a leaf spring 69 attached to the bracket 63. The normal pressure of engagement between the contacts 66 and 67 is regulated by an adjusting screw 70 threaded into a bracket 71 carried by the plate 61. If the screw 70 is rotated so that it moves downwardly, as viewed in the drawing, the two contacts 67 and 66 are moved downwardly together thus increasing the tension of the spring 64. This adjustment will govern the motor for higher speed because greater centrifugal force will be required to separate the contact 66 from the contact 67. Conversely the motor can be regulated for a lower speed by threading the screw upwardly as viewed in the drawing so as to reduce the tension between the contacts by reducing the tension of the spring 64 which is biased upwardly as viewed in the drawing.

The centrifugal switch 60 controls the speed of the motor by opening its circuit. As the speed of the motor rises above a predetermined value the contacts 66 and 67 separate to decrease the speed of the motor. As the speed falls below a predetermined value the contacts close. Thus there is a fairly rapid rate of separation and closing of the contacts in order to govern the speed of the motor. There will be some arcing

at the contacts. In order to produce as flat a contact operation as possible, the polarity of the direct current passing through the contacts is reversed twice for each rotation of the shaft 49.

- 5 This reversal is effected by the cooperating of the brushes 45 and 52 with the insulated half segments 46 and 47. In order to minimize sparking as the segments leave one brush and go into contact with the other, each of the segments 46 and 47 is provided at its ends with inserts T of arc resisting metal such as tungsten.

10 The switch disc 61 is provided with a weight 75 to counterbalance the centrifugal switch.

- When the motor 20 is operated on alternating 15 current, the relay coil 31 is energized since it is connected across the line wires through the condenser 32. Therefore the solenoid 32 is raised to disconnect contacts 35 and 39 from contacts 41 and 43 and to connect contacts 34 and 37 with 20 contacts 40 and 42 respectively. The circuit of the motor 20 when operating on alternating current includes the line wire 23, the field 22, brush 21, armature 20a, brush 24, wire 25, pivot 26, contact 34, contact 40, wire 30, brush 31, collector 25 ring 82 also mounted on disc 48 and connected by wire 83 with wire 50 leading to terminal bracket 62 of centrifugal switch 60. The terminal bracket 63 is connected by wires 51 and 54 with collector ring 85 also mounted on disc 48. Ring 85 is en- 30 gaged by brush 86 connected by wire 87 with contact 42. Contact 42 is engaged by contact 37 when the motor operates on alternating current. Thus the circuit of the electric motor for alternating current operation is completed through 35 the brushes 81 and 86 and collector rings 82 and 85, respectively, which are connected through the centrifugal switch 60. When the motor operates on alternating current, it is not necessary to provide commutation for the purpose of polarity re-

versing of current across the contacts 66 and 67 of the switch 60, since the alternating current provides polarity reversing.

The function of condenser 29 and resistance is to reduce arcing at contacts of the relay actuated 5 by winding 31.

From the foregoing description of the construction and mode of operation of my system, it is apparent that I have provided for the speed governing of a universal motor by a system which includes a single centrifugal switch in combination 10 with polarity reversing of direct current and a single relay for controlling the circuits.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, 15 it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows.

What is claimed is as follows:

A system of speed control for universal motors 20 comprising, in combination, a universal motor adapted to operate either on direct or an alternating current, a centrifugal switch driven by the motor, a circuit making device driven by the motor and comprising a ring divided into two seg- 25 ments connected respectively with the terminals of the centrifugal switch and uninterrupted collector rings connected respectively with the terminals of said centrifugal switch, means including opposed brushes for normally connecting the 30 divided ring in the circuit of the supply line and motor whereby the polarity of the centrifugal switch is reversed by the motor when operating on direct current, and a single A. C. relay for disconnecting the divided ring and for connecting 35 the collector rings in the circuit of the supply line and the motor.

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