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CONTROLLER

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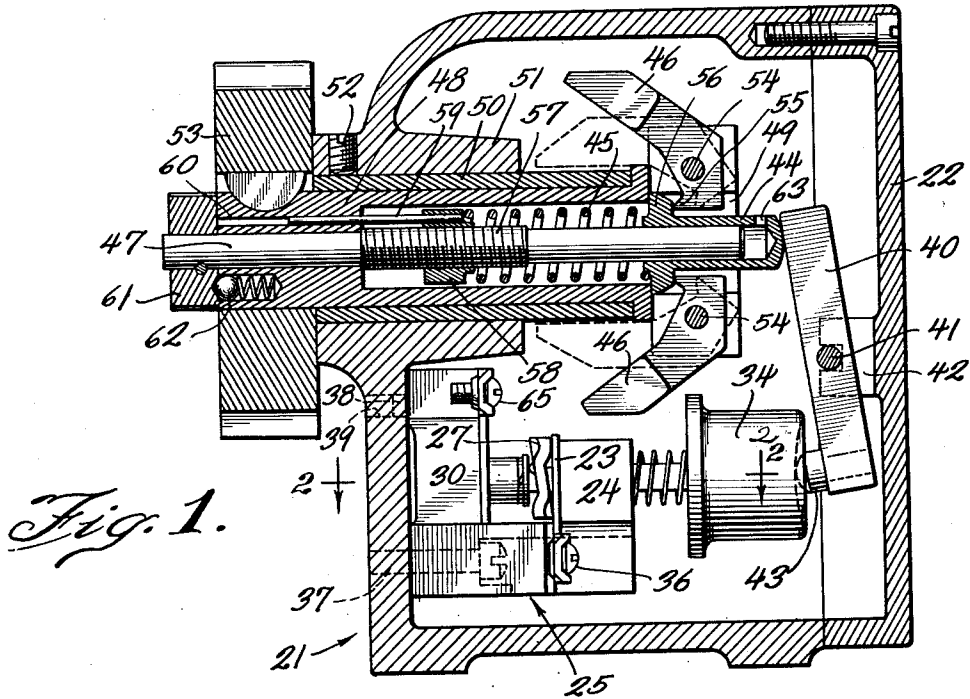
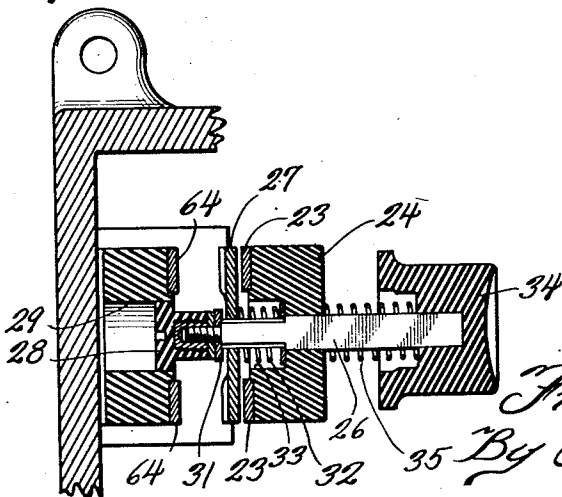


Fig. 2



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CONTROLLER

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The invention relates generally to controllers and more particularly to a circuit controller of the centrifugal type, and has as a general object the provision of a novel and improved controller responsive to cessation of rotation of a member to change the condition of a circuit.

Another object of the invention is to provide a controller of novel and improved construction having centrifugal means operating while rotating to maintain a switch closed, and operating upon the cessation of rotation to open the switch.

Yet another object of the invention is to provide a controller of the character described having a switch normally closed and a switch normally open, and centrifugal means responsive to rotation operating upon cessation of rotation to open the first and close the second mentioned switch.

Still another object is to provide a centrifugal controller having centrifugal weight members moving outwardly under the influence of centrifugal force, a spring opposing the outward movement of the members, and novel and improved means for adjusting the tension of the spring.

The stopping or braking of an electric motor by changing the connections so as to reverse the torque on the armature of the motor is commonly known as "plugging". Successful stopping of a motor by "plugging" presents the problem of interrupting all power supplied to the motor immediately when it reaches zero speed and before it starts to rotate in a reverse direction. It is a further object of the present invention to provide a novel centrifugal type controller particularly well adapted for use in a "plugging" circuit for a motor to bring it to an accurate and quick stop.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a view partly in diametrical section and partly in elevation of a controller embodying the features of the invention.

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

For purposes of disclosure the controller is here shown as adapted for use in an electrical circuit, for example, a "plugging" circuit, though it might be used in a variety of different ways and with other than electrical circuits. To that end, the controller comprises generally a switch 20, adapted to be interposed in a circuit to be controlled, normally urged to closed position, and centrifugal means operable upon a cessation of rotation to open the switch.

The means forming the switch 20 and the centrifugal means are housed in a casing 21 having a removable end cap 22 for convenient access to the interior of the casing. The switch 20 comprises two spaced conducting strips 23 mounted in vertical position on a leg 24 of a C-shaped supporting member of insulating material, generally designated 25. Extending slidably through the leg 24 and between the strips 23 is a plunger rod 26 carrying a movable contact member 27 adapted to bridge the conducting strips 23. At its inner end the rod 26 carries a piston 28 slidable in a bore 29, formed in a leg 30 of the supporting member, to guide the rod in its reciprocatory movement. The piston forms a shoulder 31 against which the member 27 is urged by a compression spring 32 encircling the rod 26 and interposed between the member 27 and the leg 24 in a recess 33 formed in the leg. At its outer end the rod 26 carries a button 34, and interposed between the button 34 and the leg 24 is a compression spring 35 materially stronger than the spring 32 and tending to urge the rod outwardly to carry the member 27 into bridging engagement with the conducting strips 23. Preferably the contact 27 has a loose fit on the rod 26 and is of irregular cross section, as best seen in Fig. 2, so as to have a wiping engagement with the conducting strips 23. The strips 23 are provided with terminals 36 for convenient attachment in the holding circuit and the support 25 is secured to the casing 21 by a single bolt 37 and a lug 38 projecting into a recess 39 in the casing to prevent rotation of the support.

Control of the switch 20 by the centrifugal means is effected through the medium of a lever 40 pivoted intermediate its ends at 41 on a lug 42 projecting inwardly from the end cap 22. At one end the lever carries a rounded stud 43 which engages the button 34 of the switch means. The other end of the lever abuts a slidable sleeve cap 44 under the joint control of a compression spring 45 and centrifugal weight members 46. The sleeve cap 44 is slidably mounted on the inner end of a rod 47 extending through a tubular shaft 48 which in turn projects outwardly of the casing 21 and at its inner end terminates in a head 49 supporting the centrifugal weight members 46. The tubular shaft 48 is journaled in a sleeve 50 extending through a hub 51 formed in the casing and secured therein by means of a set screw 52. A gear 53 is keyed to the projecting end of the shaft 48 to provide a means for rotating the shaft. In the present instance the controller is shown geared directly to the motor 5.

The weight members 46 are respectively pivoted to the head 49 at the points 54, and each is provided with a finger 55 engaging an annular flange 56 formed on the inner end of the sleeve cap 44. As pivoted, rotation of the shaft 48 tends to swing the weight members 46 radially outwardly, thereby causing the fingers 55 to move the sleeve cap 44 inwardly onto the shaft 47 against the opposition of the spring 45. The strength of the spring 45 is such that it is overcome by the weight members so long as there is any rotation of the centrifugal means, thus retaining the sleeve cap 44 in its inward position and enabling the spring 35 to retain the switch 20 closed. Upon cessation of rotation the spring 45 moves the weight members to the position shown in dotted outline in Fig. 2, and forces the sleeve cap outwardly, overcoming the spring 35 and opening the switch 20. The operation is the same regardless of the direction of rotation of the controller.

In order accurately to adjust the tension of the spring 45, the rod 47 is formed intermediate its ends with a threaded portion 57 which has threaded thereon a collar 58 against which the inner end of the spring 45 abuts. This collar is held against rotation relative to the shaft 48 but free to move axially by means of a pin 59 extending slidably into a longitudinal bore 60 formed in the shaft. The outer end of the rod 47 carries a knurled knob 61 by means of which the rod may be rotated relative to the collar 58 to advance or retract it, thereby varying the tension of the spring 45. While the centrifugal means has been described as set to open the switch at zero speed, it is to be understood that it is not limited to operate at that speed but by varying the tension of the spring 45 may be set to open the switch at 5, 10, etc. revolutions per minute of the motor. A spring pressed ball 62 is provided for engaging notches in the knob 61 to retain the same in adjusted position. A vent 63 is provided in the sleeve cap 44 to facilitate sliding movement of the cap by free ingress or egress of air.

Should it be desired to control more than one circuit by the controller, a second pair of conducting strips 64 having terminals 65 at one end may be mounted on the leg 30 of the support. These strips would be bridged by the member 27 upon inward movement of the rod 26 and could be employed to establish a circuit after the reverse holding circuit is broken.

I claim as my invention:

1. A circuit controller for an electric motor comprising in combination, a casing, switch mechanism mounted within the casing including a plunger normally urged to one switch position, a lever pivoted intermediate its ends on the casing and having one end in operative engagement with said plunger, a sleeve cap in operative engagement with the other end of said lever, a compression spring urging said sleeve cap in a direction to shift the switch, said spring being of sufficient strength to effect such shifting of the switch, a tubular shaft housing said spring and extending outwardly of the casing for driving engagement with the motor to be controlled and centrifugal weight members pivoted on the inner end of said shaft and in engagement with said sleeve cap, said weight members being operable upon rotation to oppose the action of said spring thereby maintaining said switch in one position and yielding upon cessation of rotation to permit shifting of the switch by the spring to another position.

2. In a circuit controller centrifugal means comprising a tubular shaft carrying means at its outer end for operative driving engagement with the element to be controlled, a rod extending axially of said shaft, a sleeve cap slidably mounted on the inner end of said rod, said rod having a threaded portion intermediate its ends, a collar threaded on said threaded portion, a compression spring interposed between said collar and said sleeve cap urging the latter off of said rod, centrifugal weight members engaging said sleeve cap and pivoted intermediate their ends on said shaft, said weight members being swung radially outwardly upon rotation of said shaft to force said sleeve cap onto the rod in opposition to said spring and yielding to said spring to be swung radially inwardly upon cessation of rotation, means for rotating said rod relative to said shaft, and means for holding said collar stationary relative to said shaft during rotation of the rod to adjust said collar axially to vary the tension of the spring for accurate adjustment of said centrifugal means.

3. In a circuit controller centrifugal means comprising a tubular shaft, a rod extending axially of said shaft, said rod having a threaded portion intermediate its ends, a collar threaded on said threaded portion, centrifugal weight members pivotally mounted on the inner end of said shaft operable to be swung radially outwardly upon rotation of the shaft, a spring abutting said collar at one end and opposing radial outward movement of said weight members upon rotation of the shaft, a longitudinal bore formed in said shaft, a pin rigid with said collar and projecting into said bore to hold said collar against rotation relative to said shaft, and means on the outer end of said rod for rotating the same relative to the shaft to adjust said collar axially to vary the tension of said spring.

4. In a circuit controller, centrifugal means comprising a tubular shaft, a rod extending axially of said shaft, a sleeve cap slidably mounted on the inner end of said rod, a compression spring positioned within said shaft encircling said rod and urging said sleeve cap off of said rod, and centrifugal weight members engaging said sleeve cap and pivoted on the inner end of said shaft to swing radially outwardly upon rotation of said shaft to move said sleeve cap onto said rod in opposition to said spring and yielding to said spring and swung radially inwardly upon cessation of rotation to permit movement of said sleeve cap by said spring.

5. In a circuit controller centrifugal means comprising a tubular shaft adapted to be rotated in timed relation with the element to be controlled, centrifugal weight members pivoted on the inner end of said shaft to be swung radially outwardly upon rotation of the shaft, a rod extending axially of said shaft, a collar adjustably mounted on said rod, a spring abutting said collar at one end opposing outward swinging movement of said centrifugal weight members, and means for adjusting said collar to vary the tension of said spring.

6. In a circuit controller, a tubular shaft adapted to be driven in timed relation with the element to be controlled, centrifugal weight members pivotally mounted on the inner end of said shaft and operable upon rotation of the shaft to be swung radially outwardly, spring means opposing radial outward swinging movement of said weight members, and means for adjusting the tension of said spring.

7. A circuit controller comprising, in combination,

tion, a casing having a closed end and an open end, a fixed contact housed in said casing, a movable contact cooperating with said fixed contact to form a switch, a first spring urging said movable contact into engagement with said fixed contact to close the switch, a tubular shaft extending outwardly through the closed end of said casing for driving engagement with the element to be controlled, a rod extending centrally of said shaft, a slidable sleeve cap on the inner end of said rod, centrifugal weight members pivoted on the inner end of said shaft and engaging said sleeve cap to tend to move the cap inwardly upon rotation of

the shaft, a compression spring disposed within said shaft and abutting said sleeve cap urging the same off of said rod in opposition to said weight members, said spring being stronger than said first spring, a removable cover closing the open end of said casing, and a lever pivoted intermediate its ends on said cover with one end engaging said sleeve cap and the other end engaging said movable contact enabling said compression spring to open the switch against the action of said first spring when the shaft is not rotating.

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