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ELECTRICAL CONTROL DEVICE

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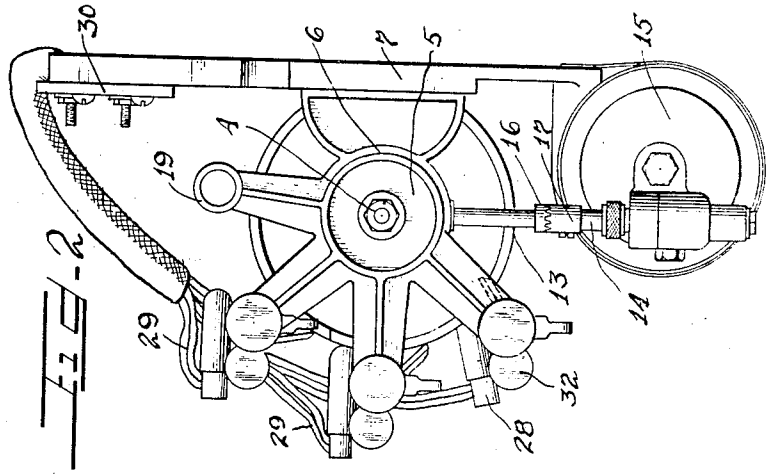


FIG. 2

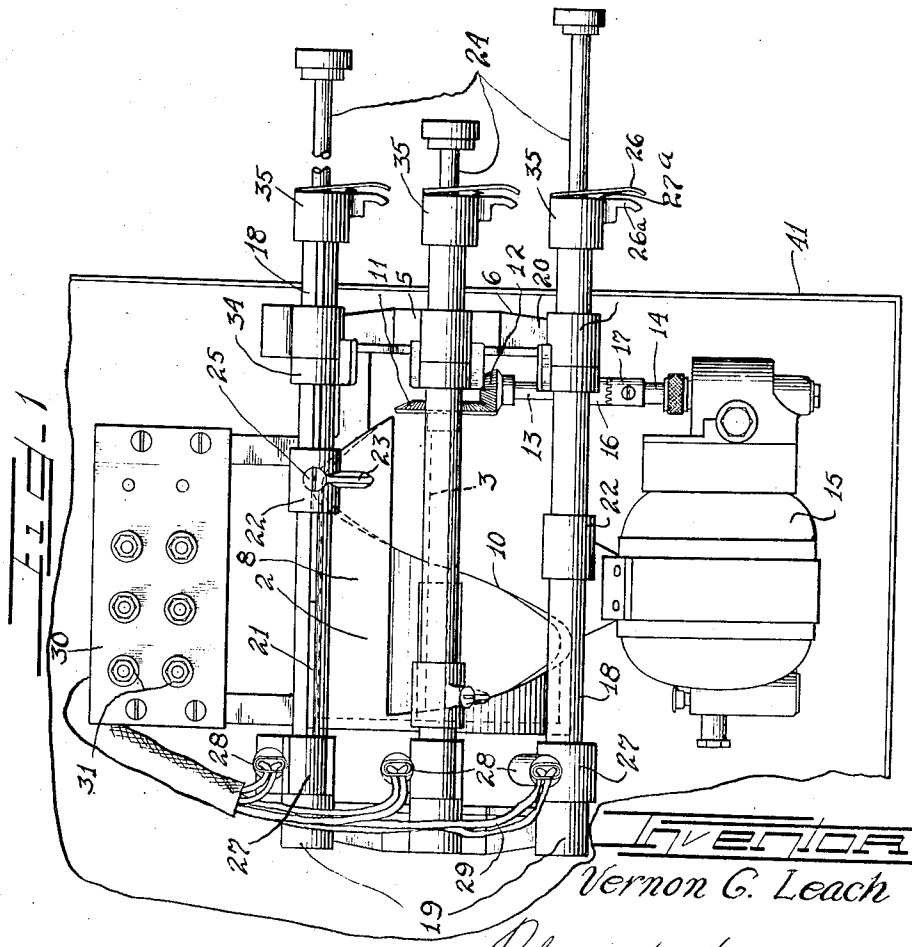


FIG. 1

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UNITED STATES PATENT OFFICE

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ELECTRICAL CONTROL DEVICE

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This invention relates to an electrical control device and more particularly to such a device which can be carefully adjusted to regulate the time of current flow through one or a plurality of independent electric circuits.

Many types of control devices have been proposed in the past but for the most part these devices fail to provide proper current control or are so intricate as to be difficult to operate, construct or repair.

I have now constructed an electrical control device which is simple in construction and is susceptible of accurate and careful adjustment to properly control the intermittent flow of current through one or a plurality of independent electric circuits.

It is accordingly an object of this invention to provide a current control device for electric circuits which is capable of adjustment for regulating the flow of current intermittently through a plurality of independent circuits.

It is a further important object of this invention to provide a current control device which is relatively simple in construction, has but a small initial and upkeep cost, and is highly efficient in operation.

It is an important object of my invention to provide simple mechanical means for actuating electric switches to alternately interrupt and close electric circuits for predetermined periods of time. It is also an important object of my invention to provide means for carrying out the above-mentioned object, which means comprise a rotatable drum so shaped that it provides, in effect, a great number of cam shaped rings to be selectively engaged by a switch-actuating finger so that electric circuits may be opened or closed for predetermined periods of time, and so that these periods may be readily increased or diminished in exceedingly small steps.

It is also a further and important object of my invention to provide inexpensive means for mechanically actuating a plurality of switch-controlling fingers to open and close electric circuits for predetermined periods of time, which periods may be increased or diminished in exceedingly small steps, and to provide means for regulating the length of the periods during which the circuit is open or closed of such simplicity as to be capable of manual control by ordinary workmen, or of automatic control.

Other and further important objects of this invention will become apparent from the following description and appended claims.

Referring to the drawing which discloses a preferred embodiment of my invention:

Figure 1 is a top plan view of the control device of this invention.

Figure 2 is a side elevational view of said control device.

On the drawing:

The control device of this invention, indicated as a whole by the reference numeral 1, comprises a rotatable cam drum 2 mounted on a shaft 3 which is journalled at its ends 4 in the hubs 5 of spiders 6. A supporting base 7 is secured to, or formed integral with, said spiders 6 and is provided with means (not shown) for securing the control device to a suitable support, such as the wall 40 of a box or cabinet 41.

The rotatable drum 2, as shown, has a substantial portion of its periphery cut away to provide a cam surface 8 for a purpose to be later explained. Preferably, the cut-away portion of the roll periphery is such that the edge 10 defining said cut-away portion is substantially in the form of a helix, the form of the edge, however, being such as to obtain the desired characteristics in the particular installation in which my device is to be used.

The drum 2 may be considered in effect to be composed of a great number of thin cams, mounted side by side, with their active surfaces so shaped, and with the cams so positioned in relation to each other, as to present a helix when the drum is seen from above and at a certain point in a revolution. When the drum is viewed from above at another point in the revolution of the drum a straight edge is seen.

For rotating the drum 2 a bevel gear 11 is mounted on the shaft 3 and intermeshes with a bevel gear 12 driven through the shafts 13 and 14 from a suitable driving mechanism 15.

Said shafts 13 and 14 are operatively connected together by means of a clutch member 16 secured to shaft 13 and a clutch member 17 secured to the shaft 14. The motor 15 is mounted as a part of the control device on the supporting base 7.

A plurality of hollow bars or rods 18 are journalled in the bearings 19 on the ends of the radial arms 20 of spiders 6 so as to lie parallel to the major axis of said drum 2 adjacent the periphery of the same. Each of said bars or rods 18 has a slot 21 therein extending substantially the full length of said rods 18. A ring 22 carrying a shoe 23, adapted to bear against the periphery of the drum 2 is slidably mounted on each rod 18.

Each ring 22 is slidably adjusted on the rod 18 by means of a plunger rod 24 which extends into the hollow rod 18, and the ring 22 is secured to the rod 24 by means of a set screw 25. The shanks of said set screw 25 are located in the slots 21 in said hollow rods 18 to thereby prevent relative rotation between said rings 22 and said rods 18.

To retain the rod 24 in adjusted position in the hollow rod 18 a collar 35 is suitably mounted on an end of the rod 18 and is provided with an apertured resilient clip or clutch member 26, suitably secured at one end thereof on the collar 35 to normally grip the rod 24. The collar 35 is provided with a finger-rest 26*a* so that the rod 24 may be released for movement by the operator by pressing the clip 26 towards the finger-rest 26*a* and against a coiled spring 27*a*, positioned between the finger-rest 26*a* and the clip 26 to normally urge the clip into engagement with the rod 24.

A plurality of collars 27 are rigidly secured to the opposite ends of said hollow rods 18, each collar having thereon one or more conventional tiltable mercury switches 28. Each switch 28 has a pair of conductors 29 joined thereto, all of which lead to a control board 30 secured to said supporting base 7. Said control board is provided with a pair of terminals 31 for each switch whereby the switch may be connected in an electric circuit (not shown).

The device, including the switchboard, is preferably enclosed in the dust-proof and weather-proof casing 41 with nothing extending outside the casing but the conduits for carrying the wires to the switchboard, and the collars 35 and the rods 24.

Since the rods 24 require no more than a straight-line push or pull to effect movement of the shoes 23, it will be obvious that the clamping member 26 may be eliminated and the rods connected to some suitable driving means so that the position of the shoe, and the operation of the attached switches, may be governed by some remotely positioned device, as, for instance, the pressure gauge of a boiler. The rods may also be attached by simple means to the float of a water tank or sump to govern the operation of pump motors.

With this arrangement it will be appreciated that the opening and closing of the switches 28 will depend upon their relative positions as determined by whether the shoes 23 are in or out of contact with the cam surface 8. The rods 18 are given a constant tendency to rotate so as to press the shoes 23 into contact with the cam surface 8 by providing counter-weighting means 32 on said collars 27. Said counter-weighting means 32 also cause the rods, when the shoes are out of contact with the cam surface, to move to a position in which the switches 28 will be open, thereby breaking the associated circuits. Movement of the rods is prevented and the switches are retained in closed position when the shoes 23 bear against the cam surface 8 of the drum 2. In other words, when a shoe or brush 23 is in contact with the cam surface 8, the hollow rods 18 will be held against rotation, the effect of the counterweighting means being merely to force said shoes into close contact with said surface. However, when the shoes reach a cut-away portion of the drum surface during the rotation of said drum 2, the counterweighting means will rotate said rods 18 to tilt said switches 32 and open the circuit.

The rods 18 are prevented from rotating beyond the point required to open the switches 32 by means of cooperating stop members on said rods and a spider 6, which comprise studs 33 projecting inwardly from one of said spiders and winged sleeves 34 rigidly secured to said rods and adapted to strike said studs when the mercury switches have been tilted a distance sufficient to open the same.

The solid periphery of the drum 2 is as stated above in the form of a cam surface and accordingly it is possible to vary the period each switch is retained in open or closed position by sliding the shoes 23 along the rods 18 to provide contact between the said shoes and drum periphery for the period of time desired. It will be obvious that a shoe 23 may be so positioned with respect to either end of the drum 2, and the ends of the drum so shaped, that the attached switch 28 may maintain the associated circuit in open or closed position during continued revolution of the drum. Furthermore, the speed of rotation of the drum may be regulated to provide a further control of this time period.

The operation of this device is as follows:

A pair of terminals 31 on the board 30 is connected in an electric circuit including a switch 28. A shoe 23 on a hollow rod 18 carrying the switch 28 is then adjusted along said rod 18 to bear on the surface of the drum 2. The motor 15 is then started and the drum 2 caused to rotate. As the drum rotates, the shoe 23 traces a definite pathway on the pe-

riphery of the drum and, while in contact with the cam surface 8 of the drum, maintains the switch in operative position to keep its associated circuit interrupted or closed, as desired. However, when said shoe 23 strikes a cut-out portion, the rod 18 carrying the same will be rotated by means of the associated counter-weighting means 32 thereby tilting its associated mercury switch effecting an opening of said electric circuit. The switch 32 remains in its tilted position during further rotation of the drum until a portion of the cam surface of said drum again comes into contact with the shoe 23, whereupon the rod 18 will be swung in a direction to bring the mercury switch back to its original position and again close the circuit. If, at any time, it is desired to vary the period which the circuit is maintained open or closed it is only necessary to operate the plunger arm 24 to position the shoe 23 at the proper point on the cam surface 8.

For simplicity I have disclosed the operation of my device with only one electric circuit but it will be understood that each mercury switch is to be connected in a circuit whereby independent control of a plurality of circuits may be obtained at the same time.

It will also be evident that a plurality of switches may be connected where one is now shown to control a plurality of devices, or else to be connected in parallel to handle heavy currents.

I also contemplate the application of the drum in situations where, with proper attention paid to the insulating of affected parts, the drum itself may be one conducting element in an electric circuit with the shoes acting as the other conducting or switch elements.

While I have disclosed the preferred embodiment of my invention, it will be understood that I do not propose to be limited thereto as various modifications in the structure disclosed may be made without departing from the spirit of my invention.

I claim as my invention:

1. A control device for an electric circuit comprising a rotatable drum having a portion of its periphery cut away to define a solid cam surface, oscillatable means adjacent said cam surface, a shoe carried by said oscillatable means and adapted to bear against the cam surface in one position of rotation of said drum and project into said cut out portion in another position of rotation of said drum, means for adjusting said shoe on said oscillatable means so that said shoe may be traversed by different paths around said periphery, a tiltable mercury switch on said oscillatable means and weighted means on said oscillatable means for oscillating said oscillatable means when said shoe moves into a cut-out portion of said drum surface to thereby tilt said mercury switch and open said electric circuit.

2. A control device for independent electric circuits comprising a rotatable drum having a portion of its periphery cut away to define a solid cam surface, a plurality of oscillatable means adjacent said cam surface, shoes carried by said oscillatable means adapted to bear against said cam surface in one position of movement of said drum and project into the cut out portion of said drum periphery in another position of movement of said drum, mercury switches on said oscillatable means in closed condition when said shoes contact said cam surface, means for adjusting said shoes on said oscillatable means so that said shoes may be traversed by different paths around the periphery of said drum, means for retaining said shoes in adjusted position, means for connecting said switches in different electric circuits and means for oscillating said oscillatable means when said shoes project into a cut out portion of said drum periphery to thereby tilt said switches and open said electric circuit.

3. A control device for regulating the continuity of current flow through a plurality of independent electric circuits, comprising a rotatable drum having a portion of its periphery cut away substantially along a helical curve to provide a solid cam surface, a plurality of oscillatable arms adjacent said cam surface, a shoe carried by each oscillatable arm and adapted to bear against said cam surfaces or project into a cut-out portion of said drum periphery at different periods of rotation of said drum, independent means for sliding each shoe along an oscillatable arm to vary the pathway to be traversed by the different shoes around the drum periphery, a tiltable mercury switch on each arm in closed position when said shoes contact said cam surface, and means on each arm for independently oscillating an arm when the shoe thereon strikes a cut out portion of said drum periphery to tilt the switch on said arm and thereby open the circuit containing said switch.

4. A control device for a plurality of independent electric circuits, comprising a rotatable drum having a portion of its surface cut away along a helical curve to provide the periphery of said drum with a cam surface, a plurality of hollow arms journalled adjacent said drum periphery, a shoe slidably mounted on each arm adapted to contact said cam surface in one position of rotation of said drum and project into said cut out portion in another position of rotation of said drum, a tiltable mercury switch rigid with each arm, means for connecting each switch in an independent circuit, plungers in said hollow arm secured to said shoes for varying the position of said shoes on said hollow arms and thereby the path to be traversed by said

shoes around said drum periphery, means for retaining said shoes in adjusted position and means on each hollow arm for oscillating said arm when the shoe on said arm reaches a cut out portion of said drum periphery to thereby tilt the switch on said arm and open the circuit containing said switch.

5. A device as specified in claim 4 including a spring clip for retaining each plunger arm and the shoe secured thereto in adjusted position.

6. A device as in claim 4 wherein each hollow arm has a slot and the plunger arm is connected to the shoe on said hollow arm by a screw having its shank positioned in said slot.

In testimony whereof I have hereunto subscribed my name at Chicago, Cook County, Illinois.

VERNON G. LEACH.