Sept. 2, 1958 J. L. HARRIS 2,850,586

CONTROL DEVICE

Filed June 28, 1950

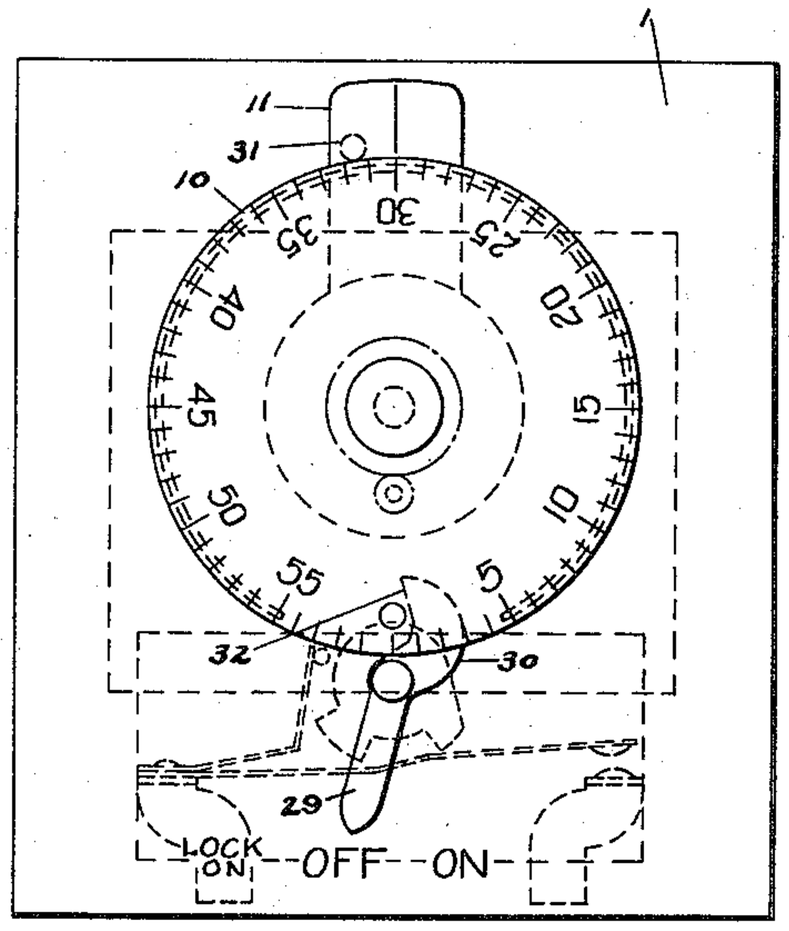

Fig-1

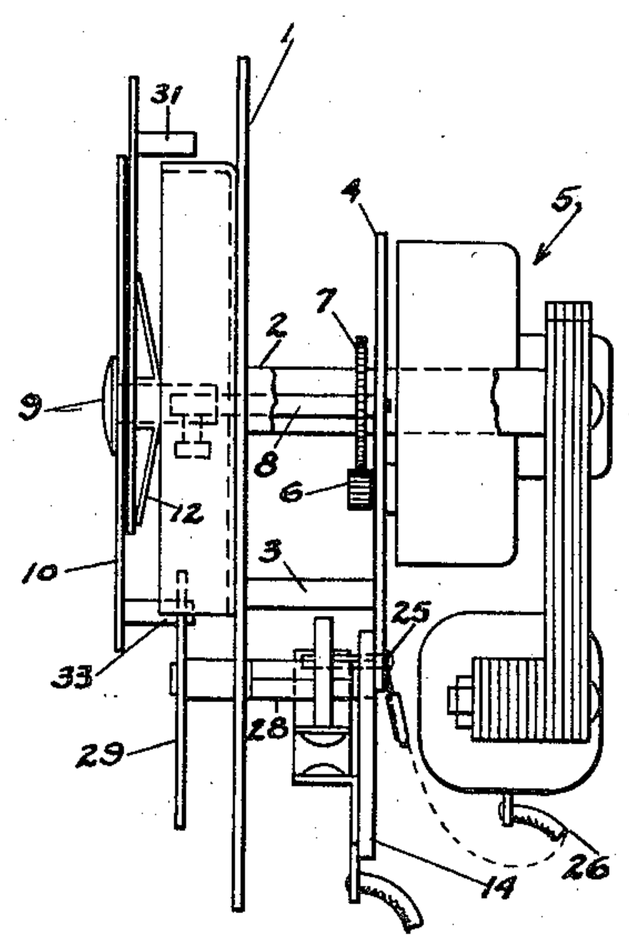

Fig-2

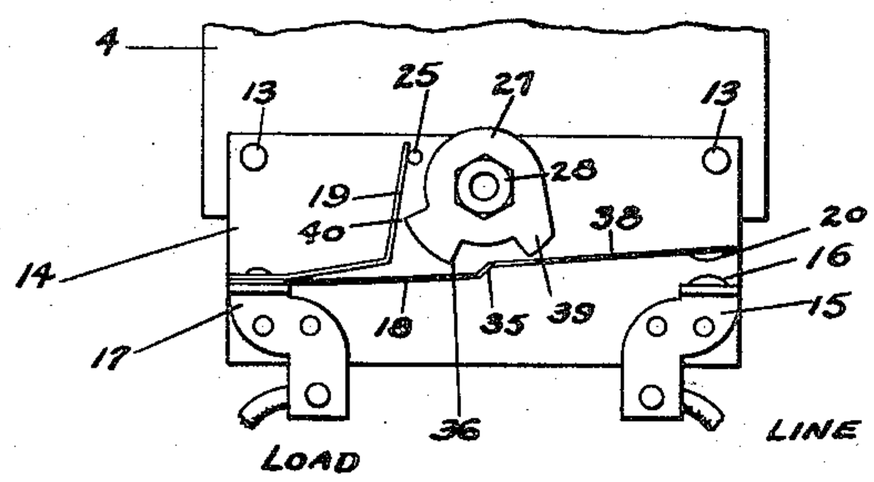

Fig-3

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CONTROL DEVICE

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8 Claims. (Cl. 200—38)

This invention relates to automatic control apparatus and is more particularly concerned with timers of the manual reset type. The primary object of the invention is to provide a timing mechanism which is simple and rugged in construction and which is easy to operate by the user.

A further object of the invention is to provide a timer in which the switch mechanism is operated at the end of the resetting stroke so as to eliminate the variable of the time of manual resetting.

A further object of the invention is to provide an interval timer mechanism which is adapted to be set for varying time periods or to accurately repeat predetermined periods for which the mechanism is set.

Another object of the invention is to provide an interval timer mechanism in which a single switch or control device may be operated by the timing mechanism or may be operated independently of the timing mechanism.

The present invention constitutes an improvement in the switching mechanism of the timer disclosed in my application Serial No. 42,119, filed August 2, 1948.

A further object of the invention is to provide a switching mechanism requiring a small operating force relative to its switching capacity, and which is simple in construction.

For a complete disclosure of the invention, reference is made to the accompanying drawings in which

Fig. 1 is a front view of a complete timer,

Fig. 2 is a side view, and

Fig. 3 is a fragmentary view of one form of switching mechanism embodying the invention.

Referring to Fig. 1, reference character **1** indicates a mounting plate. Mounted on plate **1** and separated therefrom by means of spacers **2** and **3** is a back plate **4**. This plate carries a synchronous timing motor **5** having a final shaft carrying a pinion **6**. This pinion **6** meshes with a gear **7** which is carried on a shaft **8**. The shaft **8** is freely supported in the front plate **1** and the black plate **4**, and extends forwardly of plate **1**. The free end of shaft **8** carries a hub **9** which in turn carries a dial **10** and an operating member **11**. As shown more clearly in Fig. 2 the hub **9** is provided with a shoulder adjacent its front end, and the dial **10** and operating member **11** are pressed against this shoulder by means of a friction spring **12**. This construction permits the dial and operating member to be adjusted or moved on the hub. This arrangement is disclosed in detail in my application Serial No. 42,119, filed August 2, 1948.

Secured to the back plate **4** by means of rivets **13** is a switch plate **14** preferably of phenolic material. Mounted on this switch plate is a contact bracket **15** carrying a contact **16**. Also mounted on the plate **14** is a switch blade bracket **17** which carries switch blades **18** and **19**. The switch blade **18** extends across the panel **14** and is provided with a contact **20** which cooperates with contact **16** to complete a circuit from the "line" terminal **15** to the "load" terminal **17**. The switch blade **19** extends to the right and then upwardly to engage a pin **25**. As

shown in Fig. 2, the pin **25** is pressed in the panel **14** and is connected by a lead **26** to one terminal of the timer motor **5**.

The switch blades **18** and **19** are operated by a cam **27**. This cam is mounted on a shaft **28** which is freely supported between the plate **1** and switch panel **14**. This shaft **28** extends forwardly of the mounting plate **1** and carries an operating member or pointer **29**. The member **29** is provided with an "on" cam surface **30** which is adapted to be engaged by a rearwardly extending pin **31** on the manual operator **11**. Member **29** is also provided with an "off" cam surface **32** which is adapted to be engaged by a pin **33** extending rearwardly of the dial.

As shown more clearly in Fig. 3, the switch blade **18** is formed with an offset portion **35** adjacent the cam. With the parts in the positions shown, the pointer **29** is in the "off" position which causes the cam to be in the position of Fig. 3 in which contacts **16** and **20** are open and switch blade **19** engages the pin **25**. When the operator wishes to start a timed period, the member **11** is set to the required time on the dial **10** and the entire dial assembly is rotated clockwise by "dialing" the member **11**. At the end of the dialing stroke the pin **31** engages the cam surface **30** of member **29**, this causing the shaft **28** and cam **27** to be rotated counter-clockwise. During this movement the section **36** of the cam engages the offset **35** of the switch blade and rides up the offset thus causing the contacts **16** and **20** to engage. The circuit is thus completed from the line to the load terminals. A circuit for the timer motor is also completed through switch blade **19** and contact **25**. Thus the timer motor is energized simultaneously with the load and rotates the shaft **8** counter-clockwise. As the end of the timed period approaches, the pin **33** on the dial engages the "Off" cam surface of the lever **29** and rotates the shaft **28** clockwise. During initial movement of the shaft, the section **36** of cam **27** merely rides along the top section **38** of the switch blade. However, at the end of the timed period, the section **36** of the cam rides down the offset portion **35** of the switch blade. At this time the cam snaps to its "Off" position permitting the contacts **16** and **20** to open. This de-energizes both the load and the timing motor.

In some cases it is desirable to operate the load for an extended duration of time. When this is desired the pointer **29** is moved to the position marked "Lock on." In this position the lobe **39** of cam **27** engages the switch blade and causes contacts **16** and **20** to re-engage. At the same time the portion **40** of the cam engages switch blade **19** and forces it away from the contact **25**. This breaks the timer motor circuit so that the timer does not run even though the load is energized. The load will therefore remain energized indefinitely until the pointer **29** is moved from "Lock on" back to "Off."

An important feature of the invention is the arrangement of the switch blade with the offset portion between its ends and arranged to be engaged by the cam. This arrangement provides a very simple snap action movement from "On" to "Off" positions. This arrangement further provides a relatively heavy duty switch which is operable by a slight amount of power. It should be noted that as the cam rides up the offset portion, its first action is to cause contacts **16** and **20** to engage. After the contacts engage, the cam drives the switch blade still further and thus flexes the blade and causes a slight rocking of contact **20** on contact **16**. This provides for a slight wiping action to keep the contacts clean. In addition, this flexure of the switch blade **18** after the contacts engage, builds up into the blade a force tending to pry the contacts open. This prying force is many times greater than the force applied by the cam to the center of the blade. As a result if the contacts should

weld together upon engagement, the prying force is sufficient to break them loose when the cam is moved to the "Off" position. The switch therefore serves to carry a relatively heavy load as compared with the operating forces required.

While I have shown and described a preferred form of the invention, it will be seen that various modifications may be made without departing from the spirit and scope of the invention. It is desired, therefore, to be limited only by the appended claims.

What is claimed is:

1. In a switch construction, the combination of, a spring switch blade anchored at one end and provided with a contact surface substantially spaced from said anchored end, said switch blade being formed with an offset substantially midway between said anchored end and the contact surface, a rigidly mounted stationary contact arranged to be engaged by said contact surface, a freely supported rotatable cam arranged to engage the offset of the switch blade so as to operate the switch from open position to closed position as the cam is rotated in one direction and to operate the switch from closed position to open position as the cam is rotated in the opposite direction, and means for rotating the cam in either direction.

2. In a switch construction, the combination of, a spring switch blade anchored at one end and provided with a contact surface substantially spaced from said anchored end, said switch blade being formed with an offset substantially midway between said anchored end and contact surface, a rigidly mounted stationary contact arranged to be engaged by said contact surface, a freely supported rotatable cam having a first portion arranged to engage the offset of the switch blade so as to operate the switch from open position to closed position as the cam is rotated in one direction and to operate the switch from closed position to open position as the cam is rotated in the opposite direction, said cam having a second portion arranged to engage the switch blade in a manner to return the switch from open position to closed position upon continued rotation of the cam in said opposite direction, and means for rotating the cam in either direction.

3. In a switch construction, the combination of first and second switch blades each anchored at one end, said blades having free ends substantially spaced apart, and having movable contact surfaces, stationary contact surfaces arranged for cooperation with said movable contact surfaces, a single rotatable cam located between the switch blades for engagement with the same, said cam having an intermediate position and two terminal positions, one on each side of the intermediate position, said cam being formed to open one set of contacts only in the intermediate position and to close said one set of contacts upon movement in either direction from the intermediate position, said cam also being arranged to open the other set of contacts in one only of said terminal positions.

4. In a switch construction, the combination of, a single switch blade support, first and second switch blades each anchored at one end to said single support, said blades having free ends substantially spaced apart, and having movable contact surfaces, stationary contact surfaces arranged for cooperation with said movable contact surfaces, a single rotatable cam located between the switch blades, said cam having an intermediate position and two terminal positions, one on each side of the intermediate position, said cam being formed to open one set of contacts only in the intermediate position and to close said one set of contacts upon movement in either direction from the intermediate position, said cam also being arranged to open the other set of contacts in one only of said terminal positions.

5. In an electric timing mechanism, the combination of, an electric timing motor, a rotatable cam shaft, means for rotating said cam shaft either manually or by said timing motor, said shaft having an intermediate "off" position and two "on" positions, one on each side of said "off" position, first and second switch blades each anchored at one end and extending on different sides of the cam shaft, said switch blades having movable contact surfaces, stationary contact surfaces arranged for cooperation with the movable contact surfaces, a cam mounted on the cam shaft between said switch blades, said cam being arranged so that upon movement from one "on" position to the other, it opens and recloses one set of contacts, said cam also being arranged to close the other set of contacts when in one of said "on" positions, and to open said other set of contacts when in the other "on" position, said one set of contacts controlling a load, and the other set of contacts controlling the timing motor.

6. In a timing mechanism, the combination of, a timing motor, a timing shaft rotated by the timing motor, a cam mounted for rotation on an axis spaced from and parallel with the timing shaft, lost motion drive means between the cam and timing shaft, a spring switch blade anchored at one end and provided with a contact substantially spaced therefrom, a stationary contact arranged to be engaged by the switch blade contact, said switch blade being biased in a direction tending to open the contacts and having an offset therein substantially spaced from the anchored end and the contact, said cam having an abrupt working surface and being located on the side of the switch blade opposite said stationary contact and arranged so that said abrupt working surface engages the blade at the offset, said cam also being provided with a throw greater than required to engage the contacts, whereby upon rotation of the cam in one direction, it first closes the contacts and then bows the blade to rock the movable contact and provide a prying force tending to break the contacts loose when the cam is moved in the opposite direction.

7. In a timing mechanism, the combination of, a timing motor, a timing shaft rotated by the timing motor, a cam mounted for rotation on an axis spaced from and parallel with the timing shaft, lost motion drive means between the cam and timing shaft, a spring switch blade anchored at one end and provided with a contact substantially spaced therefrom, a stationary contact arranged to be engaged by the switch blade contact, said switch blade being biased in a direction tending to open the contacts and having an offset therein substantially spaced from the anchored end and the contact, said cam having an abrupt working surface and a generally circular high portion, said cam being located on the side of the switch blade opposite said stationary contact and arranged so that said abrupt working surface engages the switch blade at the offset, said cam also being provided with a throw greater than required to engage the contacts and with an angle of motion sufficient to permit the circular high portion thereof to ride on the top of the offset, whereby upon rotation of the cam in one direction, it first closes the contacts, then bows the blade to rock the movable contact and provide a prying force tending to break the contacts loose, and finally engages the blade with its generally circular high portion, and whereby upon return motion of the cam, the resiliency of the blade provides a snap action motion of the cam when the abrupt working surface of the cam returns to the offset portion of the switch blade.

8. In a timing mechanism, the combination of, a timing motor, a timing shaft, means for rotating the timing shaft in one direction to a predetermined setting, said timing motor being arranged to rotate the timing shaft in the opposite direction, a cam mounted for free rotation on an axis spaced from and parallel with the timing shaft, means comprising a lost motion connection between said timing shaft and cam, said lost motion connection being constructed and arranged to cause the cam to rotate in

one direction and assume a first angular position when the timing shaft is set for operation of the timing mechanism and to cause said cam to rotate in the opposite direction and assume a second angular position when the timing shaft returns to the off position, a switch blade anchored at one end and carrying a contact, a second contact cooperating with first contact, said switch blade being biased in a direction tending to open the contacts, and provided with an offset extending oppositely from its contact, said cam being located on the side of the switch blade opposite the contacts and being provided with an abrupt working surface arranged to act on the offset for causing movement of the blade against its bias for closing the contacts as the cam is rotated from said second anqular position to said first angular position, said abrupt working surface of the cam reaching the top of

the offset when in said first angular position, whereby the component of force of the switch blade tending to cause reverse rotation of the cam becomes neutralized, said lost motion drive means permitting snap movement of the cam in the reverse direction under the bias of the switch blade, thus permitting snap movement of the switch blade in contact opening direction.

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