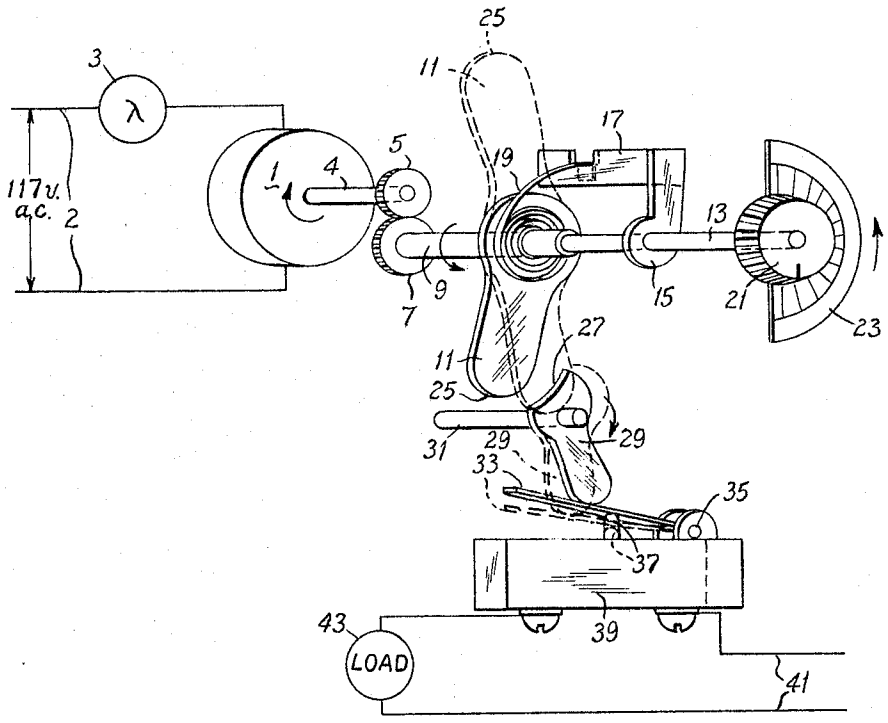
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PHOTOCONDUCTIVE TIME DELAY DEVICE

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PHOTOCONDUCTIVE TIME DELAY DEVICE

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The invention relates to photoconductive control devices and consists particularly in a photoconductive control device with time delay means.

It is a main object of the invention to provide a photoconductive control device embodying selective time delay means whereby the load can be energized a selected time after exposure of the photoconductive cell to light.

I achieve this object by providing a photoconductive cell in the circuit of an electric motor, and driving a rotatable switch activating arm by the motor, the arm normally being spring biased against a stop positioned relative to the arc of rotation of the arm in accordance with the desired time delay, so that the rotary travel time of the arm, from the stop until it closes the switch, equals the desired time delay.

In the schematic representation of my invention shown in the drawing, an electric motor **1** is connected to an alternating current source **2** of commercial voltage, and for controlling the operation of the motor in accordance with light conditions, the motor circuit includes a photoconductive cell **3** in series with the motor. Motor shaft **4** is connected by gears **5** and **7** to a hollow shaft **9** on which is fixedly mounted switch operating arm **11**.

Timer shaft **13** is coaxial with and is journaled within hollow shaft **9** and mounts stop arm **15** formed with a stop bar **17** extending parallel to shaft **13** and adapted to engage switch operating arm **11** and limit clockwise movement of the latter. Operating arm **11** is normally biased in a clockwise direction and yieldably held against stop bar **17** by resilient means such as torsion spring **19**, anchored at one end to bar **17**, and secured at its other end to arm **11**, arm **11** being rotatable counterclockwise away from engagement with stop bar **17** by motor **1** when the latter is energized. Shaft **13** also fixedly mounts a manual adjusting knob **21**, overlying a stationary scale **23**, graduated in units of time, so that, by rotation of knob **21** until its index mark registers with the desired time lag on the dial, stop bar **17** will be correspondingly rotated, and the initial position of operating arm **11** similarly varied.

The outer end of operating arm **11** is convexly rounded as at **25**, for engagement with a similar but concave surface **27** on lever **29**, which is pivoted intermediate its ends on stationary shaft **31**. The lower end of lever **29** is rounded for sliding engagement with the upper surface of switch operating bar **33**. The latter is fulcrumed at one end on a fixed axis **35** and intermediate its fulcrum and its point of engagement with lever **29**, its lower surface engages outwardly biased plunger **37** of snap action switch **39**. Switch **39** is connected in series with a source of power **41** and load **43**, so as to energize the load when closed.

With this arrangement, when the resistance of photoconductive cell **3** is reduced to a predetermined value by its exposure to light of predetermined intensity, motor **1** begins to operate, causing counterclockwise rotation of operating arm **11** away from stop bar **17**, in opposition to spring **19**. While rotating, arm **11** engages surface **27** of lever **29**, producing clockwise rotation of the latter, and downward movement of bar **33** to its broken line position shown in the drawing, until switch plunger **37** is fully depressed, thus preventing further downward movement of bar **33** from the broken line position, further clockwise movement of lever **29** as a result of its engagement with the upwardly extending left hand end of bar **33**, and

through engagement of surfaces **27** and **25**, any further counterclockwise movement of arm **11**. This stalls motor **1**, but as long as it is energized, it continues to produce torque to hold arm **11** in its final position and thus maintain switch **39** closed. When the light is extinguished or reduced below a predetermined intensity, with consequent increase in the resistance of cell **3** above a predetermined value, the torque of motor **1** becomes less than that of spring **19**, so that the latter produces clockwise rotation of arm **11** away from lever **29**, freeing lever **29**, and permitting microswitch plunger **37** to rise to its normal height, thereby opening the switch.

Operation of the device is as follows: Manual adjusting knob is rotated until its index registers with the desired time delay on dial **23**, thereby rotating shaft **13** and stop **17** so that angular distance, measured counterclockwise from stop **17**, between stop **17** and surface **27** of lever **29**, is proportional to the desired time delay. With photoconductive cell **3** unexposed to light and its resistance relatively high, motor **1** produces insufficient torque to overcome the torque of spring **19**, which accordingly biases arm **11** toward and against stop **17**.

When light of predetermined intensity strikes cell **3**, its resistance is lowered sufficiently that motor **1** develops sufficient torque to overcome that of spring **19**, and arm **11** is rotated counterclockwise into engagement with lever **29**, causing the latter to rotate, until the latter, through bar **33** fully depresses switch plunger **37**, after which further clockwise movement of lever **29** is prevented. This prevents further counterclockwise movement of arm **11** and causes the motor to stall, but the motor, though stalled, continues to develop torque as long as the light of sufficient intensity strikes cell **3**. When the light is reduced below the predetermined intensity, or removed, the resistance in the cell increases, with a proportionate drop in the motor torque below the value of the spring torque, permitting the spring to rotate arm **11** clockwise away from lever **29**, thereby permitting switch plunger **37** to rise and open the circuit through load **43**. Spring **19** continues to rotate arm **11** until the latter engages stop **17** after which the device is ready for another cycle.

It will be understood, of course, that the device may incorporate a normally closed switch instead of the normally open switch **39** described above. In the event a normally closed switch is used, the light-responsive operation of the device will open the load circuit instead of close it as in the above-described operation.

The details of the device disclosed herein may be varied substantially without departing from the spirit of the invention and the exclusive use of those modifications coming within the scope of the appended claims is contemplated.

What is claimed is:

1. A photoconductive control device comprising an electrical circuit including a source of power, a motor, and a photoconductive cell connected in series with said motor, said cell being adapted to vary resistance in said circuit in accordance with changes in light intensity, an arm drivably connected to said motor and rotatable thereby in one direction only, a stop means adapted to limit rotation of said arm in a direction opposite to that in which said motor is adapted to rotate said arm, resilient means connected to said arm and biasing the same toward engagement with said stop means, a load circuit including an electrical switch, said motor developing a torque greater than that of said resilient means when the resistance of said motor circuit is reduced to a predetermined value by said cell, a lever angularly spaced about the rotational axis of said arm from said stop means and adapted to engage said arm and be rotated thereby when the latter is rotated away from said stop means by said motor, said switch having an element operatively connected to said

lever for movement from one position to another when said lever is rotated.

2. A photoconductive control device according to claim 1 in which said stop means is variably positionable about the axis of rotation of said arm whereby to vary the angular distance between said stop means and said switch-operating means and the time required for rotation of said arm therebetween.

3. A photoconductive control device according to claim 2 including manual means for positioning said stop means.

4. A photoconductive control device according to claim 3, in which there is a scale in registry with said manual means and calibrated in units of time in accordance with the motor-driven speed of said arm.

5. A photoconductive control device according to claim 1 in which the engageable portion of said lever and said arm are respectively mating concave and convex surfaces.

6. A photoconductive control device according to claim 5 in which said switch includes an outwardly biased operating plunger, there being a bar fulcrumed on a fixed axis relative to said switch and engaging said plunger, said lever engaging said bar at a point more remote from the fulcrum than said plunger.

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