

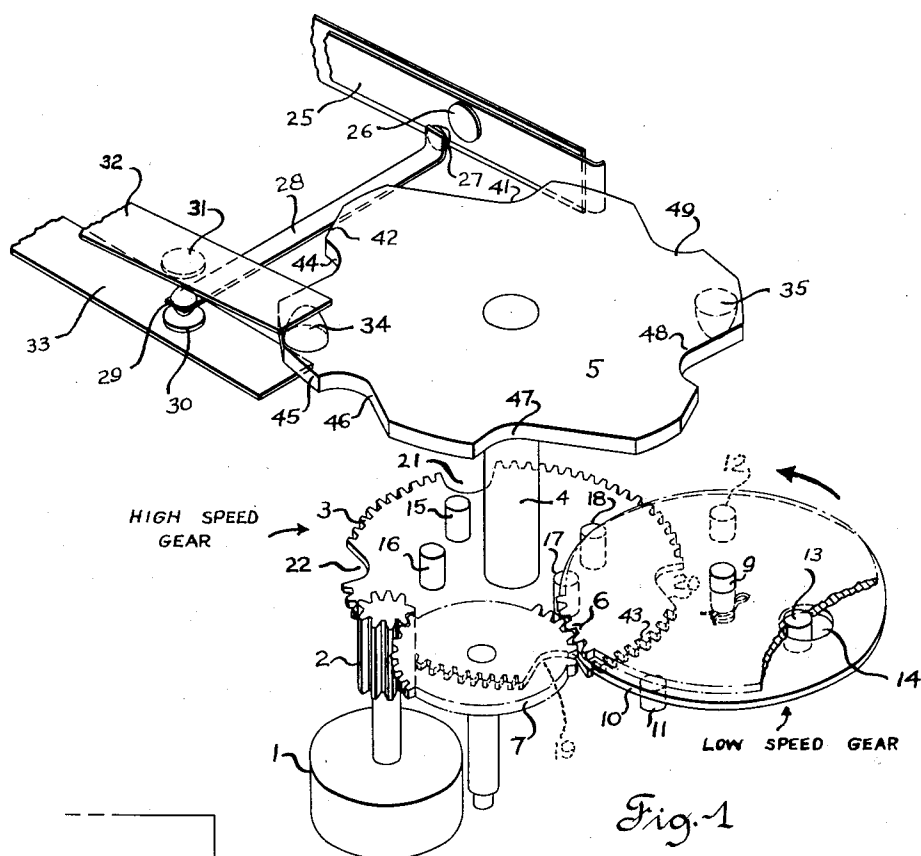
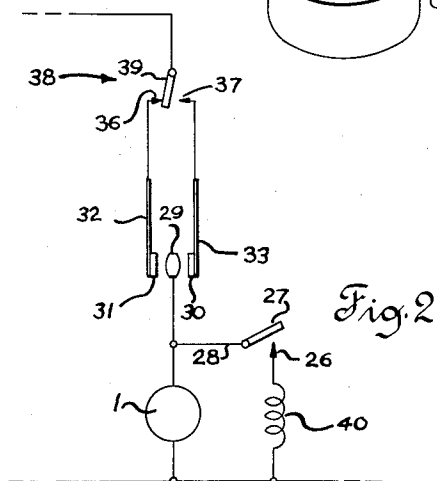
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CONTROL DEVICE

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CONTROL DEVICE

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This invention relates to automatic control systems, and more particularly to systems for causing a predetermined series of electrical impulses in response to operation of a controller.

One object of the invention is the provision of a control system which responds to movement of a control switch, causing a series of impulses each time the control switch is moved from one position to another.

A further object of the invention is to provide a motor driven timer mechanism for producing a series of electrical impulses of relatively short duration, but spread apart for intervals of relatively long duration.

Other objects will appear from the following description and appended claims.

For a full disclosure of the invention reference is made to the following detailed description and to the accompanying drawings in which: Figure 1 is a schematic perspective view of the timer mechanism; and in which Figure 2 is a wiring diagram showing the complete control system.

Referring to Figure 1, reference character 1 indicates a timing motor which drives a pinion 2. The pinion 2 drives a gear 3 which is carried on a shaft 4 and which carries a cam 5. The pinion 2 of the motor also drives a low speed gear 6 through a gear train indicated schematically as 7 which is driven by pinion 2. The gear 3 which drives the cam is rotated by the pinion 2 in a clockwise direction at relatively high speed. The gear 6 is driven in a counter-clockwise direction at relatively slow speed. The gear 6 is carried by a fixed shaft 9 which also carries a plate 10 carrying downwardly extending pins 11 and 12. The gear also includes a pin 13 which extends into an enlarged hole 14 in the plate 10. This serves as a lost motion drive between the gear and plate.

The gear 3 carries upwardly extending starter pins 15, 16, 17 and 18 which are adapted to be engaged by the pins 11 and 12 carried by the plate 10. The gear 3 is also provided with notches 19, 20, 21 and 22 which cause the gear teeth to be omitted at these points. This arrangement causes the gear 3 to stop at the predetermined points in its travel. This gear is then restarted by the pins 11 or 12 on the plate 10 engaging one of the starter pins 15, 16, 17 or 18.

The outer periphery or edge of the cam 5 serves to operate a switch blade 25 which carries a contact 26 adapted to engage and disengage a stationary contact 27. This contact 27 is carried by a jumper strip 28 carrying a pair of stationary contacts 29 which are adapted to engage contacts 30 and 31 on switch blades 32 and 33 respectively. The switch blades 32 and 33 are located in planes perpendicular to the switch blade 25 and these switch blades 32 and 33 are adapted to be engaged by projections 34 and 35 on the sides of cam 5. Thus the switch blade 25 is operated by the periphery or edge of the cam whereas the blades 32 and 33 are actuated by the sides of the cam 5.

Referring now to Figure 2, this figure shows the wiring

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diagram including the motor and various switches. The motor 1 is connected to the contact 29 and the switch blades 32 and 33 are connected to contacts 36 and 37 of an external controller generally indicated as 38. This controller includes a moveable contact arm 39 connected to the line wire and adapted to selectively engage contacts 36 or 37. The contact 26 is connected to a solenoid or other load to be controlled 40. The function of this control system is to cause a series of electrical impulses to the solenoid 40 when the external control breaks contact 36 and makes contact 37. Also, the control system serves to cause a similar series of electrical impulses to the solenoid 40 when the external controller 38 breaks contact 37 and remakes contact 36. In other words, a series of electrical impulses are created each time the external control shifts from one of its positions to the other.

Operation

With the parts in the positions shown, the switch 26-27 is open. Contacts 29 and 30 are engaged and contacts 29 and 31 are disengaged. Also, the contacts 39-36 of the external control 38 are closed whereas the contacts 39-37 of this controller are open. Thus, both paths for current to the motor 1 are broken and the motor is de-energized.

When the external controller 38 shifts in position thus breaking 39-36 and making 39-37 a circuit to the timer motor is completed through contacts 29 and 33. The timer motor will now run, and as the pinion 2 is now engaging a tooth section of the gear 3 the cam 5 begins rotating in a clockwise direction. The notch 41 of the cam 5 now comes under the blade 25 thus permitting this blade to drop and engage contacts 26 and 27 which cause current to pass through the solenoid 40. The cam 5 is now rotating at relatively high speed and the edge of notch 41 picks up blade 25 in a short time and causes contacts 25-26 to open thus de-energizing the solenoid 40. After the notch 41 of the cam 5 has cleared the switch blade 25, the notch 19 on the high speed gear 3 reaches the pinion. This causes the cam and gear to stop at this point. In the meantime, however, the low speed gear 6 is rotating in a counter-clockwise direction and the pin 12 carried by plate 10 is approaching the starter pin 15 on the gear which has now moved into the path of the pin 12. When pin 12 engages pin 15, it advances the gear 3 and cam 5 in a clockwise direction. This causes the sloping edge 42 of the cam to come beneath the blade 25. This results in the blade 25 advancing cam 5 so as to advance the gear segment 43 into contact with the pinion 2. Thus the pinion 2 once again starts driving the gear 3 and the notch 44 of the cam comes under the blade 25 which causes another impulse. After the cam has rotated sufficiently that the notch 44 on the cam has passed the switch blade 25, the notch 20 on the gear arrives at pinion 2 and the gear 3 and cam 5 once again stop. The cam and gear will now remain in this position until the pin 11 driven by the low speed gear 6 engages the starter pin 16 on the gear. It will be understood that at this position of the cam shaft, the starter pin 16 has now become located in the path of the pins driven by gear 6. This once again causes rotation of the cam and gear in a clockwise direction and the switch blade 25 rides down the sloping portion 45 on the cam which causes the cam to jump ahead and advance the gear. The gear 3 and cam are, therefore, once again, rotated by the pinion 2 and the switch blade 25 drops in the notch 46 for causing another impulse of energy to the solenoid 40. After the cam 5 has rotated sufficiently to cause the blade 25 to ride out of notch 46, the lug 35 carried on the side of the cam 5 engages the switch blade 33 for opening

contacts 29 and 30. This stops the timer motor in this position. The timer motor will now remain de-energized until the external control shifts its position causing contacts 36—39 to again engage. When this happens, a series of three spaced impulses will be caused by the notches 47, 48 and 49 on the cam 5. At the end of these impulses the lug 34 on the cam 5 will once again contact the switch blade 32 causing contacts 29—31 to open. The parts thus reassume the positions shown in the drawing.

It should be noted that when the cam 5 begins rotating from the starting position, both projections 34 and 35 on the cam 5 are away from the switch blades 32 and 33. Thus during a running cycle of the control, both contacts 30 and 31 are in engagement with the contact 29. This arrangement insures that once a cycle has been started it will remain in progress independently of the position of the external control 38. Also, if the external control 38 has shifted its position during a cycle, the control unit will automatically go through a new cycle.

The purpose of the lost motion connection between the low speed gear 6 and the plate 10 which carries pins 11 and 12 is to permit movement of these pins in advance of the starting pins 15, 16, 17 or 18. Inasmuch as the gear 3 rotates at relatively high speed, it is possible for the starting pin 11 or 12 to be in the path of the starting pins on the gear 3. If this happens, the plate 10 is merely rotated forwardly which motion is permitted by the lost motion connection of the pin 13 extending through the enlarged hole 14.

From the foregoing description it will be apparent that the present invention provides a simple arrangement for causing a series of electrical impulses to be created each time that an external control shifts from one position to another. It will also be apparent that the present invention provides a simplified arrangement in which a single cam operates a plurality of switches independently.

While a preferred embodiment of the invention has been shown and described, it will be apparent that many modifications may be made without departing from the spirit and scope of the invention. It is, therefore, desired to be limited only by the scope of the appended claims.

What is claimed is:

1. In a control system including a controller having first and second switches which are opened and closed alternately, the combination of, a motor, third and fourth switches connected to said first and second switches respectively and also connected to said motor for controlling the same, cam means driven by said motor for operating said third and fourth switches, said cam means being arranged to open said third and fourth switches alternately as the cam means reaches predetermined positions, while closing both of said last mentioned switches when the cam means is between said predetermined positions, a fifth switch, and cam means driven by said motor for opening and closing said fifth switch at predetermined intervals as said first cam means rotates between said predetermined positions.

2. In a control system including a controller having first and second switches which are opened and closed alternately, the combination of, a motor, a cam driven by said motor, third and fourth switches connected to the first and second switches respectively and also connected to said motor for controlling the same, said third and fourth switches extending on opposite sides of said cam, said cam having projections on opposite sides thereof arranged for opening said third switch at one position of the cam, opening said fourth switch at another position of the cam, and closing both said third and fourth switches when the cam is between said positions, and a fifth switch riding the edge of the cam, the edge of the cam being arranged to operate said fifth switch as the cam rotates between said positions.

3. In a control device, a cam, a motor, a pinion driven by the motor, a gear for driving the cam, a first switch operated by one side of the cam, a second switch operated by the edge of the cam, said gear having teeth omitted for causing said cam to stop at predetermined points, and means driven by said motor for starting said cam at predetermined times.

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