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SWITCH MECHANISM

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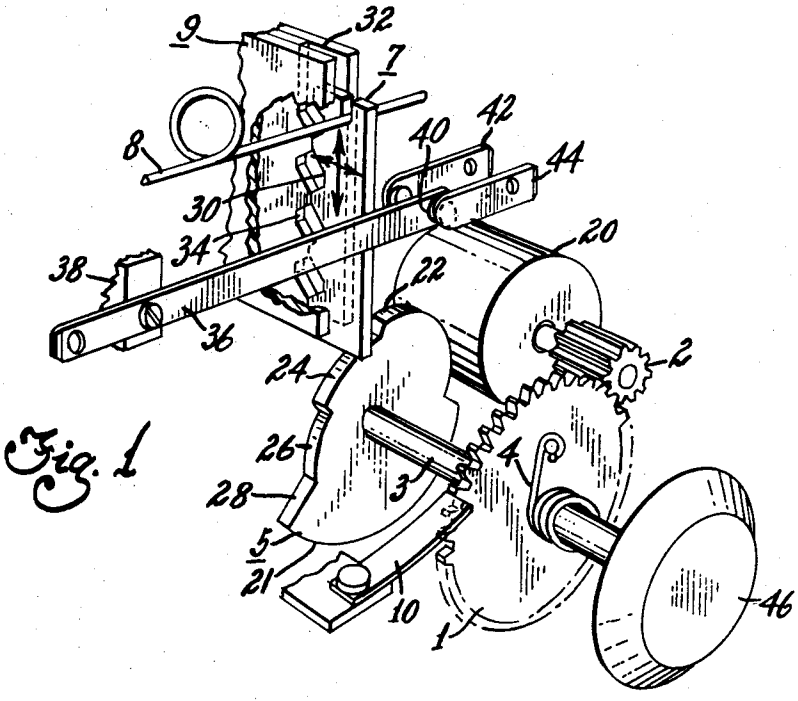


Fig. 1

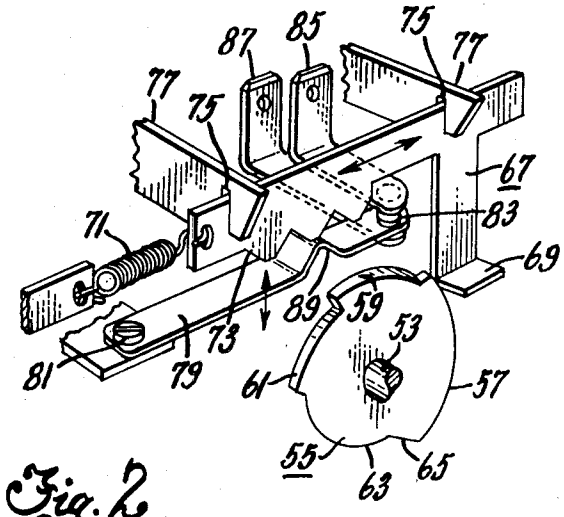


Fig. 2

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SWITCH MECHANISM

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This invention relates to switch and control mechanisms such as may be used in program timers.

In the design of program switches, some means is usually employed to effect a fast action of the make and break of the contacts to avoid excessive contact deterioration. A popular means of accomplishing such fast action is to advance the actuating cams in quick steps through an escapement. Although this jump type switch works satisfactorily when properly adjusted, considerable difficulty is experienced in their manufacture due to a multiplicity of tolerances which affects the relation of the switches and their operating cams.

It is an object of this invention to provide a switch actuating arrangement in which there is eliminated the necessity of individual switch adjustment and which allows larger manufacturing tolerances without comprising accuracy of timing.

It is another object of this invention to provide fast making and breaking of contact mechanisms when a slow, constant speed cam drive is provided.

These and other objects are attained in the form shown in the drawings in which a constantly rotating slow speed cam is provided with abrupt peripheral drops to suddenly move a spring pressed cam follower. The follower is provided with a saw-tooth cam surface which either cooperates with a guideway or with a V-shaped hump on a spring contact member to move in either form a spring contact member between normally stationary contacts.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a perspective fragmentary view of a program timer embodying one form of my improved switch mechanism; and

Figure 2 is a fragmentary sectional view of a program timer illustrating a modified form of my improved switch mechanism.

Referring now to the drawings and more particularly to Fig. 1, there is shown a timer motor 20 which either constantly or intermittently rotates the drive pinion 2. The drive pinion 2 meshes with and rotates a gear wheel 1 rotatably mounted on the cam shaft 3. A wound spring clutch 4 connects the gear 1 to the shaft 3 when the gear 1 is rotated in the clockwise direction and disconnects the gear 1 from the shaft 3 when the shaft 3 is turned in the clockwise direction. A spring detent 10 engages the teeth of the gear wheel 1 to prevent counterclockwise rotation thereof. Fixed to the shaft 3 is a cam 5 having a section 21 of maximum radius and successively reduced sections 22, 24 and 26 of successively reduced radius, with sharp drops between the sections. Between the sections 26 and 21 there is provided a more gradual incline 28.

A cam follower or switch operator 7 is normally held in engagement with the periphery of the cam 5 by a

cantilever arranged looped wire spring 8 extending through a notch in the top of the follower 7 to urge it downwardly. The left edge of the follower 7 is provided with a sawtooth cam surface 30. The cam follower 7 is slidably mounted in a guide means 9 formed as a part of the housing of the timer. The guide means 9 is provided with a groove 32 slidably receiving the follower 7 and having a sawtooth cam surface 34 in the bottom of the groove 32 which is complementary to the cam surface 30 upon the follower 7. A spring switch blade 36 has a spring bias against the adjacent vertical edge of the follower 7 to hold the cam surfaces 34 and 30 in engagement. The spring switch blade 36 is anchored to a housing portion 38. The opposite end of the spring switch blade 36 carries a double contact 40 adapted to make contact at opposite limits of its movement with the stationary contacts 42 and 44. The height of the flat top saw teeth cam surfaces 30 and 34 is just sufficient to provide movement of the double contacts 40 between the contacts 42 and 44.

When the tops of the teeth of the surfaces 30 and 34 are in contact, the cam follower 7 and the blade 36 are cammed to the right sufficiently to cause engagement of the contacts 40 and 44. When the saw teeth of the surfaces 30 and 34 are exactly in mesh, the spring effect of the blade 36 will carry the follower 7 and the contact 40 to the left extremity of their movement to make contact with the contact 42. When the saw teeth are in contact intermediate the top and the bottom, the blade 36 will be held between the contacts 42 and 44 to prevent current flow to either contact. The radii of the different segments 21, 22, 24 and 26 may be so chosen to hold the teeth either with the tops in engagement or nested, or at intermediate points to provide the switch positions desired. The ramp 28 returns the follower 7 to its upper position. The knob 46 fastened to the right end of the shaft 3 may be used to manually turn the shaft 3 and the cam 5 in the clockwise direction.

In Figure 2, a cam 55 is fixed to a shaft 53 and similarly includes sections 57, 59, 61 and 63 of progressively reduced radii. The junctions of the sections are provided by sharp drops. Between the sections 63 and 57 there is provided a gradual lifting ramp 65. This cam 55 and the shaft 53 may be similar to the corresponding mechanism in Figure 1 and may be similarly provided with a drive mechanism and knob.

A cam follower 67 is provided with a foot 69 held in engagement with the periphery of the cam 55 by a tension coil spring 71. The follower 67 is somewhat T-shaped and is provided with a sawtoothed cam surface 73 on its lower edge. The upper edge of the follower 67 is received within the notches 75 in the guide members 77.

Beneath the cam follower 67 is a spring blade 79 provided with an anchorage 81 at one end and a double contact 83 at the opposite end. The double contact 83 operates between the upper and lower stationary switch contact members 85 and 87. At an intermediate point of the switch blade 79 there is provided an inverted V-shaped hump 89 substantially complementary to the notches between the saw teeth of the cam surface 73. When the hump 89 rests on one of the tips of the saw teeth, as shown in Figure 2, the switch blade 79 will be pushed downwardly to move the contact 83 into engagement with the contact 87. When the cam moves the follower 67 so that the hump 89 is in any of the notches between the saw teeth of the cam surfaces 73, the spring force of the blade 79 will carry the contact 83 into engagement with the upper stationary contact 85. When the cam 55 moves the follower 67 so that the hump 89 is at an intermediate point upon any of the teeth of the

cam surface 73, the contact 83 will be held at an intermediate point out of contact with both the upper and lower contacts 85 and 87.

As described in Figure 1, the radii of the cam 55 may be chosen so as to move the cam follower 67 to present either a high, low or intermediate surface of the cam surface 73 in engagement with the hump 89 appropriately hold the switch blade in either lower, upper or intermediate positions as desired.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A switch mechanism including an actuating cam, a follower contacting and moved by said cam in a general direction, guide means for guiding said follower in said general direction in accordance with the movement provided by said cam, said follower being provided with a cam surface extending generally parallel to said general directions but having at least three successive distinct deviations laterally of said general direction, and a switch means operated in accordance with each of the deviations of the cam surface of said follower relative to the movement of said follower.

2. A switch mechanism including an actuating cam having a cam surface with at least three different distinct actuating sections at different progressively decreasing distances from a base line, a follower contacting and moved in at least three distinct progressive movements by said cam and cam surface according to the contour of said surface, guide means for guiding said follower in a general direction in accordance with the movement provided by said cam, said follower also having a cam surface extending at angles to said general direction to provide a plurality of distinct angular cam surfaces relative to said general direction, and a switch means operatively connected to said follower and operated in accordance with each of the deviations of said cam surface of said follower relative to said general direction, the difference in distance of the sections of the cam surface of said actuating cam from the base line being less than the length of one of the angular cam surfaces of said follower measured along said general direction.

3. A switch mechanism including an actuating means, a follower contacting and moved by said actuating means, guiding means for guiding said follower in a general direction in accordance with the movement provided by said cam, said follower having a sawtoothed type of cam surface having at least two teeth extending generally parallel to said general direction, a three position switch means operated in accordance with deviations of the teeth of said sawtoothed cam surface relative to said general direction, said actuating means having means for holding said sawtooth cam surface in three distinctly different positions relative to said switch means for holding said switch means in three different positions.

4. A switch mechanism including an actuating means, a follower contacting and moved by said actuating means, guide means for guiding said follower in a general direction in accordance with the movement provided by said cam, said follower having a sawtoothed type of cam surface having at least two teeth extending generally parallel to said general direction, double throw switch means having a follower projection in contact with said cam surface operable in response to the movement of said follower, said actuating means having at least three distinct actuating positions for holding said follower in at least three different positions with the follower projection in contact with the top and intermediate and bottom portion of one of said teeth to hold said switch means in an intermediate position or positions on either side of said intermediate position.

5. A switch mechanism including an actuating cam having a cam surface with at least three different distinct actuating sections, a follower contacting and moved by said cam and cam surface to three corresponding different distances, guide means for guiding said follower in a general direction in accordance with the movement provided by said cam, said follower having a cam surface with at least three deviations extending alternately at angles to said general direction, and a switch means having a follower projection in contact with the said follower cam surface operable to three different positions in response to the movement of said follower.

6. A switch mechanism including an actuating cam having a cam surface with at least three different distinct actuating sections, a follower contacting and moved by said cam in at least three distinct movements in a general direction, said follower having a cam surface provided with alternating deviations relative to said general direction, a guide means having a complementary cam surface in contact at one point with said cam surface of said follower, and double throw switch means alternated a plurality of times laterally of said general direction by the distinct movements of said follower relative to said guide means.

7. A switch mechanism including an actuating cam, a follower contacting and moved by said cam in a general direction, said follower having a cam surface provided with at least three distinctly separate deviations relative to said general direction, guide means having a complementary cam surface in contact at one point with said cam surface of said follower, a laterally movable switch blade operably connected to said follower for distinct movements laterally of said general direction corresponding to said distinctly separate deviations, and spaced relatively stationary contacts laterally located on opposite sides of said switch blade and engaged by said switch blade at the extremity of its movements.

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