

Dec. 20, 1938.

J. H. STALEY

2,141,024

TIME CYCLE CONTROLLER

Filed Feb. 15, 1937

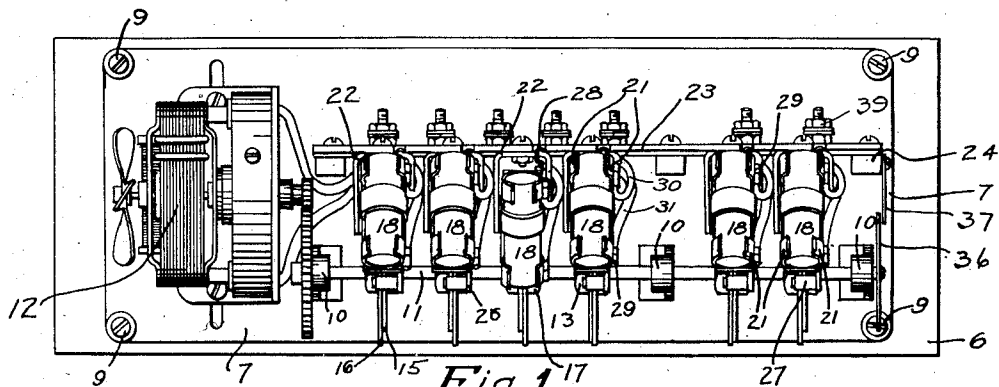


Fig. 1

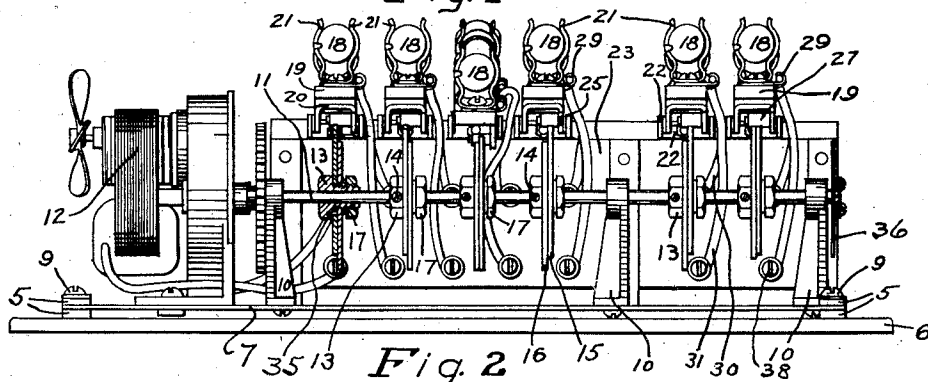


Fig. 2

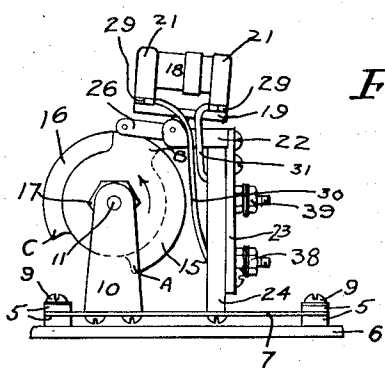


Fig. 3

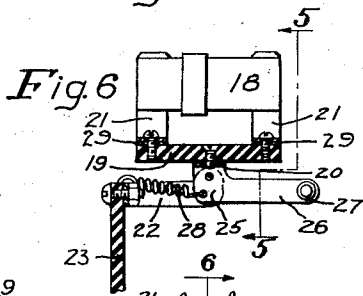


Fig. 4

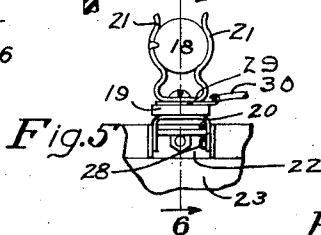


Fig. 5

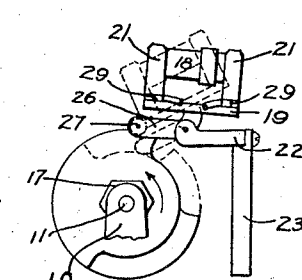


Fig. 6

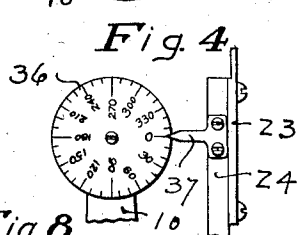


Fig. 7

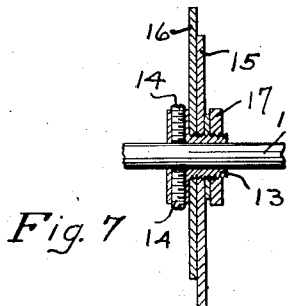


Fig. 8

Inventor

Joseph H. Staley
By Minton & Minton,
Attorneys

UNITED STATES PATENT OFFICE

2,141,024

TIME CYCLE CONTROLLER

Joseph H. Staley, Columbus, Ind., assignor to
Electric Switch Corporation, Columbus, Ind.

Application February 15, 1937, Serial No. 125,784

4 Claims. (Cl. 200—32)

This invention relates to means for controlling switching operations in one or more electrical circuits. There are many applications of the invention, one such being in illuminated signs such as are designed to simulate motion as well as to give a variable display. In this particular field it has been the customary procedure to devise some sort of mechanism whereby the individual circuits are closed and interrupted by a mechanism fixed in character. That is, the switch controlling mechanism was predesigned for the particular sign and if any variations in that sign were to be made from time to time, then the controller was obsolete.

It is a primary object of my invention to provide a very simple control structure which may be adjusted to close and interrupt the circuit or circuits throughout the entire range of any conceivable timing without having to add or subtract parts. A further primary object of the invention is to provide a circuit controller comprising rotating disks all of which are assembled on a single line shaft which may be varied in length for the required number of shaft members, and which structure may be produced at a relatively low cost and will be extremely durable throughout a long period of time. These and other objects such as certain advantages in the assembly and manufacture of the parts thereof which will be apparent to those versed in the art will be readily indicated by the following description of one particular form of the invention as illustrated by the accompanying drawing, in which—

Fig. 1 is a top plan view of a structure embodying my invention;

Fig. 2, a side elevation;

Fig. 3, an end elevation;

Fig. 4, a detail in end elevation illustrating a change in setting;

Fig. 5 is a detail in section on the line 5—5 of Fig. 6;

Fig. 6 is a detail in section on the line 6—6 of Fig. 5;

Fig. 7, a detail in section of the timing disk mounting; and

Fig. 8, a detail in end elevation of the time indicator.

Like characters of reference indicate like parts throughout the several views in the drawing.

A sub-base plate 7, here shown as of metal, is supported from and above a metal base 6 where it is retained by screw-bolts 9 passing through the plate 7 and seated in the base 6, and to reduce the noise made by the machine, and also to lessen vibrations going to or from the machine, I place

thick rubber washers 5 on each side of the sub-base 7. Standards 10 seated on the sub-base 7 support a shaft 11 by suitable journal boxes in which the shaft revolves. Some means is employed to drive this shaft, such means being here shown as an electrically operated motor 12 interconnected with the shaft through a spur gear reduction drive. In some installations, this motor may be a synchronized motor although not necessarily so.

Mounting hubs 13 are placed on the shaft 11 to be fixed thereto by some means, here shown as by two set screws 14, Fig. 7, so that as the shaft 11 may revolve, the hub 13 is carried around therewith.

On each of the hubs 13 are mounted a pair of disks 15 and 16, each disk being provided with a central hole therethrough so as to permit the disk to slip over a reduced portion of the hub 13, the reduced portion fitting slidably through the holes of the disks so as to carry the disks centrally of the shaft 11. Some means is provided to rigidly engage these two disks 15 and 16 in a desired operating position with the hub. The means herein shown and described comprises a pin 35 fixed in the head of the hub 13, Fig. 2, and extending into a hole in the disk 16, with a nut 17 screw-threadedly engaging over the end of the reduced portion of the hub 13 which extends through the two disks to permit that nut 17 to be drawn up snugly against the disks and compressibly against the head or shoulder of the hub 13 at the end of the reduced portion.

The disks 15 and 16 are herein shown as being identical in shape and size and an advantage is found in this fact in that all of the disks employed may be produced by one die and only one style of disk need be made. Each disk is provided with a periphery substantially 180° in extent comprising that part of a circumference of a circle the center of which is on the axis of the shaft 11. The other 180° of the periphery of the disk comprises substantially that part of the circumference of a circle whose radius is less than that of the first circle. The off-set between the larger and smaller circumferential parts is sloped and interconnects therebetween with rounded contours. Now it is to be seen that by placing two of these identical disks on one hub 13, one disk may be adjusted circumferentially about the hub in respect to the other disk so as to secure an effective periphery of the larger circle running from 180° to 360° or any spacing therebetween.

While the rounded corners at the juncture of

the inclined surface between the smaller and larger circular peripheries causes those portions to be somewhat less than 180°, the slight indentation therebetween when one disk is revolved 180° in respect to the other is not sufficient to permit operation of the switch.

For example, Fig. 3, the corner A of disk 15 is carried around clockwise from the corner B of disk 16 to give the total circumferential line running from the point C of the disk 16 around the disk periphery to the point A of the disk 15, or in other words, that distance A B has been added to the distance C B of the disk 16. This relative adjustment of one disk to the other is secured and maintained as follows:

The disk 16 is first placed along on the shaft 11, over the hub 13 and positioned on the pin 35, whereby, as the hub 13 may be revolved on the shaft 11 by the head of the hub, the disk 16 may, through its pin connection, be likewise revolved. On the outer end of the shaft 11 is fixed an indicating disk 36 which is initially turned to a starting position such as "zero". With the indicator 36 thus set, the cam disk 16 is positioned to have one of its shoulders at the "lift" or "drop" position for the roller 27 as desired (as pointed out below), whereupon the screws 14 are tightened to fix the hub 13 to the shaft 11. Then the second disk 15 is brought over the hub 13 against the disk 16 and the shaft 11 turned to bring the indicator disk 36 around to the next operating sequence of the roller 27, whereupon the disk is revolved to bring its contour into conformance with that operating position and the nut 17 is then tightened against the disk 15 to grip it securely against the disk 16 to form the then completed cam comprised of the two disks. The indicator 36 is adjusted as above indicated relative to any fixed point such as the pointer 37 mounted on the post 24.

While I have here shown, Figs. 1 and 2, six sets of the disks carried on the shaft 11, more or less may be carried on the shaft by varying its length as the conditions may warrant, depending, of course, upon the number of circuits to be controlled.

The combined contours of the pairs of disks 15 and 16 may be utilized to operate any desired switching mechanism, the particular type herein shown being a mercury tube switch 18 of the type shown in my U. S. Letters Patent No. 1,906,118, issued April 25, 1933, although other types of mercury tube switches may be employed. In the form here shown the tube 18 is removably held by a pair of clips 21 which stand upwardly of a rocker 19 of non-electric conducting material. The rocker 19 is fixed to a cross bar 20 preferably of metal having a depending ear at each side, through which ears the bar 20 is hinged by the ears between and to the spaced apart arms of a U-shape bracket 22. The bracket 22 is bolted to a panel of non-conducting material 23, supported by standards 24 from the sub-base 7. The panel 23 preferably extends for the entire length of the series of switches as shown in Figs. 1 and 2.

One of the ears 25 of the bar 20 has an arm extension 26 to have its outer end in the path of the pair of disks 15 and 16 thereunder, and for the purpose of eliminating friction and providing a smoother operating device I mount a roller 27 on the end of the extension to bear against the periphery of the disks. A spring 28 has one end fastened to the lower rear end of the ear 25 below its rocking axis and the other end to the panel 23 to normally contact the roller

27 with disks 15 and 16. Metal conductor plates 29 make contact with the respective terminal clips 21 of the mercury switch tube 18 and have leads 30 and 31 from the respective plates to the panel 23 to suitable wiring terminals 38 and 39 for the circuits to be controlled.

Referring to Fig. 4, as the motor 12 may cause the shaft 11 to revolve, the various pairs of disks 15 and 16 are revolved therewith so that the rollers 27 will ride on the peripheries of the respective combined pairs, holding the rocker 19 in an upper position as indicated by the solid lines when the roller is bearing against the circumference of the larger circle of the disks and allowing the rockers 19 to drop down to ride over the small circumferential periphery when that portion is presented. In other words, as the disks revolve, the switch 18 in each instance will be raised and lowered to cause the closing and interruption of the circuit through that switch tube 18 as desired. Of course, the tube 18 may be placed between the clips 21 in one of two positions, first to have the circuit closed when the tube is in the upper position as indicated by the solid lines in Fig. 4 and have the circuit open when in the lower position as indicated by the dash lines, and second when reversed, to have the circuit open when in the upper position and closed when in the lower position. This condition, of course, may be taken advantage of when adjusting the relative positions of each pair of disks 15 and 16 so as to secure the desired timing sequence between the closed and interrupted circuit conditions as well as between each pair of disks so that one circuit operation may be varied in relation to another circuit operation.

Attention is directed to the fact that where multiple groups of cams are carried on the same shaft, the cams in each group may be adjusted independently of those in other groups so that a wide range of circuit operations may be had upon each revolution of the shaft, as above indicated. For instance, one group may control its circuit so as to give say sixteen circuit "breaks and makes" per revolution, another group adjusted to control its circuit to give two "breaks and makes" per revolution, while other groups may control their circuits to give "breaks and makes" in one part of the revolution and none in the remainder. Thus it is to be seen that the structure is extremely flexible as to the range of possible circuit controls.

While I have herein shown and described my invention in the one best form as now known to me, it is obvious that structural variations may be had without departing from the spirit of the invention and I, therefore, do not desire to be limited to that precise form beyond the limitations as may be imposed by the following claims.

I claim:

1. In an adjustable timing switching mechanism, a rotatable shaft, means for rotating the shaft, at least one switch along the shaft, a sleeve shiftable both longitudinally and revolvably of the shaft, means for securing the sleeve in selected positions on the shaft in reference to said switch, a composite cam carried by said sleeve having two co-axial parts to form an adjustably shaped periphery, means removably engaging one of said cam parts with said sleeve to carry that part in fixed position therewith, the second cam part being revolvably carried by the sleeve to be shiftable therearound in respect to the first cam part, a member carried by the sleeve securing the second cam part on the sleeve

whereby the two cam parts initially adjustable one in respect to the other may be revolvably and longitudinally adjusted as a combined unit on said shaft and then fixed thereto in reference to said switch, and a switch actuating member into the path of which said cam is located to rock the actuating member and thereby operate said switch in timed sequence in accordance with the cam shape and the rotation of said shaft.

2. In an adjustable timing switching mechanism, a rotatable shaft, means for rotating the shaft, at least one switch along the shaft, a sleeve shiftable both longitudinally and revolvably of the shaft, means for securing the sleeve in selected positions on the shaft in reference to said switch, a composite cam carried by said sleeve having two co-axial parts to form an adjustably shaped periphery, means removably engaging one of said cam parts with said sleeve to carry that part in fixed position therewith, the second cam part being revolvably carried by the sleeve to be shiftable therearound in respect to the first cam part, a member carried by the sleeve securing the second cam part on the sleeve whereby the two cam parts initially adjustable one in respect to the other may be revolvably and longitudinally adjusted as a combined unit on said shaft and then fixed thereto in reference to said switch, and a switch actuating member into the path of which said cam is located to rock the actuating member and thereby operate said switch in timed sequence in accordance with the cam shape and the rotation of said shaft, a head on said sleeve between which and said securing member both of said cam parts are compressively engaged, said securing member consisting of a nut screw-threadedly engaging said sleeve.

3. In an adjustable timing switching mechanism, a rotatable shaft, means for rotating the shaft, at least one switch along the shaft, a sleeve shiftable both longitudinally and revolvably of the shaft, means for securing the sleeve in selected positions on the shaft in reference to said switch, a composite cam carried by said sleeve having two co-axial parts to form an adjustably shaped periphery, means removably engaging one of said cam parts with said sleeve to carry that part in fixed position therewith, the second cam part being revolvably carried by the sleeve

to be shiftable therearound in respect to the first cam part, a member carried by the sleeve securing the second cam part on the sleeve whereby the two cam parts initially adjustable one in respect to the other may be revolvably and longitudinally adjusted as a combined unit on said shaft and then fixed thereto in reference to said switch, and a switch actuating member into the path of which said cam is located to rock the actuating member and thereby operate said switch in timed sequence in accordance with the cam shape and the rotation of said shaft, a head on said sleeve between which and said securing member both of said cam parts are compressively engaged, said securing member consisting of a nut screw-threadedly engaging said sleeve, said first cam part engaging means consisting of a pin carried by said head and entering the cam part.

4. In an adjustable timing switching mechanism, a rotatable shaft, means for rotating the shaft, at least one switch along the shaft, a sleeve shiftable both longitudinally and revolvably of the shaft, means for securing the sleeve in selected positions on the shaft in reference to said switch, a composite cam carried by said sleeve having two co-axial parts to form an adjustably shaped periphery, means removably engaging one of said cam parts with said sleeve to carry that part in fixed position therewith, the second cam part being revolvably carried by the sleeve to be shiftable therearound in respect to the first cam part, a member carried by the sleeve securing the second cam part on the sleeve whereby the two cam parts initially adjustable one in respect to the other may be revolvably and longitudinally adjusted as a combined unit on said shaft and then fixed thereto in reference to said switch, and a switch actuating member into the path of which said cam is located to rock the actuating member and thereby operate said switch in timed sequence in accordance with the cam shape and the rotation of said shaft, said switch being a mercury switch and clips carried by said arm removably and reversibly receiving the switch whereby the switch may be reversed in position as to open and closed circuit positions in respect to the travel of said cam.

JOSEPH H. STALEY.