Aug. 28, 1951 M. D. MARKLEY ET AL 2,565,735

SWITCH MECHANISM

Filed March 29, 1947

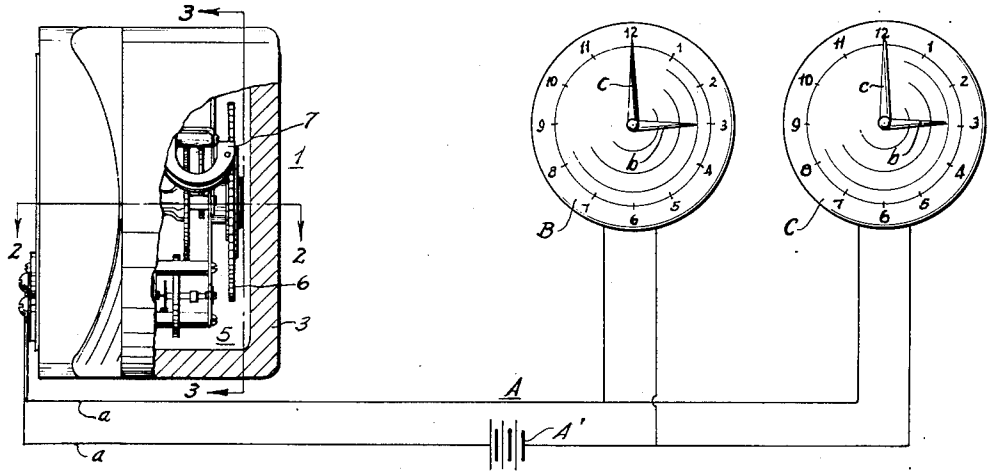


FIG. 1

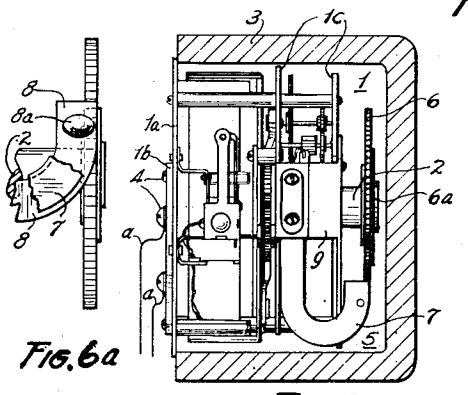


FIG. 6a

FIG. 2

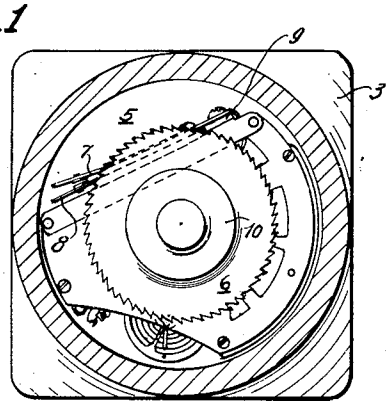


FIG. 3

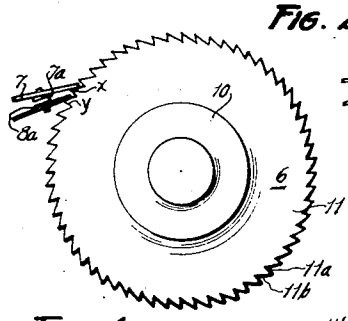


FIG. 4

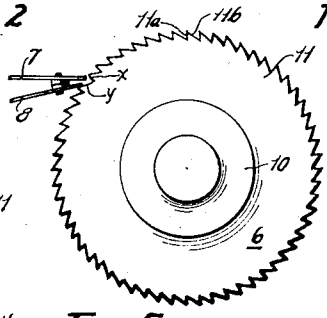


FIG. 5

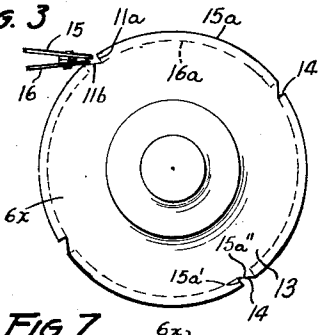


FIG. 7

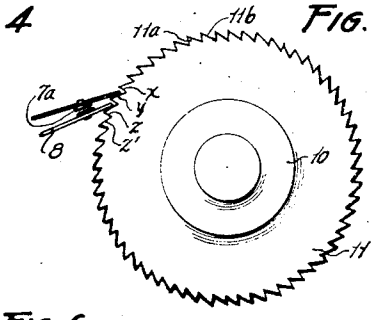


FIG. 6

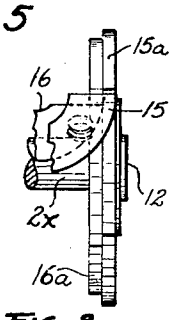


FIG. 8

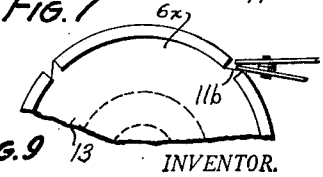


FIG. 9

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Patented Aug. 28, 1951

2,565,735

UNITED STATES PATENT OFFICE

2,565,735

SWITCH MECHANISM

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Application March 29, 1947, Serial No. 738,162

2 Claims. (Cl. 200—38)

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This invention relates to a switch means for an electric circuit having a pair of related contact supporting members each successively operated relative to the other to provide fast make-and-break contacts to insure definite impulses in the circuit. The contact supporting members are arranged to alternately ride the ends of revolving related walls with the result that the successive fast make-and-break contacts are effected irrespective of the speed of the related walls.

Our invention may be used to provide predetermined periodic impulses successively, uniformly or non-uniformly, in a circuit. In the preferred application of the invention the switch means are operated by a clock mechanism, so that during any predetermined time period the circuit or circuts may be closed any desired number of times, to impart impulses to and operate one or more electrical devices. In the illustrated application of the invention we provide for the closing of a circuit sixty times (once each minute) each hour period and operate the hour and minute hands related to two separate clock faces, but the mechanism lends itself to other applications, such as driving time disks and computing and printing elements for registering mechanisms, one example of which is shown in our co-pending application Ser. No. 298,311, filed October 6, 1939, now Letters Patent No. 2,487,819, dated November 15 1949.

In all switches operated by a clock mechanism, of which we have knowledge, unsatisfactory results were present, namely, undue load was placed on the mechanism so that the keeping of time became irregular and inaccurate and this in turn affected the devices controlled by the circuit, as well as the co-ordination of these devices with other types of computing devices with which, in some instances, they were associated; the make-and-break of the contacts lacked sufficient snap action or speed to prevent multiple impulses and arcing, and arcing had the effect of damaging the parts associated with the contacts; also, installation and/or repair of the power take off to operate the switches required disassembly of the clock mechanism.

One object of the invention is to provide an improved switch means for an electric circuit having related contact supporting members each controlled to operate relative to the other to insure fast make-and-break engagement of the contacts.

Another object of the invention is to provide an improved switch means operated by a rotating member having related walls on its periphery

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adapted to operate the switch contact elements to make fast make-and-break contacts thereof irrespective of the speed of the rotating member.

Another object of the invention is to provide an improved clock operated switch means so connected with the clock mechanism as to eliminate drag on the gearing thereof and utilize a minimum amount of the available power, whereby the accurate time keeping characteristic of the clock mechanism is not affected.

Another object of the invention is to provide an improved clock operated switch means, wherein the supports for the switch contacts are definitely controlled to make predetermined related engagements successively to close a circuit.

Another object of the invention is to provide an improved clock operated switch means employing a driven ratchet and supporting members for the switch contacts arranged to successively ride teeth of the ratchet, one member being arranged to ride one tooth and effect engagement of the contacts in advance of the riding of another tooth by the other member, to insure a fast make-and-break operation of the switch contacts.

Another object of the invention is to provide an improved clock operated switch means employing a driven ratchet and contact supporting members the free ends of which, prior to and following each make-and-break of the contacts to close and open the circuit, engage certain teeth of the ratchet to prevent multiple impulses or contacts of the switch contacts and arcing therebetween.

Another object of the invention is to provide an improved electric switch means adapted to be operated periodically by a driven member of a clock mechanism.

A further object of the invention is to provide an improved electric switch means for periodically closing a circuit, of relatively simple construction and capable of being readily connected with a driven member of a clock mechanism for operation thereby.

Other objects of the invention will be apparent to those skilled in the art to which our invention relates from the following description taken in connection with the accompanying drawing, wherein

Fig. 1 is a view, partly diagrammatic and partly in section, showing a switch means embodying our invention.

Figs. 2 and 3 are sections on the lines 2—2 and 3—3, respectively, of Fig. 1.

Figs. 4, 5 and 6 are elevational views (somewhat

enlarged) showing the position of the contact supporting members during rotation of the ratchet wheel to close and open the electric switch.

Fig. 6*a* is a fragmentary view of parts shown in Fig. 4, parts thereof being broken away.

Fig. 7 is a view similar to Fig. 4, but showing a modification.

Fig. 8 is a plan view of the parts shown in Fig. 7.

Fig. 9 is a fragmentary side elevation looking toward the right of Fig. 8.

In the drawings, 1 indicates as an entirety a suitable clock mechanism which may be spring or electrically operated, an electrically wound, spring operated mechanism being shown for illustrative purposes. The hour hand shaft of the mechanism is shown at 2. The mechanism 1 is mounted on a plate 1*a* and enclosed in a suitable casing 3, which may be removably secured to the plate 1*a* in any desired manner. The plate 1*a* is provided exteriorly with a wall 1*b* formed of suitable insulating material, in which electrical terminals 4 are mounted for leads *a*, *a*, of an electric circuit A, the source of current supply of the circuit being shown at A'.

The circuit A is parallel connected to suitable hour and minute hands *b*, *c*, associated with each of the clock faces B, C. As will be understood, the clock faces B, C, are supported at locations remote from each other and the clock mechanism 1.

5 indicates as an entirety a switch mechanism consisting of a wheel 6 provided on its periphery with projections or teeth and suitably fixed to the outer end of the hour hand shaft 2, and a pair of members 7, 8, provided inwardly of their outer ends with operatively related opposed contact elements 7*a*, 8*a*, respectively, adapted to make contact, one with the other, successively during rotation of the wheel 6.

Where the circuit operating mechanism 5 is to be operated each minute throughout successive hour periods, the wheel 6 is provided with sixty teeth or projections.

The inner end portions of the members 7, 8, are suitably connected to terminals mounted in a base 9, which is supported on the plates 1*c* of the mechanism 1, the members 7, 8, and the terminals therefor being suitably insulated from each other, the base 9 and the parts of the mechanism 1, and the terminals in turn being connected to the terminals 4, respectively. The contact supporting members 7, 8, are formed of resilient conducting material and disposed in spaced relation and mounted on the base 9 so as to effect and maintain their outer ends in yieldable engagement with the ratchet teeth under pressure as the wheel 6 rotates. To economize on space, the outer end portions of the supporting members 7, 8, are reversely curved to dispose their free ends in the plane of the ratchet wheel 6. The member 7 extends beyond the member 8 a predetermined distance so as to engage and ride a tooth rearward of the one with which the member 8 engages and rides, in making each impulse in the circuit A, as later set forth. In the embodiment shown in Figs. 1 to 6, inclusive, the member 7 rides the tooth adjacent to and rearward of the tooth on which the member 8 rides in a make-and-break operation to make an impulse in the circuit A; but as later set forth, the members 7 and 8 may be arranged to engage and ride teeth which are not adjacent to each other in each operation to close the circuit.

By mounting the ratchet wheel 6 on the hour hand shaft 2, a minimum amount of the available power for the clock mechanism 1 is utilized to operate the switch mechanism and the clock movement is relieved of the load required to drive the ratchet wheel 6, so that danger of the clock mechanism failing to keep accurate time is substantially eliminated; also, it will be noted that in mounting the ratchet wheel 6 on the shaft 2 and the supporting members 7, 7, on the frame plates 1*c*, installation, repair and adjustment of these parts may be made without any disassembly of the clock mechanism.

The ratchet wheel 6 preferably consists of a hub 10 suitably fixed to the shaft 2 and an annular disk 11 fixed to the hub 10 and provided with ratchet teeth on and extending around its periphery. The annular disk 11 is formed of rigid material having electric insulating characteristics. Each tooth of the wheel 6 consists of an end wall or riser 11*a*, preferably disposed radially of the shaft 2 and a face 11*b* with which the members 7, 8, engage under spring pressure and ride successively, respectively, as the wheel 6 rotates. Each tooth face 11*b* is preferably disposed at an angle of 60 degrees to the riser 11*a* of the adjacent rearward tooth. As shown in Figs. 3 and 4, the terminating end portions of the members 7, 8, are arranged to simultaneously engage the rider faces 11*b* of adjacent teeth, and in such position the contacts 7*a*, 8*a*, are disengaged. For example, in Fig. 4 the wheel 6 is turning clockwise and the members 7, 8, have engaged the faces 11*b* of adjacent teeth *x*, *y*, and both are riding these faces due to rotative movement of the wheel 6. As this rotative movement continues the supporting member 7 rides the outer end of the tooth face 11*b* of tooth *x* and snaps downwardly (as viewed in Fig. 5), thereby causing contact element 7*a* to engage contact element 8*a* which is held in position by the engagement of the member 8 with the face 11*b* of tooth *y*, and close the circuit A. As this contact or engagement of the elements 7*a*, 8*a*, is effected the member 8 simultaneously is riding the face 11*b* of tooth *y* and approaching the outer end of the latter, due to the rotation of the wheel 6, so that the member 8, following the closing of the circuit A, rides the end of face 11*b* of tooth *y* and snaps downwardly (as viewed in Fig. 6) into engagement with the face 11*b* of tooth *z*, thereby disengaging the contact element 8*a* from contact element 7*a* to open the circuit A (see Fig. 6), whereas supporting member 7 engages the face 11*b* of tooth *y*. As the ratchet wheel 6 continues turning, the member 7 will ride the face 11*b* of tooth *y* to effect contact of element 7*a* with element 8*a* and the member 8 will then ride the face 11*b* of tooth *z* and snap into engagement with the face 11*b* of tooth *z'* and disengage element 8*a* from element 7*a*.

It will thus be noted that the supporting member 7 successively rides each tooth to effect contact of the elements 7*a*, 8*a*, and that the supporting member 8 following each contact rides the adjacent advancing tooth to disengage the contact elements.

From the foregoing description it will also be observed that the supporting members 7, 8, are independently supported at their inner ends and each thereof independently snaps relative to the other member as it rides each ratchet tooth and that each engagement of the contact elements 7*a*, 8*a*, to close the circuit A, and each disengagement thereof to open the circuit A takes place

with a snap action to avoid arcing; and as the contact elements 7*a*, 8*a*, are maintained separated, except for a short period, danger of multiple impulses taking place is eliminated.

While we have shown one pair of contact supporting members for controlling the circuit A, by providing separate circuits and a pair of contact supporting members for engagement with the teeth of the wheel 6 for each circuit the latter may be closed and opened in the manner above set forth.

Figs. 7 and 8 illustrate a modified form of construction embodying our invention wherein a circuit may be variously controlled. For example, if the ratchet wheel 6*x* is making one revolution each hour, the circuit may be closed and opened at predetermined intervals and maintained opened for a definite period of time, these views illustrating uniformly spaced teeth 14, each having a riser wall 11*a* and a rider face 11*b*, and arranged to close the circuit every 15 minutes; or if the wheel 6*x* is driven at a faster or slower rate the circuit will be closed in each revolution thereof according to the spacing of the teeth 14 and speed of the wheel 6*x*.

The wheel 6*x* consists of a hub 12 adapted to be secured to a driven shaft 2*x* and an annular disk 13 fixed to the hub 12 and formed of suitable insulating material. The members are supported as already set forth and connected to leads of an electric circuit (not shown). Intermediate the teeth 14 the disk 13 is provided with arcuate walls 15*a*, 16*a*, in side by side relation and disposed on different radii of the axis of the wheel 6*x*, the member 15 being arranged to engage and ride on the wall 15*a* and the member 16 being arranged to engage and ride on the wall 16*a* and the teeth 14 as the wheel 6*x* rotates to revolve the teeth 14 and walls 15*a*, 16*a*, relative to the members 15, 16, respectively.

As shown, the tail end of each wall 15*a* is disposed on a radius cutting the inner end of the adjacent tooth 14, as shown at 15*a'*, whereas the advancing end of the wall 15*a* is inclined upwardly as shown at 15*a''* in the plane of the face 11*b* to guide the member 15 thereto.

As shown in Fig. 7, with the wheel 6*x* turning clockwise, the member 16 has engaged with and is riding the face of a tooth 11*b* and the member 15 has approached the tail end of adjacent wall 15*a*, ridden the end thereof and snapped downwardly to effect contact of the contact elements, in the manner already set forth, following which the member 16 will ride the end of the tooth face 11*b* and snap downwardly to disengage the contact elements and engage the wall 16*a*, whereas the member 15 will ride the inclined wall 15*a''* onto the adjacent wall 15*a*, these operations being repeated as each tooth 14 moves past the members 15, 16. It will thus be seen that the tail end of each wall 15*a* serves as a tooth to cooperate with the adjacent tooth 14 to effect a closing and opening of the circuit.

It will be observed that any number of teeth 14 and related walls 15*a'*, 15*a''*, uniformly or non-uniformly spaced, may be provided to close and open an electric circuit.

To those skilled in the art to which our invention relates many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. Our disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What we claim is:

1. In switch means of the class described, the combination with a shaft adapted to be connected to and continuously driven by a clock mechanism, of switch means consisting of a wheel fixed to and driven by said shaft and provided on its periphery with arcuate walls in side by side relation and disposed on different radii, each said arcuate wall and the adjacent arcuate wall being of substantially equal length angularly and projecting members between the inner arcuate walls, each having an outwardly inclined rider face, the tail of each outer arcuate wall having an end wall disposed on a radius cutting the inner end of the adjacent rider face and its advancing end being inclined upwardly in the plane of the adjacent rider face, a pair of resilient conductor members adapted to be connected to the leads of an electrical circuit, means for rigidly supporting the inner ends of said members, contact elements mounted on the opposed surfaces of said members inwardly of their outer ends, the outer terminating end portion of one of said members having engagement with said inner arcuate walls under pressure and arranged to ride thereon and said rider faces and the outer terminating end portion of the other member having engagement under pressure with said outer arcuate walls, as said wheel rotates, the member which engages the outer arcuate walls being arranged to ride the tail end of each thereof as the member which engages the inner arcuate walls is riding the adjacent rider face to effect contact of said contact elements.

2. In switch means of the class described, the combination with a shaft adapted to be connected to and continuously driven by a clock mechanism, of switch means consisting of a wheel fixed to and driven by said shaft and provided on its periphery with spaced inner and outer arcuate walls in side by side relation disposed on different radii, each said arcuate wall and the adjacent arcuate wall being of substantially equal length angularly, a pair of members formed of resilient material, means for supporting the inner ends of said members, contact elements mounted on the opposed surfaces of said members inwardly of their outer ends and adapted to be electrically connected to the leads of an electrical circuit, the outer end portions of said members having engagement with said arcuate walls under pressure, respectively, and means between the respective adjacent ends of said walls for guiding the outer end portions of said members, one relative to the other, to effect engagement of said contact elements and disengagement thereof as said wheel rotates.

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