Dec. 8, 1959 TAIZO NAKAMURA 2,916,570

AUTOMATIC ELECTRIC TIMER

Filed Nov. 4, 1957 2 Sheets-Sheet 1

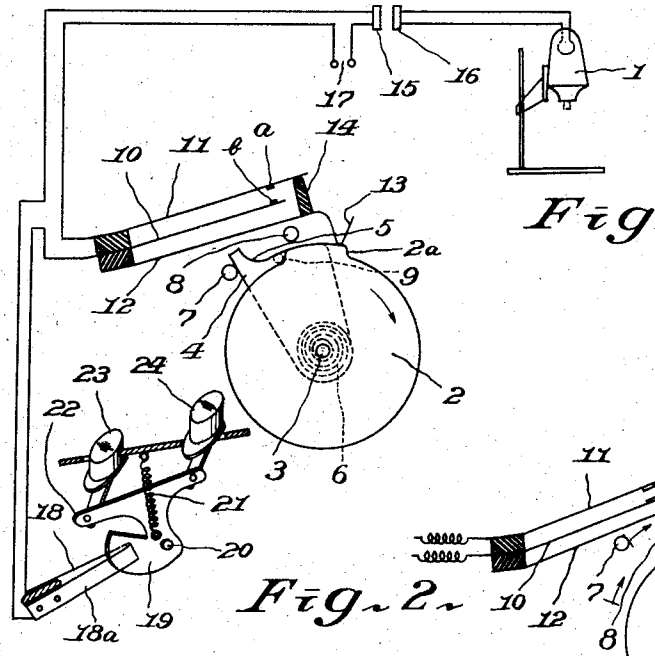


Fig. 1

Fig. 2

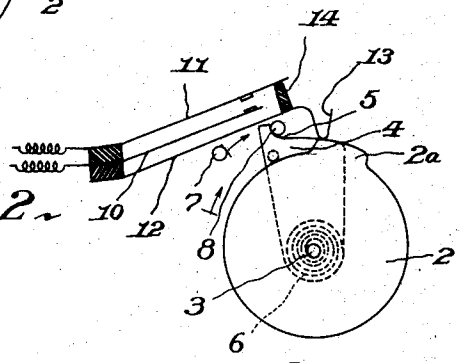
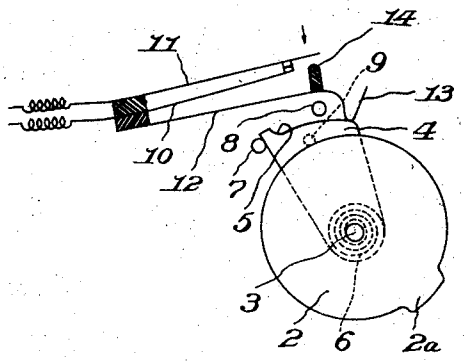


Fig. 4



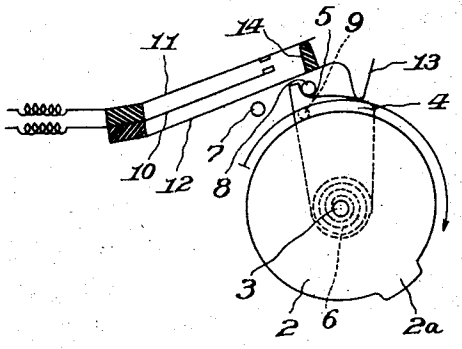


Fig. 3

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Fig. 5.

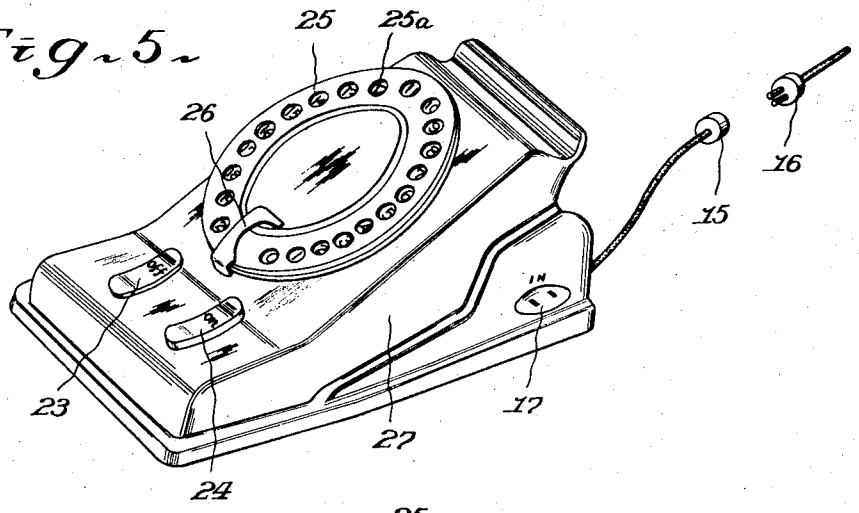
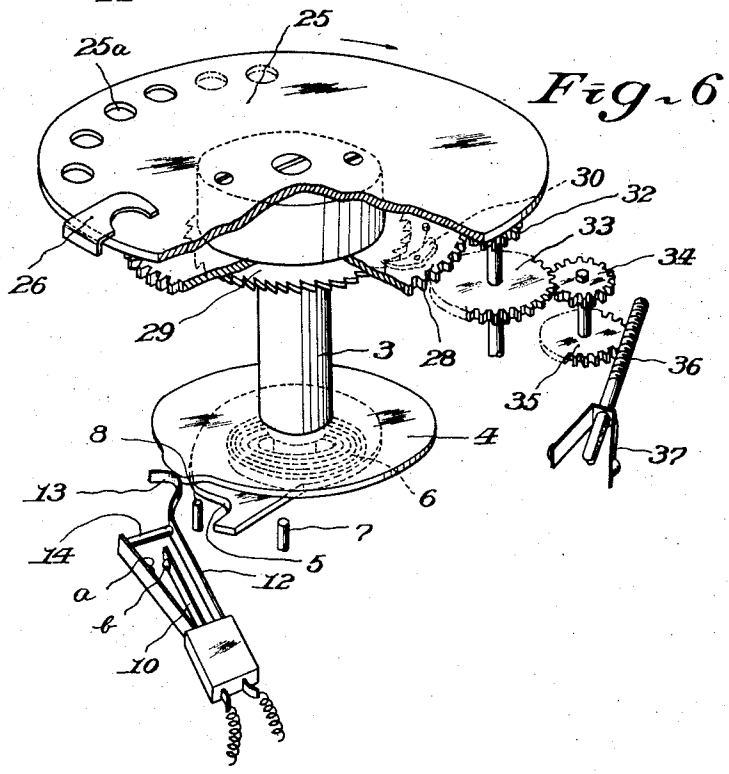


Fig. 6.



United States Patent Office

2,916,570

Patented Dec. 8, 1959

2,916,570

AUTOMATIC ELECTRIC TIMER

Taizo Nakamura, Fujisawa-shi, Japan

Application November 4, 1957, Serial No. 694,419

Claims priority, application Japan August 22, 1957

3 Claims. (Cl. 200—38)

This invention relates to improved automatic electric timers.

In the enlarging and printing of any photograph, it is conventional to light up the photographed film for a predetermined time, while viewing it in a dark room or relying merely upon one's feeling. These operations, however, are apt to cause eye and mental fatigue, and also cannot carry out accurate lighting. Although various kinds of electric or mechanical timers for said purpose have been proposed, they are too complicated and expensive for general use. Accordingly, they are inconvenient and not practical.

Therefore, an essential object of this invention is to provide an improved electric timer having none of the above-mentioned disadvantages, and more particularly to provide an inexpensive, small size electric timer, the treatment and operation of which are, respectively, very simple and accurate.

Said objects and other objects of this invention have been attained by a timer which comprises a moving member, such as a dial arranged so as to be rotated, a series of numbers plotted along said dial, a means for restoring said member to its initial position with a slow constant speed when said member is released, an electric circuit to be controlled. A means is provided cooperating with said moving member to close said electric circuit, said moving member, electric circuit and means being combined so that when said moving member is rotated to a stop, by supporting said member at its desired number portion and then is restored, said electric circuit may be utilized only for said restoring period, whereby a desired timing operation is made possible, for example, a printing lamp may be used during said period.

According to said timer, various operations, for example, lighting for any desired time in the photographic printing can be easily obtained by making the period of time in which the electric circuit is maintained in closed state correspond to the desirable printing time.

The novel features characteristic of the present invention are set forth with particularity in the appended claims. My invention itself, however, both as to its manner of construction and manner of operation together with further objects and advantages thereof, may best be understood by reference to the following description and claims taken in connection with the accompanying drawings, in which the same members are indicated by the same numerals and characters, and in which:

Fig. 1 is a schematic view of the principal construction and its electric connection of one embodiment of this invention.

Figs. 2–4 are different operative states of the dial device in the embodiment in Fig. 1.

Fig. 5 is a perspective view of an example of this invention.

Fig. 6 is a perspective view of an illustrative concrete dial device and contacts in the embodiment in Figs. 1–5, partly cut off.

Referring to Fig. 5, the timer is provided with a dial **25** having a series of finger holes **25***a* as used, for example, in the conventional telephones, said dial being rotatably supported on a base box **27** which is provided with a series of numbers at the positions just under said finger holes **25***a*. The finger holes **25***a* are not indispensable as long as the portion of the dial corresponding to a desired number can be rotated to a stop **26**. The dial **25** is provided with a cam plate which is attached to the shaft of said dial so that when said dial is rotated by a finger, said cam plate may be rotated together with said dial, but when said dial is released, said cam plate may be slowly rotated at a constant speed in the reverse direction, said slow rotation of said cam plate being obtained by a driving mechanism composed of gears, governor and the like, as will be described later in connection with the embodiment in Fig. 6.

The above-mentioned cam plate is indicated by a numeral **2** in Figs. 1–4. This cam plate **2** is provided with a projection **2***a*. To the shaft **3** of said cam plate is attached a timing plate **4** through a spring **6** so that said plate **4** may be rotated together with the cam plate **2** through the spring **6** when said plate **2** is made to rotate clockwise as shown in the drawing. Stops **7** and **8** are provided for the timing plate **4** and a stop **9** is provided for the projection **2***a*. Contact pieces **11** and **10** having, respectively, contacts *a* and *b* are faced so that said contacts may be opened when the contact piece **11** is pushed outwardly by an insulating pin **14** attached to the end portion of the other resilient piece **12**. The resilient piece **12** is provided at its end portion with an arcuate projection **13** which is positioned so as to be pushed upwardly by the projection **2***a* of the cam plate **2** and the projected edge **5** of the timing plate **4**.

An illustrative concrete construction of the dial device is shown in Fig. 6. Said mechanism consists of the dial **25** having a plurality of equidistanced finger holes **25***a* and attached to a shaft **3** which is rotatably supported by suitable bearings (not shown in the drawing), a ratchet wheel **29** attached fixedly to said shaft **3**, a large gear wheel **28** supported on said shaft **3** so as to be rotated relative to said shaft, a worm gear **36** having an adjuster **37** and meshed with said wheel **28** through a train of gears **32, 33, 34** and a worm wheel **35**, a ratchet **30** attached to said wheel **28** at its rear surface so as to allow only the counterclockwise rotation of said wheel **28**, a timing plate **4** provided with a projected edge **5**, a cam plate **2** having a projection **2***a*, and a spring **6** which is connected between the shaft **3** and the timing plate **4**. The contact mechanism consists of contact pieces **11** and **10**, a resilient piece **12** having an arcuate projection **13**, contacts *a* and *b* supported by said pieces **11** and **10**, and an insulating pin **14** supported by said piece **12**.

Let it be assumed that when the dial **25** is in stationary state, the members as described above are set in the position shown in Fig. 1, but when the dial **25** is rotated clockwise by a finger, the cam plate **2** is caused to rotate clockwise.

Then when the dial **25** is caused to rotate clockwise by a finger, the cam plate **2** is rotated clockwise together with the timing plate **4**. At the start of said rotation, the plate **4** is stopped by the stop **8**, as shown in Fig. 2. In this condition, the projection **2***a* of the cam plate **2** is detached from the projection **13**. The projection **13** is pushed upward by the high portion of the edge **5** of the plate **4**, so that the contacts *a* and *b* are maintained in opened position through the pin **14**. The cam plate **2** can be further rotated from the position shown in Fig. 2 to the position shown in Fig. 3, but the timing plate **4** is maintained at the position shown in Fig. 2, because said plate is stopped by the stop **8**. During said rotation of

the cam plate 2, the gear wheel 28 does not rotate, because the ratchet 30 is in a free state. However, when the dial 25 is released and the cam plate 2 is rotated counterclockwise by the spring force of the spring 6, the wheel 28 is made to rotate counterclockwise together with the ratchet wheel 29 due to the coupling of the ratchet 30 and the wheel 29, whereby the worm gear 36 is rotated through the gear trains (32, 33, 34 and 35). Accordingly, the restoration of the dial 25 and the cam plate 2 is carried out at a slow constant speed. On the other hand, however, the timing plate 4 is restored suddenly by the spring 6 to such initial position stopped by the stop 7 as shown in Fig. 4, whereby the projection 13 is dropped on the low peripheral edge of the cam plate 2 and the pin 14 is made to detach from the contact piece 11, resulting in closing of the contacts *a* and *b*.

Accordingly, the contacts *a* and *b* are positively closed for the period of time corresponding to the restoration angle of the cam plate 2, so that when the contacts *a* and *b* are inserted in an electric circuit to be controlled, for example, in the circuit of an electric lamp of such photographic printer 1 as shown in Fig. 1, it is possible to close the electric circuit for a period of time corresponding to the restoration angle of the dial. In Figs. 1 and 5, by the numerals 17, 15 and 16 are indicated, respectively, electric input terminals for the electric source, socket and plug.

In the timer of this invention, a push button mechanism such as, for example, shown in Fig. 1 may be used for directly opening and closing the electric source, said mechanism being composed of two contact pieces 18 and 18*a* which are connected in series to the electric circuit to be controlled, an insulating plate 19 having an electroconductive pin 20 and supported rotatably between said contact pieces 18 and 18*a*, an arm 22 projecting from said plate 19, push buttons 23 and 24 which are arranged to push down, respectively, the left side and right side portions of said arm, and a spring 21 acting to produce a quick turning of said plate 19 when any one of said push buttons is pushed down. Accordingly, when the push button 23 is pushed down, the plate 19 takes the position shown in Fig. 1 and the contact pieces 18 and 18*a* are opened by the insulating plate 19.

On the other hand, when the other push button 24 is pushed down, the electroconductive pin 20 is quickly brought between the contact pieces 18 and 18*a* by quick turning of the plate 19 due to the spring 21, whereby said pieces are short circuited by said pin 20 and the electric circuit is closed. Therefore, the push buttons 23 and 24 are, respectively, circuit opening button and circuit closing button.

According to this invention, as clearly understood from the above description, an electric circuit can be easily and accurately closed for any desirable period of time, without necessitating watch and one's feeling and with simple and easily operative construction.

When the closing time is insufficient, the dial may be operated for two or more times so as to obtain a sufficiently long operative closing of the circuit.

In the embodiment of this invention, for the purpose of obtaining an easy viewing of the dial number, it may be possible to use a semitransparent plate as the dial plate and to provide a small electric lamp under said plate to light it up, or to paint the upper surface of the dial plate with an illuminative paint. Furthermore, the spring 6 may be substituted with any other electric or mechanical mechanism having the same operating property as that of said spring.

The timer of this invention can be effectively used for various objects, for example, for photographic enlarger and other printing devices, and as lighting apparatus in microscope photography.

While I have described particular embodiments of my invention, it will, of course, be understood that I do not wish my invention to be limited thereto, since many modifications may be made and I, therefore, contemplate by the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

I claim:

1. An automatic timer comprising, in combination with an electric circuit the energization of which is to be controlled and timed, a rotatable main cam element angularly displaceable from an initial rest position to selected angular values of displacement corresponding to predetermined intervals of time, means to manually displace the main cam element angularly from its initial position to set the time during which the circuit is to be energized, means to restore the cam element to its initial rest position at a constant speed of angular restoration, a pair of normally open cooperating contacts connected in said circuit, means mounting one of the contacts constantly biasing it toward the other contact, holding means cooperative with said biasing means and the main cam to releasably hold the contacts open when the main cam is in said rest position, auxiliary cam means angularly displaceable jointly with said main cam a limited angular extent from a rest position to a position for cooperating with said holding means to maintain the contacts open during angular travel of the main cam, said restoration including means to quickly automatically restore the auxiliary cam means to its rest position subsequent to cessation of angular travel of said main cam to cause it to render the holding means ineffective to maintain the contacts open and allow said biasing means to close the contacts, said main cam having a camming surface for cooperating wth said holding means for causing it to open the contacts when the main cam is fully restored to its initial position.

2. An automatic timer according to claim 1, in which said means to manually displace the main cam element angularly from its initial position comprises a telephone-like dial having symbols angularly spaced thereon and visible in the dark to indicate different time settings to which the time may be set.

3. An automatic timer according to claim 1, in which said means to quickly restore the auxiliary cam comprises a spring, and in which said restoration means includes means to cause the spring to restore the main cam at a constant speed of travel.

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