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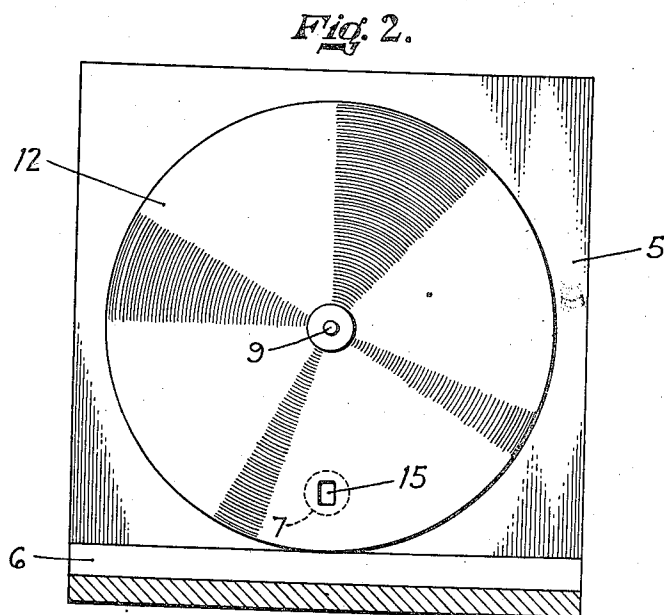
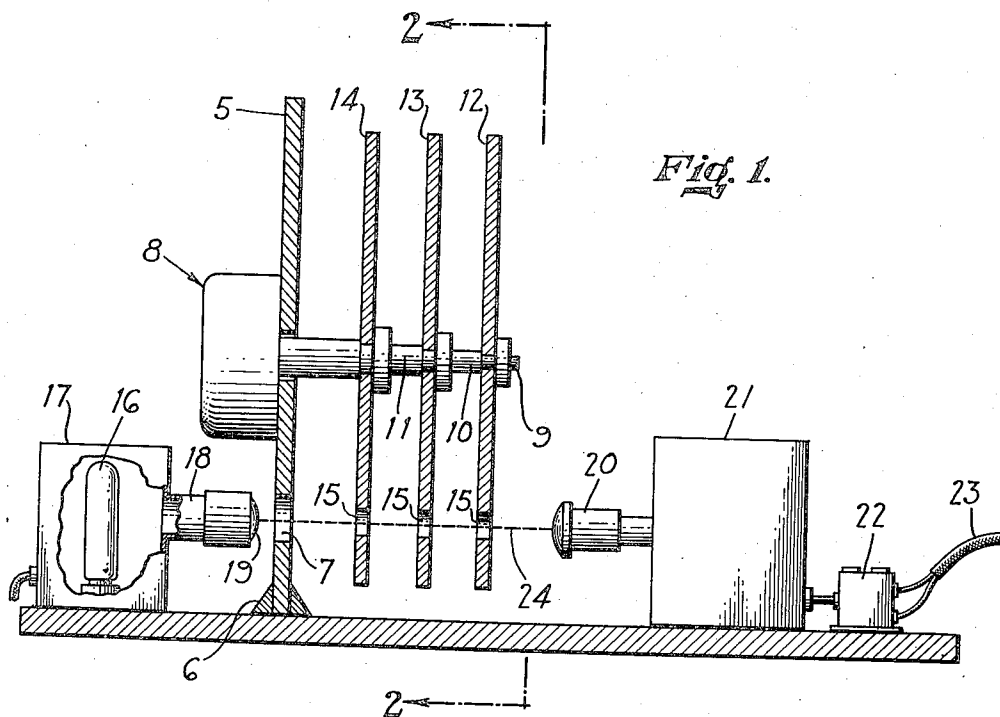
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2,268,133

ELECTRIC TIMING DEVICE

Filed June 17, 1938

2 Sheets-Sheet 1



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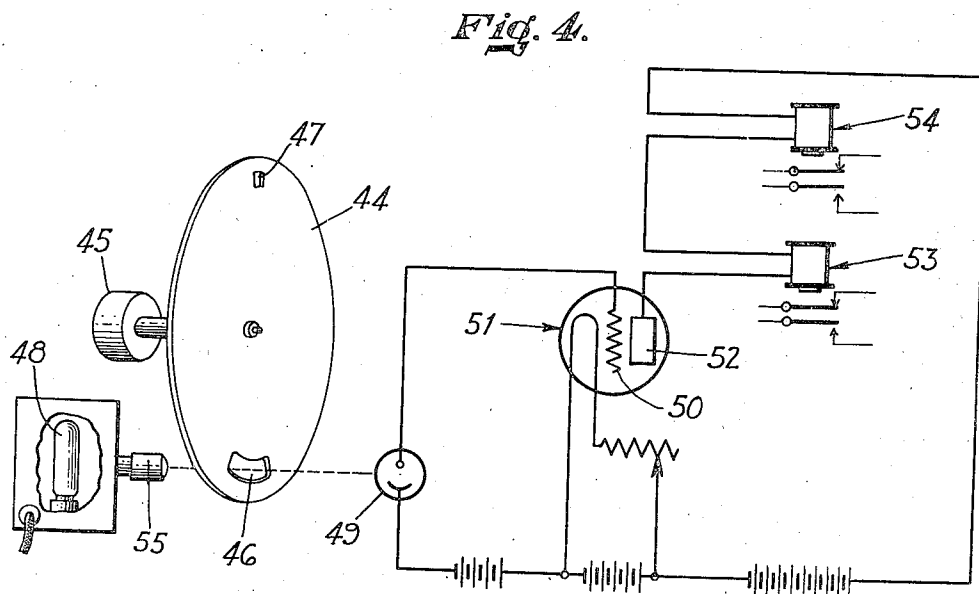
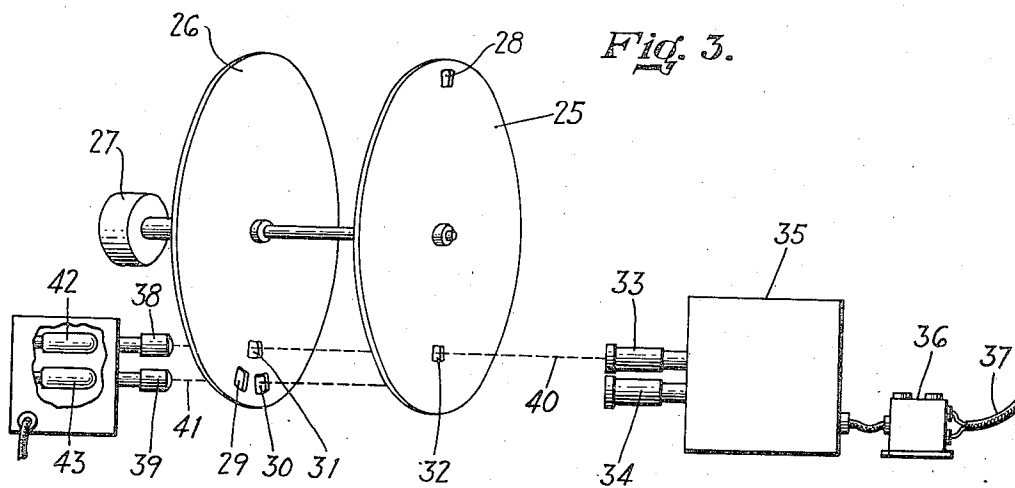
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,268,133

ELECTRIC TIMING DEVICE

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4 Claims. (Cl. 161-1)

This invention relates to an electrical timing device and refers more particularly to a device operated by a clockwork mechanism for providing impulses of electrical energy at predetermined time intervals.

An object of the present invention is the provision of a timing device which is simple in construction, easy to manufacture and reliable in operation.

Another object is the provision of an automatically operable timing device which may be used for emitting time signals at predetermined intervals, for example, for radio broadcasting purposes.

Other objects will be apparent in the course of the following specification.

The objects of the present invention may be realized through the provision of movable elements such as discs or drums, which are driven by a clock-work mechanism at different speeds and are provided with portions which are permeable to light, such as open portions or apertures, and which may be brought into alignment between a source of light and a light sensitive cell at a predetermined time, whereby said cell upon receiving the light beam provides an electrical current which is amplified and caused to operate a relay or the like.

The invention will appear more clearly from the following detailed description when taken in connection with accompanying drawings, showing by way of example, preferred embodiments of the inventive idea.

In the drawings:

Figure 1 is a diagrammatic view of the timing device constructed in accordance with the principles of the present invention;

Figure 2 is a view along the line 2-2 of Figure 1;

Figure 3 is a diagram illustrating a timing device as used, for example, for the making of signals in radio broadcasting; and

Figure 4 is a diagram showing a timing device capable of operating several circuits.

The timing device shown in Figures 1 and 2 comprises a support 5 having the form of a vertically disposed plate carried by the stand 6 and provided with an opening 7 which may be situated in the lower part of the support 5.

A clockwork mechanism, preferably, an electric synchronous clock motor, which is generally designated by the numeral 8 in the drawings, is firmly connected with the stand 5 and comprises shafts 9, 10, and 11 which extend through the support. In the construction shown in the draw-

ings, these shafts are concentrically disposed, although, obviously, eccentric shafts may be also used.

The shaft 9 which would be normally connected to the seconds' hand, is firmly connected with a disc 12. The shaft 10 which rotates at the rate of one revolution per hour is connected to another disc 13 which is situated behind the disc 12. The shaft 11 which may rotate at the rate of one revolution every twelve hours carries the disc 14, which is situated between the disc 13 and the support 5. The shafts 9 to 11 are firmly connected with their respective discs, so that the discs may rotate with the same speed with which the hands of a clock are rotated.

Obviously, the discs are made of some material which is impermeable to the rays emitted by the source 16; their number and their speed of rotation may be varied at will. For example, a device constructed in accordance with the principles of the present invention may be used with only one disc or two discs, and through the use of a suitably geared mechanism the speed of the discs may be changed at will.

As shown in Figure 2, the discs 12 to 14 are provided with suitable apertures or portions 15, which are permeable to the rays emitted by the source 16 and which are so located that in certain positions of the discs, these apertures are situated in alignment with each other in front of the opening 7 formed in the support 5.

An electrical lamp 16 or any other suitable source of visible or invisible rays is situated opposite the opening 7 formed in the support 5. The lamp 16 is preferably enclosed in a casing 17 which is provided with an opening 18 carrying a focusing lens 19. The opening 18 is situated directly opposite the opening 7, and the focusing lens 19 is so located that the light emitted by the lamp 16 will be transformed into a narrow beam of light 24 which extends horizontally through the opening 7 when this opening is exposed by the apertures 15 in the discs 12 to 14.

A photoelectric or light-sensitive cell 20 is situated in the path of the beam emitted by the lamp 16 on the opposite side of the support 5. The light-sensitive cell 20 is of standard construction and is illustrated diagrammatically in the drawing. The electrical circuit connected with the cell 20 includes an amplifier 21 and a relay or other suitable current-actuated device 22 which is used for the purpose of operating any suitable load circuit or signalling circuit indicated diagrammatically by the numeral 23 of the drawings.

The device is operated as follows:

It is apparent that at the moment when the beam of light 24 emitted by the lamp 16 reaches the photoelectric cell 20, this photoelectric cell will produce an electrical current which will cause the actuation of the relay 22. The duration of the time during which the cell 20 is actuated depends upon the time during which the beam of light 24 is allowed to reach the electric cell.

Through the use of a different number of discs 12 to 14 and through the provision of several apertures 15 on these discs, the time when the apertures of these discs will be in alignment with each other, thereby permitting the beam of light 24 to reach the light-sensitive cell 20 may be varied or regulated at will. At the same time, the duration of the period of exposure may be also varied by varying the width of the apertures 15 and/or the speed of rotation of the discs. By using large discs and an appropriate light source in conjunction with a quick acting trigger circuit in the sensitive cell amplifier, it is possible to obtain a very large number of impulses per second. If however, as in the example shown in Figures 1 and 2, the discs 12 to 14 are rotated at the same speeds with which the hands of a clock are rotated, and if each one of them is provided with a single suitably located opening, the light-sensitive cell 20 will be actuated once every twelve hours. The duration of the impulse received by the cell 20 depends then upon the angular width of the openings 15. If the opening 15 of the disc 12 rotating with the speed of one revolution per minute has an angular width corresponding to four degrees, the period of exposure will be two-thirds of a second.

As already mentioned, by a suitable selection of the speed of rotation of the discs and of the location and size of their apertures, it is possible to provide an impulse at practically any desired time interval and for any selected duration.

Figure 3 illustrates diagrammatically a practical embodiment of the principles of the present invention. In this case the two discs 25 and 26 are to be used for the purpose of automatically producing a time signal for radio broadcasting purposes, this time signal consisting of one single buzz or sound on the hour and two short signals every half hour. The disc 25 is rotated by the clockwork mechanism 27 with the speed of one revolution per hour, while the disc 26 is rotated by the same mechanism with the speed of one revolution per minute. The disc 25 is provided with an opening 28, which is situated close to the periphery of the disc and which is adapted to be brought into alignment with two openings 29 and 30 provided in the disc 26. In the example illustrated, each of the openings 29 and 30 has an angular width of four degrees and is separated from the other by an angle of four degrees.

Another opening 31 is provided in the disc 26 and is situated closer to the center of the disc than the openings 29 and 30. The disc 25 is provided with an opening 32 which is adapted to coincide with the opening 31 of the disc 26.

A light-sensitive cell 33 is situated on the level of the openings 31 and 32 while a second light-sensitive cell 34 is situated on the level of the openings 28, 29 and 30. The cells 33 and 34 are connected with each other, with an amplifier 35 and a relay 36, which is used for actuating a signalling circuit 37.

A focussing lens 38 is situated opposite the

cell 33, while the focussing lens 39 is situated opposite the cell 34. The beams of light 40 and 41 are produced by the lamps 42 and 43.

The position of the discs 25 and 26 shown in Figure 3 indicates the beginning of an hour. At that time the two openings 31 and 32 are in alignment with each other and with the ray of light 40. This ray of light which is concentrated by the focussing lens 38, will pass through the openings 31 and 32 in the discs 26 and 25 and will reach the light-sensitive cell 33, thereby energizing the cell. The current produced by the cell 33 will be amplified by the amplifier 35 and will actuate the relay 36, thereby producing a signal in the circuit 37. If the angular width of the opening 31 is four degrees, the time of passage of this opening 31 in front of the lens 38 will be such that the light-sensitive cell 33 will be subjected to the ray of light 40 during two-thirds of a second.

At that time, the beam of light 41 concentrated by the focussing lens 39 will not reach the light-sensitive cell 34, since the disc 25 will prevent the passage of light to this cell.

At the expiration of the time interval of two-thirds of a second, the opening 31 will move away from the beam of light 40, so that the light will not be able any more to reach the cell 33.

The disc 26 will continue its rotation, making one complete revolution in one minute. The disc 25, which rotates simultaneously with the disc 26, will complete one-sixtieth of a complete revolution during that minute. This movement of the disc 25 will be sufficient to shift the opening 32 in relation to the direction of the beam of light 40, so that when the opening 31 again appears in front of the beam of light 40, this light will be prevented now from reaching the cell 33.

After the expiration of half an hour, the disc 25 will complete half a revolution and the opening 28 will be moved into the path of the ray of light 41. When at this time the opening 30 will appear within the path of the beam of light 41, a signal, the duration of which depends upon the width of the opening 30, will be received in the circuit 37, since the cell 34 will be energized by the beam 41. After the opening 30 has passed beyond the beam 41, the opening 29 will appear in front of the beam and the cell 34 will be energized for the second time, so that a second signal will be received in the circuit 37. If the angular width of the openings 29 and 30 is four degrees and they are situated four degrees apart, two impulses will be produced, which are two thirds of a second apart and each of which is two thirds of a second in duration, the entire operation taking place in two seconds. Therefore, due to the described arrangement, the circuit 37 will receive one single signal every hour and two short signals every half hour.

The timing device shown in Figure 4 comprises a disc 44 which is rotated by the mechanism 45 and which is provided with a large opening 45 and a smaller opening 47. A source of light 48 transmits a beam of light through one of these openings to a light-sensitive cell 49 which is connected to the grid 50 of the vacuum tube 51 of the amplifier. The plate 52 of the vacuum tube 51 is connected with several relays 53 and 54 which are adjusted to operate at different amounts of plate current.

When the small aperture 47 is situated in front of the beam of light 55, the smallest amount of plate current will be produced, which, for example, will actuate the relay 53. When the aper-

ture 47 is replaced by the aperture 46, a greater amount of light will fall on the cell 49 and, in turn, the cell 49 will actuate the grid 50 of the vacuum tube 51 to a greater degree, resulting in a greater amount of plate current. The relay 54, for example, may be so adjusted that it will operate only when this greater plate current is available.

It is apparent that the specific illustrations shown above have been given by way of illustration and not by way of limitation, and that the structures above described are subject to wide variation and modification without departing from the scope or intent of the invention, all of which variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In combination, a source of light, a plurality of discs having openings formed therein, said discs being movable relatively to each other and preventing the rays of light emitted by said source from falling directly on a light sensitive element except in at least one predetermined relative position of said elements, and a clock-work mechanism connected with said discs for moving the same relatively to each other to cause the occurrence of said predetermined position at a predetermined time.

2. A timing device for actuating a light sensitive device by a ray of light at predetermined time intervals, said timing device comprising a support having an opening formed therein for the direct passage of said ray from a source to

said light sensitive device, a plurality of discs impermeable to said ray and having inner open portions adapted to align with said opening to form a passage for said ray, and a clockwork mechanism connected with said support and said discs and rotating said discs at different speeds to bring the open portions of the discs into alignment with said opening at predetermined time intervals.

3. In combination, at least one source of light, a plurality of elements preventing the rays of light emitted by said source from falling directly on a light sensitive element except in predetermined relative positions of said elements, and a clock-work mechanism connected with said elements for moving them at different speeds to cause the occurrence of said predetermined relative positions at predetermined time intervals.

4. In combination, a source of light, at least one element interposed between said source of light and a light sensitive device and causing the rays of light from said source to illuminate said light sensitive device with various degrees of intensity to create electrical currents of different intensity corresponding to the intensity of the illuminations, means connected with said element for actuating the same to cause the occurrence of such illuminations at predetermined time intervals, and current-responsive means connected with said light sensitive device and selectively operated by said currents of different intensity.

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