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TIMING MECHANISM

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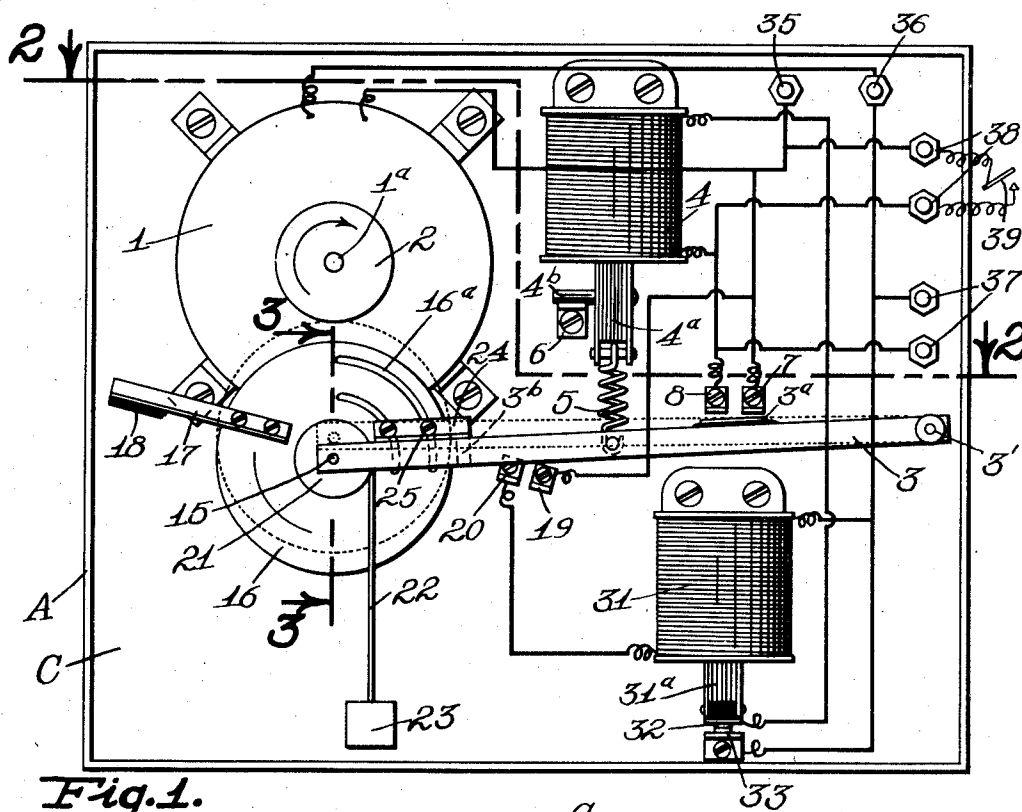


Fig. 1.

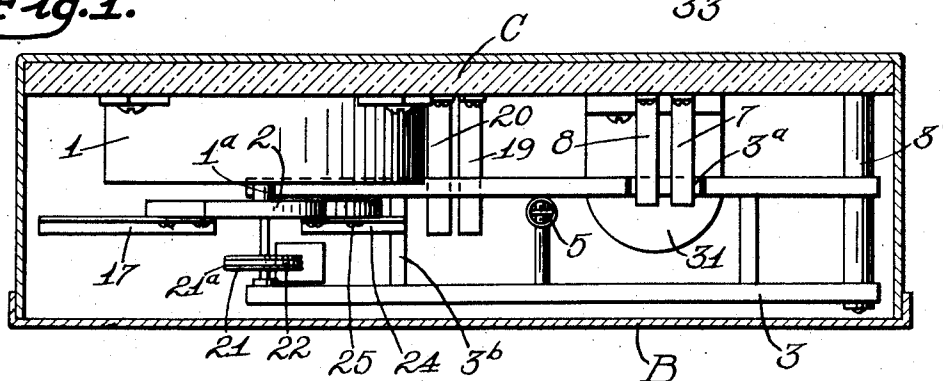


Fig. 2.

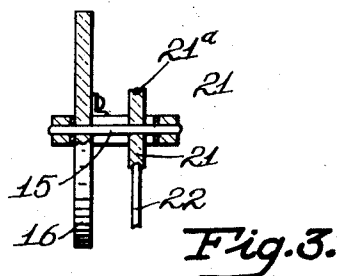


Fig. 3.

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## UNITED STATES PATENT OFFICE

2,076,290

## TIMING MECHANISM

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mesne assignments, to Standard Steel Works,  
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Application April 13, 1931, Serial No. 529,878

Renewed September 9, 1936

3 Claims. (Cl. 161—1)

My invention relates to time relays, and particularly to such time relays that are adapted to control electrical apparatus by the opening and closing of electrical circuits.

My time relay is intended primarily to be used in connection with paving plants and ingredient mixing apparatus, as shown in my application, Serial No. 449,111, for Measuring apparatus filed May 2, 1930, and which resulted in United States Letters Patent No. 1,826,919, issued October 13, 1931, and my application Serial No. 514,770 for Control and timing apparatus filed February 10, 1931, which resulted in Patent No. 1,945,800 of February 6, 1934, although it may be used equally well for any apparatus where the requirements, hereinafter pointed out, are to be fulfilled.

The objects of my invention are: first, to provide a device of this class that is accurate and will open or close a circuit or operate other mechanism to within a fraction of a second of the predetermined time or period; second, to provide a device of this class in which the timing element may be any ordinary clock or time mechanism; third, to provide a device of this class in which the ordinary time lag of the starting of the clock mechanism is eliminated; fourth, to provide a device of this class whereby many different time periods may be obtained; fifth, to provide a device of this class that is automatically re-set at the end of the elapsed period; sixth, to provide a device of this class whereby small variations of the time interval or period may be quickly and accurately made; seventh, to provide a device of this class whereby an exterior electrical circuit is closed simultaneously with the beginning of the time interval, and also whereby the exterior circuit is automatically opened at the end of the time interval; eighth, to provide a device of this class that is simple and economical of construction and operation, durable, efficient, and one which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, I have devised a time relay having certain novel features of construction, combination and arrangement of parts and portions as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawing and to the characters of reference thereon which form a part of this application in which:

Figure 1 is a front elevational view of my time relay in one form with the front cover removed, and showing the wiring diagram thereon; Fig. 2 is a partial sectional and plan view thereof taken

at 2—2 of Fig. 1; and, Fig. 3 is a sectional view taken at 3—3 of Fig. 1.

Like characters of reference refer to similar parts and portions throughout the views of the drawing.

The time relay mechanism is preferably contained within a metal case A which is provided with a cover B hingedly secured to the case. The time relay mechanism is mounted on an insulation backing C secured to the back side of the case A.

The timing means 1 may be that of an ordinary clock or time mechanism, or that of an ordinary synchronous electric motor, such as used in ordinary electric clocks now in use, and, which is geared to a shaft to obtain the desired speed for the operating members. The timing means here shown is the power unit of an electric clock, and which is provided with three shafts, namely, an hour shaft, minute shaft, and a second shaft, only one being shown. By using the power unit of a standard clock, the timing means is made extremely accurate, thus eliminating initial errors or inaccuracies in timing. In the present embodiment of the timing means, I employ the time second shaft, designated 1a, since this shaft makes one revolution during one minute of time, and since the interval of time here desired to be used covers a range from three-fourths of a minute to one and one-half minutes, the second shaft meeting these requirements most satisfactorily.

Mounted on the shaft 1a is a disc 2, of any convenient diameter, which is preferably made of an insulating material and is provided, around its circumference, with small grooves in the form of knurling extending parallel with the longitudinal axis of the shaft 1a. The disc 2 serves as a means of transmitting the power of the timing means 1 to the other portion of the apparatus to be hereinafter described.

An arm 3 comprising a pair of spaced apart bars, is pivotally mounted at one end on a support 3' positioned near one side and intermediate the upper and lower edges of the backing C. Positioned above the arm 3 is an electromagnet 4 which is provided with a movable core or armature 4a. The core 4a is connected to the arm 3, intermediate the ends thereof, by means of a spring 5. The lower positions of the core 4a and the arm 3 are limited by a pin 4b, on the core, which engages the stop 6 secured to the backing C. Mounted on one of the bars of the arm 3, and insulated therefrom, is a metal bar 3a which is adapted to engage the contacts 7 and 8 for electrically connecting the same together when

the arm 3 is raised to the dotted line position, shown in Fig. 1, by the magnet 4.

On the free end of the arm 3 and between the bars comprising the same, is secured a fixed pin or shaft 15. Rotatably mounted on the shaft 15 is a disc 16 which is preferably made of insulating material and which is provided around its circumference with knurling similar to the knurling on the disc 2. In this instance, the diameter of the disc 16 is twice the diameter of the disc 2 so that during a time interval or period of one minute the disc 16 will rotate 180°. Rigidly secured to the disc 16 and extending radially outwardly therefrom is an angle arm 17 the end of which is provided with a metal bar 18 insulated from the arm 17. The metal bar 18 is adapted to engage contacts 19 and 20 when the disc 16 has been rotated through the required or predetermined arc by the timing means 1, the disc 16, during such rotation, being held in engagement with the disc 2 of the timing device by the electromagnet 4. Mounted on the shaft 15 and non-rotatably secured to the disc 16 is a disc 21 provided with a groove 21a. Secured with one end to the disc 21 is a cable 22 which is positioned in the groove and extends over the upper portion of the disc 21 and with its other end downwardly therefrom. To the lower end of the cable 22 is secured a weight 23. The weight 23 is adapted to return the disc 16 to its original position after the disc 16 has been disengaged from the disc 2 at the end of the time interval. The original position of the disc 16, as shown by solid lines in Fig. 1, is determined by an arm 24 in the form of an angle member which is rigidly but adjustably secured to the disc opposite the arm 17. The arm 24 is secured to the disc 16 by screws 25 extending through concentric arcuate slots 16a in the disc 16. Thus the position of the arm 24 may be varied relative to the arm 17. The arm 24 is adapted to engage a cross bar 3b between the spaced longitudinal bars of the arm 3, thereby limiting the return position or backward rotation of the disc 16, caused by the weight 23, and determining the amount of rotation necessary before the contacts 19 and 20 are engaged by the metal bar 18 which directly determines the time interval during which the contacts 7 and 8 are closed, as will be hereinafter more specifically described. It is thus seen that the time interval of the relay may be readily and easily varied by varying the position of the arm 24 with respect to the disc 16. It will be here noted that a multiplicity of time intervals, other than those obtained by the varying of the arm 24, may be obtained by varying the ratio of the diameter of the discs 2 and 16.

Mounted on the backing C below the arm 3 is a second electromagnet 31 provided with a movable core 31a. Secured to and insulated from the lower end of the core 31a is a contact 32 which normally engages a second contact 33 positioned immediately below the contact 32. The electrical connection between the contacts 32 and 33 is broken or opened when the magnet 31 is energized by the closing of the contacts 19 and 20 which closes the connection between the magnet 31 and the terminal post 35. The separation of the contacts 32 and 33 deenergizes the magnet 4 permitting the disc 16 and the arm 3 to be disengaged from the disc 2, and also permitting the contacts 7 and 8 to be disconnected and thereby preventing the magnet 4 from again becoming energized, (from the

terminal post 35 to which the contact 7 is connected), when the contacts 32 and 33 are again closed, such closing being effected by the initial return movement of the disc 16 to its original position, which opens the contacts 19 and 20.

Continuous electrical power is supplied to the device through the terminals 35 and 36. The timing device 1 is so connected to the power supply that it will be in operation at all times, thus eliminating the starting lag of the synchronous motor of the timing device. The terminal 36 connects directly to the magnet 31 and, thus the contacts 32 and 33, to the magnet 4. The power line 36 also connects directly to one of the terminals 37, which terminals are adapted to be connected to the electrical device to be operated by the timing device, such as a magnet locking the gate of a mixer or the like, as shown in application Serial No. 514,770, for a Control and timing apparatus. The terminal 35 connects to one of the terminals 38, which terminals are connected to a switch 39 which may be manually or otherwise closed momentarily for electrically connecting the terminals 38 and thereby placing the instant device in operation. This switch 39 may be placed in any convenient location, or may be operated by the closing of the gate, such as the gate of a weigh hopper, shown in applicant's copending application, Serial No. 514,770. The terminal 35 also connects to the terminals 7 and 19, as described above. The terminal 8 is directly connected to the second of the terminals of each of the sets of terminals 37 and 38, and also to the magnet 4. The contact 20 connects directly to the magnets 31. Thus, when the contacts 19 and 20 are closed by the metal bar 18 the magnet 31 will be energized. In view of the above explanation of the power supply and the wiring diagram the operation of my time relay may be briefly defined as follows:

Assuming electrical power to be connected to the terminals 35 and 36, the disc 2 of the timing means 1 will be rotating continuously and at a constant speed in the direction indicated by the arrow. The contacts 32 and 33 will be closed, thus connecting the terminal 36 to the magnet 4. When the members 38 are connected together by the closing of the switch 39, the power line 35 is connected through the switch 39 to the magnet 4, thus energizing the magnet 4, thereby raising the arm 3 and placing the disc 16 in engagement with the disc 2. The raising of the arm 3 also connects the contacts 7 and 8, thus connecting the terminal 35 to the magnet 4 through the metal bar 3a and permitting the switch 39 connected to terminals 38 to be opened. Since the terminals 37 are also connected in this manner to the power lines 35 and 36, the electromagnets, or other device (not shown), connected thereto will also be energized. When the disc 16 is thus placed in engagement with the disc 2, the disc 2 will cause the disc 16 to rotate in the direction indicated by the arrow, moving the metal bar 18 slowly toward the contacts 19 and 20. The time required for the metal bar 18 to engage the contacts 19 and 20 depends upon the angle through which the arm 17 must be rotated. If the arm 17 travels through an arc of 180°, a period of sixty seconds will elapse before the contacts 19 and 20 are connected. When the metal bar 18 engages the contacts 19 and 20, the electromagnet 31 is energized, breaking the contacts 32 and 33 which disconnect the

terminal 36 from the magnet 4, deenergizing the magnet 4, permitting the disc 16 to be disengaged from the disc 2 and the contacts 7 and 8 to be disconnected, thereby deenergizing the electrical apparatus connected to the terminal 37. When the disc 16 is disengaged from the disc 2, the weight 23, which was drawn upwardly during the rotation of the disc 16 by the disc 2, causes the disc 16 to return to its original position, that is, until the stop 24 engages the cross member 3b. The returning of the disc 16 to its original position opens the contacts 19 and 20, thus deenergizing the magnet 31 and permitting the contacts 32 and 33 to be again closed. It will be noted that although the contacts 32 and 33 are again closed, the magnet 4 is not again energized since the contacts 7 and 8 are open, (assuming that the switch 39 connected to the terminals 38 is also open when the switch 39 is closed, the magnet 4 is energized). It is thus seen that the electrical device connected to the terminals 37 is connected to the power lines 35 and 36 only during a definite predetermined interval of time.

Though I have shown and described a particular construction, combination and arrangement of parts and portions of my time relay, and a particular application thereof, I do not wish to be limited to this particular construction, combination and arrangement, nor to the particular application, but desire to include in the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an electric timing mechanism, a normally open control circuit including a magnet and terminating in stationary contacts, a timing circuit comprising, a magnet and a normally closed control switch one member of which is operatively connected with the magnet of said control circuit, a normally open circuit leading to devices to be timed and terminating in stationary terminals, a time actuated driving disc, a pivoted arm, a driven disc rotatable on said arm, the arm being operatively connected to be swung by the timing circuit magnet to bring the driven disc into engagement with the driving disc thereby to rotate said driven disc and to contact the arm with the terminals of the circuit to the devices to be timed to close said circuit, a member on the driven disc for engaging said control circuit contacts positively to

stop the disc and to close said control circuit to energize its magnet and thereby to open the normally closed timing circuit control switch causing the magnet of the latter circuit to become de-energized, the circuit leading to the devices to be timed to be opened and permitting the discs to become separated, means urging return rotation of the driven disc, and a member adjustable on the driven disc for engaging said arm to check the return rotation of said disc.

2. In an electric timing mechanism in combination, a normally open control circuit terminating in stationary contacts, a magnet in said circuit, a continuously rotating driving member, a pivoted arm, a driven member rotatable on said arm, a timing circuit, a switch in said timing circuit controlled by said magnet, electrical means in said timing circuit operatively connected to swing said arm to bring said driven member into engagement with the driving member, means rotatable with said driven member to engage the said contacts thereby positively to stop said driven member and to close said control circuit permitting its magnet to open the timing circuit switch to permit disengagement of the driven member from the driving member, an element circumferentially adjustable on said driven member for contact with said arm, and means for returning said driven member with the said element to bring the latter into engagement with the arm.

3. In an electric timing mechanism in combination, a normally open control circuit terminating in stationary contacts, a magnet in said circuit, a continuously rotating driving member, a pivoted arm, a driven member rotatable on said arm, a timing circuit, a switch in said timing circuit controlled by said magnet, electrical means in said timing circuit, a resilient connection between said electrical means and the said arm arranged yieldingly to swing said arm to bring said driven member into engagement with the driving member, means rotatable with said driven member to engage the said contacts thereby positively to stop said driven member and to close said control circuit permitting its magnet to open the timing circuit switch to permit disengagement of the driven member from the driving member, an element circumferentially adjustable on said driven member for contact with said arm, and means for returning said driven member with the said element to bring the latter into engagement with the arm.

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