

Feb. 21, 1933.

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1,898,893

ELECTRIC TIME CLOCK

Filed May 28, 1931

2 Sheets-Sheet 1

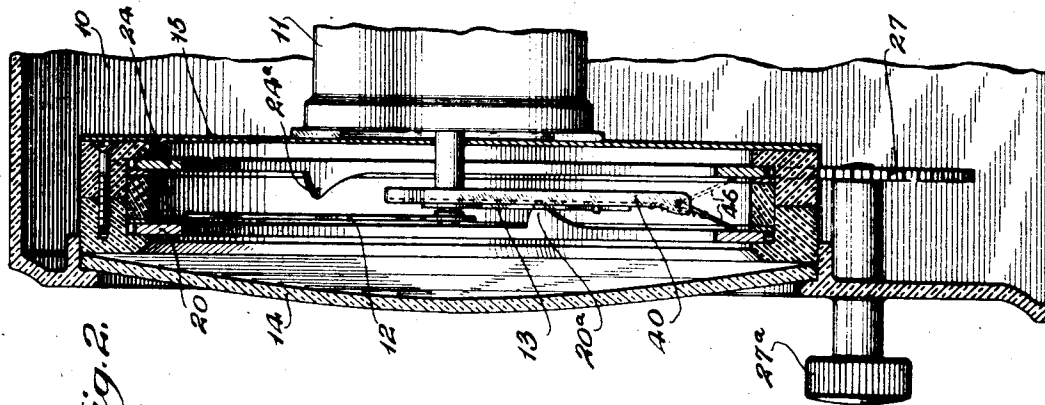


Fig. 2.

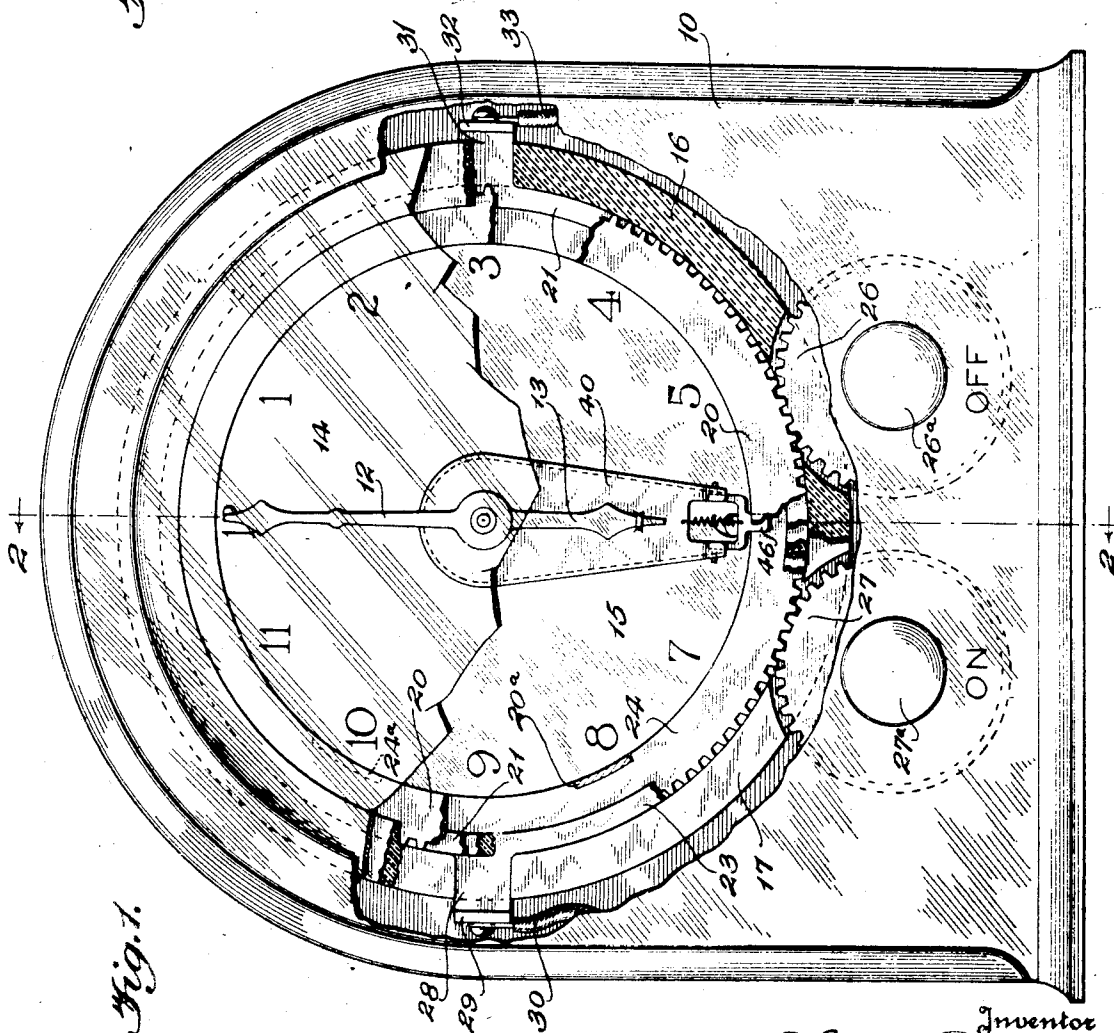


Fig. 1.

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Fig. 3.

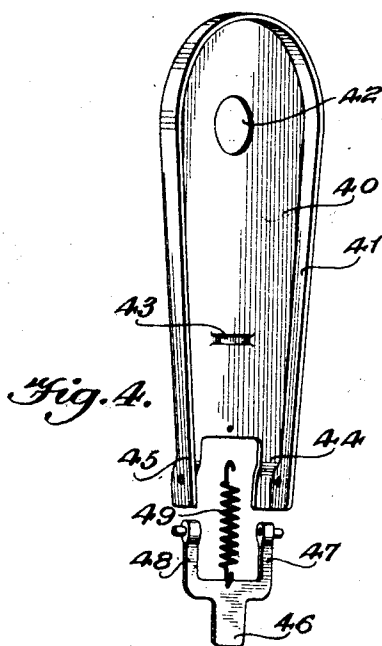
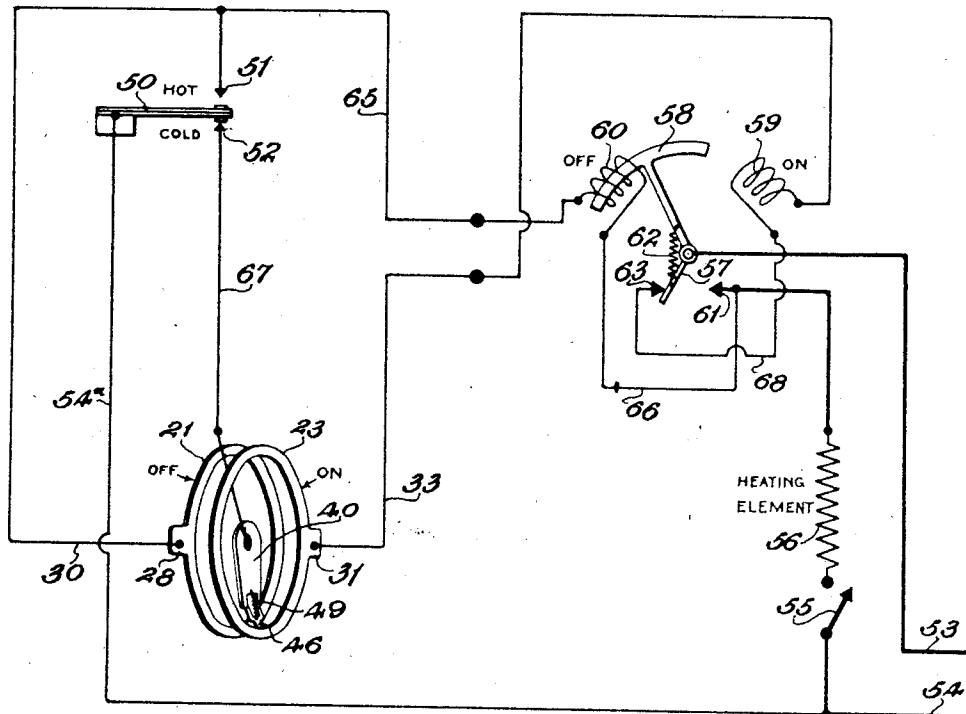
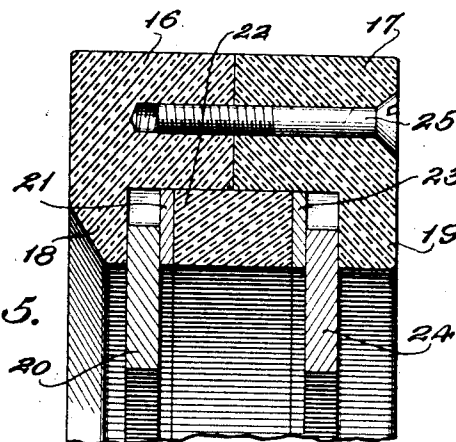


Fig. 5.



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UNITED STATES PATENT OFFICE

LUDWIG REICHOLD, OF WINSTED, CONNECTICUT, ASSIGNOR TO THE FITZGERALD MANUFACTURING COMPANY, OF WINSTED, CONNECTICUT, A CORPORATION OF CONNECTICUT

ELECTRIC TIME CLOCK

Application filed May 28, 1931. Serial No. 540,747.

This invention relates to improvements in electric time clocks, and more particularly concerns the circuit controlling elements of such mechanisms.

One of the features of the present invention is the provision of a simple circuit-controlling mechanism for attachment to a clock.

Further, the invention provides also means for adjusting the parts whereby the controlling of the circuit may be effected at any desired time.

Another feature of the present invention is the provision of circuit controlling devices which permit the control of the operation of a current consuming device through a relay in such manner that the relay coils and the circuit closing contacts are normally free of current, and are only energized at the moment of actuation and for a limited period of time.

Still another feature of the invention is the provision of a time clock having timing mechanism for controlling circuits which is employable in a circuit system including a thermostat and a relay whereby a heating element may be controlled both as to the time of the beginning and the end of the heating operation, and as to the temperature maintained during the heating period.

Other features of the invention reside in particular details and arrangements of parts, and in the further features as will appear in the course of the following specification and claims.

An illustrative form of construction according to the invention is set forth on the accompanying drawings, in which:

Figure 1 is a face view of a clock having circuit controlling elements associated therewith, with portions successively broken away to show the arrangement of the parts.

Figure 2 is a vertical sectional view substantially on line 2—2 of Figure 1.

Figure 3 is a circuit diagram showing the circuit controlling elements connected with a thermostat and relay for controlling a heating element.

Figure 4 is a perspective view of a detail, with certain parts separated for clearness.

Figure 5 is an enlarged sectional view corresponding to the upper part of the circuit controlling elements in Figure 2.

In these drawings, the case 10 contains a clock mechanism which is illustrated in Figure 2 as comprising an assembly of a synchronous driving motor with the necessary gearing contained within a housing 11 and adapted to drive the minute hand 12 and the hour hand 13. The front of the case has a crystal 14 in front of the usual figure dial 15, which latter is illustrated as secured to the housing 11.

Between the dial 15 and the crystal 14 are mounted two rings 16, 17 (Figures 2 and 5) of insulating material, which each have the inwardly extending flanges 18, 19 and thus provide between them a groove in which are mounted the metallic front adjusting ring 20, a stationary metallic ring 21 in contact therewith, a separating washer 22 of insulating material which maintains the ring 21 spaced from the rearward fixed metallic ring 23, and the rear adjusting ring 24 of conductive material. The insulating rings 16 and 17 are secured together by screws 25 to hold the several rings 20, 21, 22, 23 and 24 together.

The front ring 20 has a rearwardly turned dog 20a (Figures 1 and 2) which preferably extends more than half the distance toward the rear ring 24. This rear ring 24 has a similar dog 24a which likewise extends preferably more than half the distance toward the front ring 20. The peripheries of both rings 20 and 24 are toothed, and respectively mesh with the pinions 26, 27 (Figure 1) located on shafts journaled in the casing 10 and having the knobs 26a, 27a on the exterior of the casing.

The fixed ring 23 has an outwardly extending lug 28 with a rebent end 29 thereon to which a conductor 30 may be connected. The lug 28 preferably extends through a notch in the insulating ring 16, whereby the stationary ring is held against rotational movement. In similar manner the ring 20 is provided with a lug 31 extending through the insulating ring 17 and having a rebent

end portion 32 to which a conductor 33 may be attached.

Fixed to the hour hand 13 is a plate 40 (Figure 4) preferably having the stiffening flange 41 at its edges. This member preferably extends around the hand staff portions of the clock mechanism and has an opening 42 through which such portions may project, as well as a stamped loop or stirrup 43 into which the point of the hour hand may be inserted for securing the parts in fixed relative position. The lower end of the member is cut away near the center to provide the lateral bifurcated portions 44, 45. The contact closing rocker comprises the contact end 46 and the bifurcated arms 47, 48 which are respectively pivoted to the bifurcations 44, 45, the plane of the pivots preferably lying half way between the rings 20, 24. A snap spring 49 is connected to the rocker and to the member 40 and tends to rapidly move the rocker, after it has passed a central position of dead center, into an end position. In such end position, the contact end 46 is in engagement with the adjusting ring 20 (full line position in Figure 2) or with the adjusting ring 24 (dotted line position in Figure 2).

In Figure 3 is shown a circuit arrangement in which the fixed rings 21, 23 are illustrated, for the purpose of showing the contact arrangements, as capable of being engaged by the contact end 46. The thermostatic bar 50 has a contact 51 which is closed when the bar is heated to a predetermined temperature, and a cold contact 52 which is closed when the bar is cooled to a predetermined temperature. Conductors 53, 54 are connected to any suitable source of electric current, and lead through a main switch 55, to a heating element 56, and to the moving relay blade 57 of an electromagnetic relay switch having the magnetic rockable core 58 which may be moved from the left hand position shown in Figure 3 into the right hand position upon energization of the "on" coil 59, or back into illustrated position by energization thereafter of the "off" coil 60. During such movement the relay blade 57 is rapidly moved, when the "on" coil is energized, from the position shown in full lines into contact with the fixed contact 61, by the agency of the snap spring 62. Such a switch construction has been set forth, for example, in my co-pending applications Serial No. 506,770, filed January 5, 1931, and Serial No. 524,711, filed March 23, 1931, to which reference is made for details of construction and assembly. When the "off" coil 60 is thereafter energized, the relay blade 57 is moved back into the full line position in which it is in engagement with the fixed contact 63.

When the parts are in the position shown in the diagram of Figure 3, and the main

switch 55 is closed, current can flow from conductor 54 by conductor 54a, the thermostat bar 50, the cold contact 52, conductor 67, clock element 40, the rocker and contact end 46, the "on" ring 23, conductor 33 through coil 59, conductor 68, contact 63, relay blade 57 back to conductor 53. The coil 59 when energized attracts the armature 58 and causes the relay blade 57 to be moved from contact 63 to contact 61, thus opening the control circuit which has energized the coil 59. Current can now flow from conductor 54 through the closed switch 55 and heating element 56 to contact 61, with a return through the relay blade 57 to the conductor 53.

As the temperature rises, the thermostat bar 50 leaves the "cold" contact 52 and finally engages the "hot" contact 51. Current can now flow from conductor 54 by conductor 54a, thermostat bar 50, contact 51, conductor 65, coil 60, conductor 66 to contact 61, through the relay blade 57, and thus back to conductor 53. The "off" coil is thus energized and pulls the armature 58 and therewith moves the relay blade 57 from engagement with contact 61 back to engagement with contact 63, thus interrupting the flow of current through the heating element 56, as well as the flow of current through the "off" coil 60.

When the associated structures have cooled so that the thermostat bar 50 again engages the "cold" contact 52, the first aforementioned circuit is re-established through the "on" coil, and the relay is again operated to energize the heating element 56.

If the member 40 comes opposite the dog 24a, and the rocker is moved thereby until ultimately the contact end 46 passes over to the "off" ring, then the aforementioned circuit through the "on" coil 59 is interrupted at this rocker, and the circuit through the heating element 56 may no longer be re-established when once opened. If the thermostat is then engaged at the "cold" contact, current may flow from conductor 54 through conductor 54a, thermostat bar 50, contact 52, conductor 67, elements 40, 46, to the "off" fixed ring 21 and thence by conductors 30 and 65 to the coil 60, with a return by conductor 66, contact 61, relay blade 57 back to conductor 53. The energization of the "off" coil 60 causes the relay blade to open the circuit through the heating element 56 in the manner described above.

Thus in Figure 1 the hour hand is at 6 o'clock and the contact end of the rocker is engaged with the "off" ring 20. When the hour hand reaches 8 o'clock the rocker and contact end 46 will begin to ride on the dog 20a, until ultimately at approximately 8:30 the rocker will have been moved past the center position, so that its spring 49 now rapidly moves it over until the contact end

46 is brought against the opposite adjusting ring 24, and at the same time any possible circuit leading to the ring 20 is interrupted. Further, owing to the existing electrical contact between the ring 24 and the stationary ring 23, current can now flow in the manner prescribed above, through the "on" coil 59 to close the main circuit.

Thereafter, it will be noted that no current flows to the ring 24 owing to the interruption at the relay blade 57, so that there is no liability of arcing or fusing at the engagement between the rocker contact end 46 and the ring 24, and these parts may be made relatively light. In general, it will be noted that the clock contacts serve only to close the circuit, while the circuit is opened at the relay contacts, where a much greater power is available through the energization of the coils 59 and 60.

As the hour hand continues to move, the rocker is ultimately brought against the dog 24a, at about 9:45, and thus finally is caused to snap away from the ring 24 at 10:15 and into engagement with the ring 20, so that a further circuit may be established as described above through the "off" coil 60. Here again, the circuit through the controlling coil is immediately interrupted by the operation of the relay blade 57, and hence there is no current flowing in the clock mechanism normally, but only for short periods of time as controlled by the thermostat or movement of the rocker, and such currents exist only long enough to energize the coils 59 and 60, to move the relay blade.

The attendant may move the adjusting rings 20 and 24 into any desired position with respect to one another by moving the external knobs 26a and 27a. It will be noted that the dogs 20a, 24a are visible through the crystal around the edges, but that there is no encumbrance which obscures the dial lettering.

It is obvious that the invention is not limited solely to the form of construction illustrated, but that it may be employed in many ways without departing from the scope of the appended claims.

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

1. An electric circuit making and breaking structure for connection to a clock movement, comprising a conductive ring mounted substantially concentric with the hand staff of the clock movement, a member fixed to a clock hand and moving in rotation therewith, a rocker carried by the end of said member and adapted to be engaged with said ring when in one rocked position and to be freed of said ring when in another rocked position, means to hold said rocker in either rocked position, and a conductive cam piece

on said ring for moving said rocker from its position in engagement with said ring to its position out of engagement with said ring.

2. In a circuit making and breaking device for attachment to a clock mechanism, a pair of insulating rings having internal surfaces and inwardly projecting flanges, said rings when joined together providing a groove of circular section, a pair of conductive adjusting rings movably mounted in said groove, a pair of fixed conductive rings each electrically connected with an adjusting ring, insulating spacing means between said conductive rings, each of said adjusting rings having a conductive cam portion thereon, a member carried in rotation by a clock hand, a rocker pivoted on said member and adapted to selectively engage one or the other of said adjusting rings, said rocker being engageable by one of said cams to move said rocker from engagement with the surface of said ring past a dead center position, and means to move said rocker from the moved position into contact with the other adjusting ring.

3. An electric circuit making and breaking structure, comprising a shaft, means for rotating said shaft synchronously, a rocker carried in rotation with said shaft and movable about a rocker axis at a right angle to the shaft axis, a conductive ring concentric with the shaft and conductively engaged by said rocker in one position of the latter, a cam piece adjustable angularly with respect to said shaft and engageable by said rocker during its movement with the shaft whereby to cause the rocker to be moved to a position out of engagement with said ring, and means for holding said rocker in either position.

4. A structure as in claim 3 in which said holding means comprises a spring connected for movement with said shaft at one side of said rocker axis and connected to said rocker at the other side of said rocker axis.

In testimony whereof, I affix my signature.

LUDWIG REICHOLD.