June 11, 1940. J. DE HAES 2,203,944

CURRENT CONTROL CLOCK

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Fig. 1

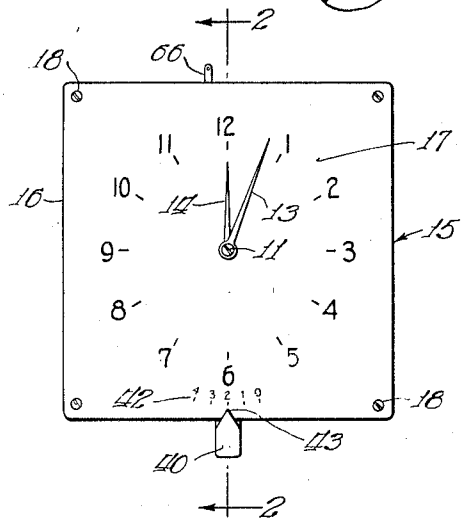


Fig. 6

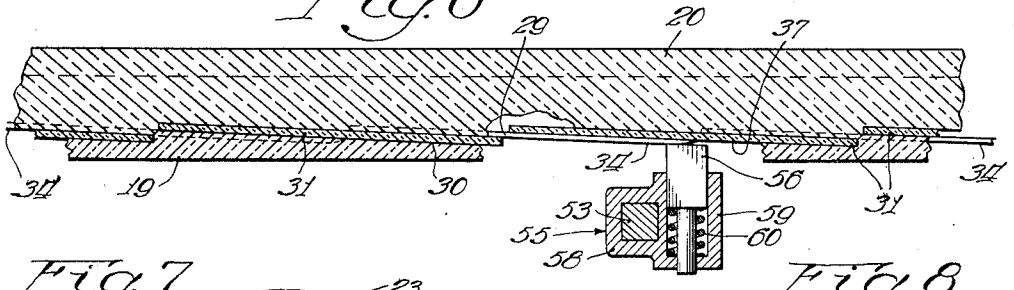


Fig. 7

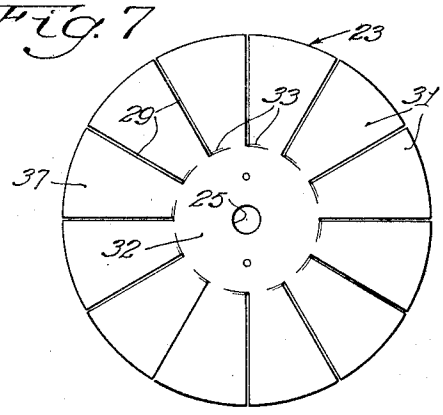
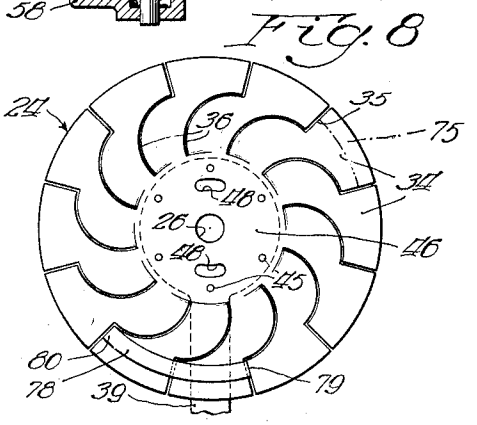


Fig. 8



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Fig. 2

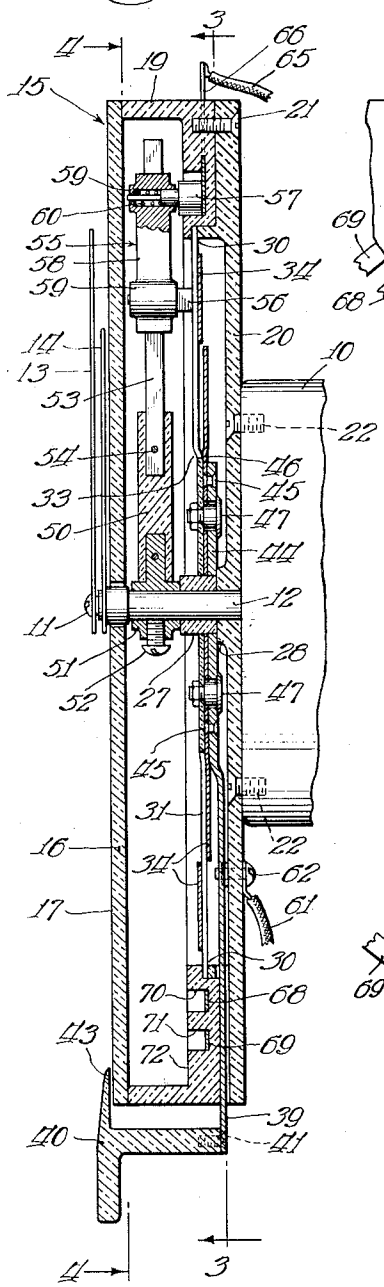
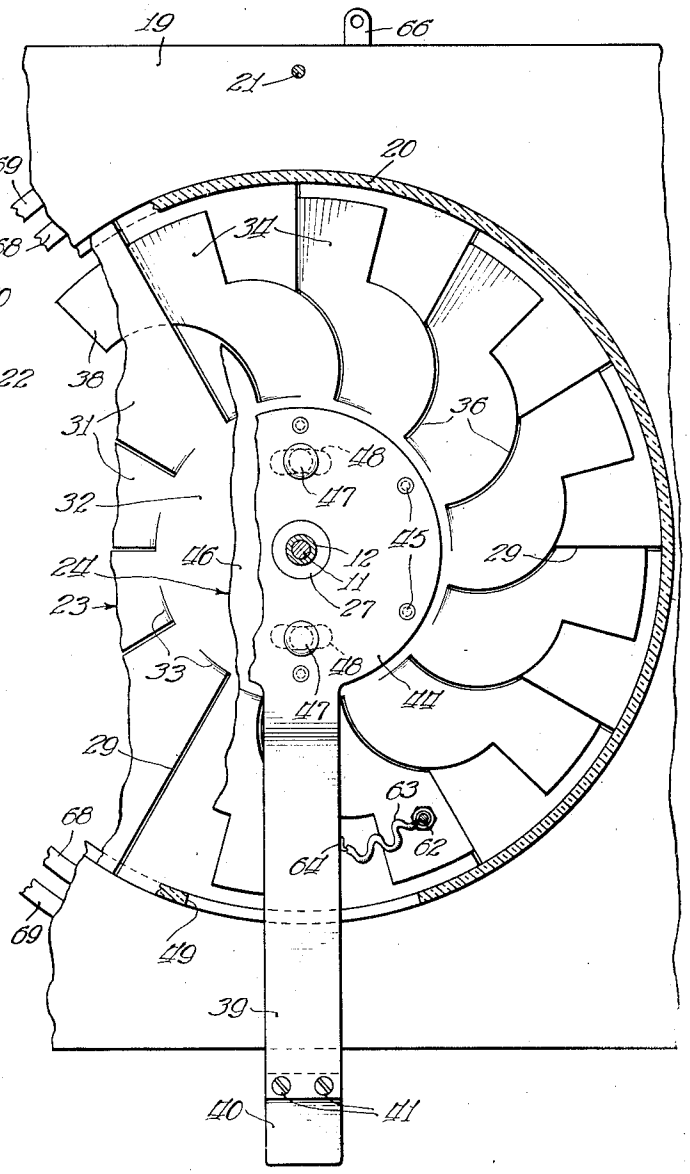


Fig. 3



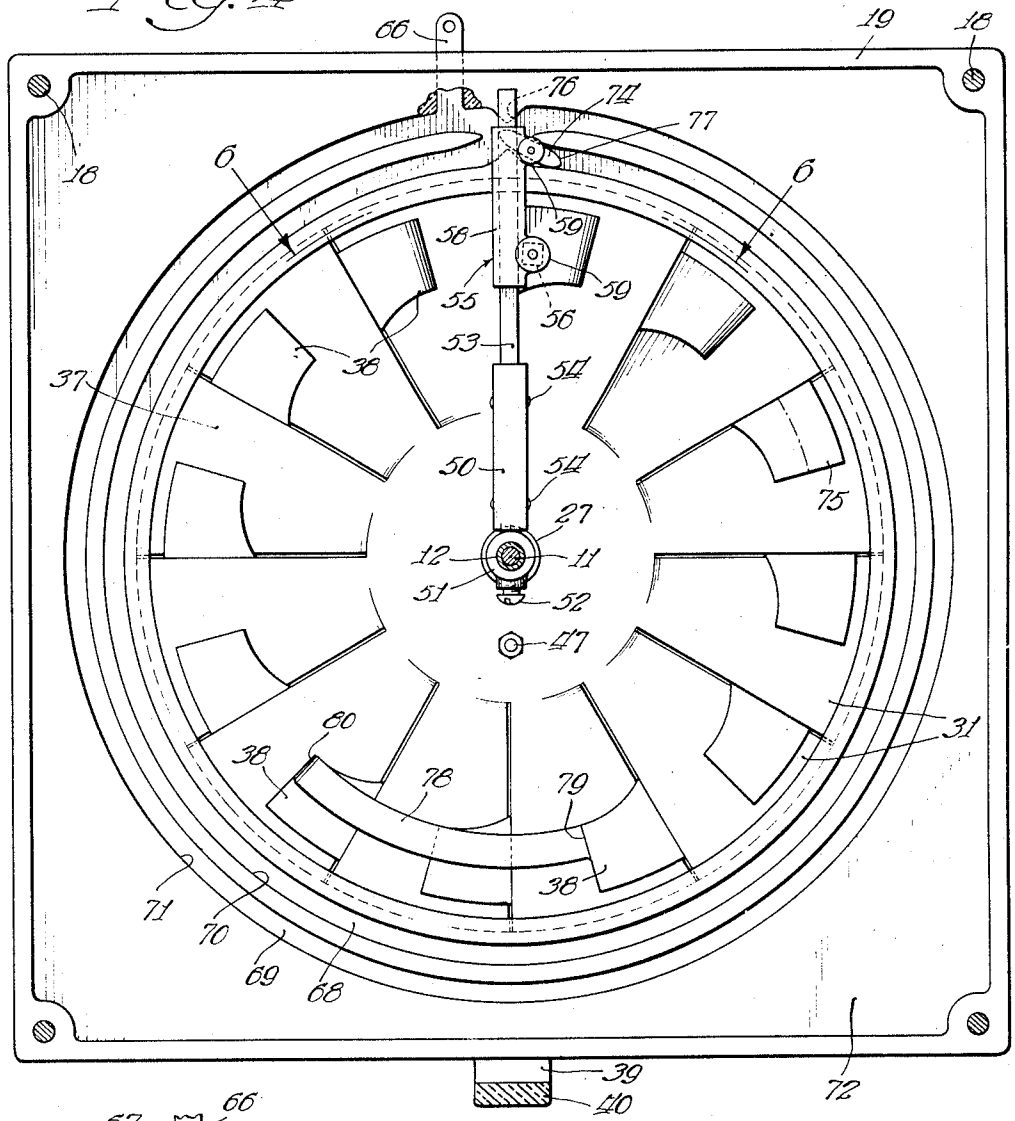
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Fig. 4



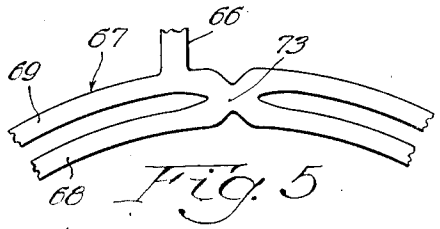


Fig. 5

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UNITED STATES PATENT OFFICE

2,203,944

CURRENT CONTROL CLOCK

Jerome De Haes, Chicago, Ill.

Application October 9, 1937, Serial No. 168,125

8 Claims. (Cl. 200—37)

This invention relates to current control clocks and is of particular utility in controlling the electrical apparatus for actuating combustion effecting or aiding devices for a heating furnace, for example. It has been found that the economy and efficiency of a heating furnace, particularly on operating by an automatic feeding device such as in a stoker operated or oil burning furnace, may be enhanced by having the feeding mechanism operated irregularly instead of continuously. The invention might also be used for actuating the drafts of a heating furnace. It is well known that the economy and efficiency of a heating furnace may be enhanced by alternately opening and closing the drafts to suit temperature conditions, but such control by thermostatic or temperature responsive devices has not been entirely satisfactory. The present invention aims to provide means controlled by a time clock, not only for such alternating operation, but also for varying the intervals of on and off position of the electrical apparatus over a period of twenty-four hours.

The invention further provides such control means in association with an ordinary twelve hour dial clock with the attendant advantages of such a combination in a unitary structure, which is compact and relatively simple in manufacture and operation.

Other objects and advantages will be apparent from the following description, taken together with the accompanying drawings, in which—

Figure 1 is a front elevational view of the structure of the present invention;

Figure 2 is an enlarged cross-section taken on the line 2—2 of Fig. 1;

Figure 3 is a plan section on the scale of Fig. 2 taken on the line 3—3 thereof, looking in the direction of the arrows indicated;

Figure 4 is another plan section taken on the line 4—4 of Fig. 2 and looking in the opposite direction;

Figure 5 is a fragmentary view of the metallic stamping for the switch track also shown in Fig. 4;

Figure 6 is a further enlarged segmental section taken on the curved line 6—6 of Fig. 4;

Figure 7 is a plan view of the insulating disk; and

Figure 8 is a similar view of the metallic conductor disk.

Referring in detail to the illustrative construction shown in the drawings, the numeral 10 indicates conventional time clock mechanism for rotating a pair of spindles 11 and 12, to one of which, the spindle 11, is fixed the usual minute hand 13 and to the other spindle 12 the usual hour hand 14 of an ordinary twelve hour clock.

In accordance with the present invention, said spindles 11 and 12 pass centrally through a unitary structure comprising a casing 15 desirably made of insulating material such as Bakelite, properly sectioned as hereafter described, one of said sections 16 being the front section and providing a dial face 17 for the clock, having the usual hour numerals thereon from one to twelve. Screws 18 secure the front section 16 to an intermediate section 19 of the Bakelite casing, this latter section being of annular formation and serving as a spacer between the front section 16 and a back section 20 of the casing. Screws 21 secure the intermediate section 19 and back section 20 together. Screws 22 mount the casing as a whole onto the clock mechanism 10 by passing thereinto from the back section 20.

Received within the casing centrally of the spindles are a pair of disks 23 and 24, the disk 23 being of insulating material also desirably of Bakelite, and the disk 24 being of metallic conductor material such as brass. Central perforations 25 and 26 respectively in said disks permit them to pass over said spindles and to fit substantially snugly on a central insulating boss 27 carried by a hub portion 28 of the rear casing section 20.

The disks 23 and 24 are adapted to be intercalated and for this purpose the disk 23 has the radial slits 29 therein dividing the periphery of the disk into twelve equal sectors. The disk 23 is fixed with respect to the casing and to accomplish this has its periphery clamped between the casing sections 19 and 20 as at 30, and also as shown in Fig. 6, the mating faces of the casing sections at this point are stepped to provide pockets which further lock the disk against rotation, and these pockets are also arranged to cant the sectors of the disk 23 respectively out of the plane of the disk, as best shown in Fig. 6, and for a purpose presently described. In forming the disk 23 the sectors 31 where they join the central portion 32 of the disk are slightly bulbed out as at 33 so that the sectors of the disk 24 may be received therebetween as next described.

The metallic conductor disk 24 is also sectored in twelve equal sectors 34, as shown in Fig. 8, by radial slits 35. In this case, however, the slits 35 are arcuate for a portion of their length, as indicated at 36 so as more readily to permit the intercalation of the sectors of disks 23 and 24, as best shown in Figs. 3, 4 and 6, from

which it will be seen that the sectors 34 of the disk 24 are received through the slots 29 in the disks 23 to have portions of the sectors 34 overlapped with portions of the sectors 31 respectively and alternately and, as best shown in Fig. 4, providing the outer face 37 of the disk 23 with circumferentially spaced apart overlapping portions 38 of the metallic conductor disk 24.

To vary the area of the portions 38 exposed on the outer disk face 37, the disk 24 has secured thereto a lever 39 by which the disk 24 may be partially rotated, the metallic lever 39 having a handle 40 desirably of insulating material, secured thereto by the screw 41 and accessible on the outer face of the clock as shown in Fig. 1, a graduated scale 42 on the clock face and an indicator 43 on the handle 40 determining the rotative position of the disk 24 with respect to the disk 23. The lever 39 has an enlarged circular portion 44 which is secured by rivets 45 to the central portion 46 of the disk 24, so that these two parts will move together. Rotation of these parts is limited by headed pins 47 secured to the fixed insulating disk 23 and passing through slots 48 in the central portions 44 and 46 respectively. A slot 49 in the periphery of the casing section permits the lever 39 to pass therethrough and to have rotative movement within the limits of the slots 48.

A switch member is carried by the casing to ride over the face 37 of the disk 23 and to have circuit continuing relationship with the portions 38 of the metallic conductor disk 24 which appear upon the face of the disk 37 as described. For this purpose a switch arm 50 of insulating material is mounted by a metallic hub 51 and clamping screw 52 to the spindle 12 for the hour hand 14. The arm 50 is extended in a metallic rod 53 suitably secured to the insulating portion of the arm as by a rivet 54, this rod being desirably of square cross-section as best shown in Fig. 6, and mounting slidingly thereon a metallic bridge member 55 having fingers 56 and 57, these fingers being laterally offset from the portion 58 of the bridge member which directly engages the rod 53, and being mounted in spring-barrel portions 59 of the bridge member which contain compression coil springs 60 and press the fingers outwardly into engagement with the other switch elements as next described.

It will be understood that among these other switch elements are the portions 38 of the metallic disk 24 which appear on the face 37 of the insulating disk 23, and the finger 56 is so arranged radially of the arm 50 as to ride on and off of these portions 38. A conductor 61 is secured as at 62 to the back of the insulating section 20 of the casing and constitutes one side of the circuit, an extensible insulated wire 63 connecting the conductor 61 with the lever 39 as by being soldered thereto as at 64, thus placing the sectors 38 in circuit with this side of the line.

The other side of the line is represented by a conductor 65 which is secured to a terminal 66 in the form of a tab portion of a metallic stamping 67 having concentric portions 68 and 69, which are received respectively in tracks 70 and 71 formed as grooves in a face portion 72 of the insulating casing section 19, the stamped plate 67 being pressed into these grooves, so as to form the bottoms of the grooves. These grooves receive the finger 57 of the bridge member 55 so that the finger 57 is in constant electrical connection with the stamped plate 67 which in turn is electrically connected with the conductor 65.

The concentric stamped plate portions 68 and 69 are in communication with each other at 73 at which point also the grooves 70 and 71 are in communication, and the finger 57 swivels in its spring-barrel 59 under the influence of an elongated guide portion 74 of the finger, which rides in the grooves 70 and 71.

The operation of the device is as follows:

It will be understood that the arm 50 is radially aligned with and travels with the hour hand 14 of the clock, and also that the movable bridge member 55 of the arm 50 occupies one position radially of the arm 50 when the hour hand is traveling through the twelve hours of a P. M. period of the day, and another position radially when the hour hand is traveling through the A. M. period of the day. Assuming now that the clock is in the P. M. period, the finger 57 will ride in the outer groove 71, in contact with the plate 67, and the finger 56 will ride alternately over the conductor plate portions 38 of the disk 24 and the insulating face 37 of the disk 23. Thus, as shown in Fig. 4, as the arm 50 covers a portion of the disks 23 and 24 corresponding to the hour from twelve to one in the afternoon of the day, the electrical control circuit will be completed by the switching and circuit continuing mechanism already described, that is during the first half hour say, of this hour, from twelve to twelve-thirty, the furnace drafts will be open at the end of which half hour the finger 56 will ride off the adjacent portion 38 of the conductor plate and will ride onto the adjacent face 37 of the insulating plate, thus discontinuing the circuit and closing the furnace drafts by conventional mechanism not here necessary to be described. The drafts will remain closed from twelve-thirty to one o'clock. Then at one o'clock the finger 56 will again ride onto the next portion 38 of the conductor disk 24 and the furnace drafts will be open again for another half hour and so on. It will be noted that at this time the movable bridge member 55 is in its outermost position radially of the arm 50 by reason of the finger 57 being in the track 71, so that the finger 56 is riding upon the radially outermost portions of the portions 38. If now it be desired to have the furnace drafts closed during the entire period of say the hours from two to three in the afternoon, to save fuel, or to prevent over-heating, the next adjacent portion 38 may have its outermost portion 75 removed so that during the hours from two to three o'clock in the afternoon the finger 56 will not contact any portion of a portion 38 of the conductor disk, whereas at three o'clock it will engage another adjacent portion 38 and the furnace drafts will be opened for another half hour, and so on.

When now the hour hand has completed a twelve hour movement representing the P. M. hours of the day and is again at the top of the dial, the arm 50 will also reach this point, and, by means of communication of the grooves 70 and 71 at a point corresponding to the numeral 12 on the clock dial, and through the actuation of suitable cam bevels at 76 in the grooves and at 77 on the guide 74 respectively, the finger 57 is cammed or shifted from the outermost, or P. M. groove 71, to the innermost or A. M. groove 70, thus moving the bridge member 55 radially inwardly on its rod 53, so that during the next twelve hour movement of the clock the finger 56 is in engagement with the radially innermost portions of the portions 38 of the conductor disk 24. Thus, when the hour hand reaches a point indicat-

ing the beginning of a period from say five-thirty in the morning to seven-thirty in the morning, the finger 56 may ride continuously in electrical connection with a thin metallic segment 78 which is fastened at its ends only as at 79 and 80 to adjacent sectors 38 of the conductor disk 24 and so as to bridge these sectors. By reason of the connections of this segment 78 at its ends only it does not prevent rotation of the disk 24 as already described. It will also be noted that the segment 78 is sufficiently narrow so that when the finger 57 is travelling in the outer or P. M. groove 71 and the finger 56 is at its radially outermost position, the finger 56 will not contact the segment 78 during the hours from five-thirty to seven-thirty in the afternoon, but will do so to keep the furnace drafts open during these hours in the morning when it is desired to bring the heat up quickly.

It will be understood that instead of the furnace being on and off alternately for half hours at a time, as is normally provided by the exposed areas of the portions 38 as shown in Fig. 4, the disk 24 may be rotated by means of the handle 40 to expose sufficient portions 38 to have the furnace on for say a minimum of ten minutes of each hour, or a maximum of say fifty minutes of each hour, depending upon temperature conditions, and the graduated scale 42 may indicate by the graduation zero such ten minute intervals, by the graduation 1, twenty minute intervals, etc.

Manifestly, the invention is not limited to details of construction shown for purposes of illustration. Furthermore, it is not indispensible that all features of the invention be used conjointly, as various combinations and sub-combinations may be advantageously employed.

Such changes may be made as fall within the scope of the following claims without departing from the invention.

Having described my invention, I claim:

1. In a current control clock, the combination of time mechanism, a switch, and means controlled by the time mechanism for alternately continuing and discontinuing a current through said switch, wherein means are provided for varying the time of on and off positions of the switch, and wherein said last-mentioned means includes a radially slit insulating disk and a radially slit metallic conductor disk, said disks being adapted to be intercalated with the radial sectors of the conductor disk passing between and partially overlapping the radial sectors of the insulating disk, wherein one member of the switch is carried by the hour hand of the time mechanism and rides over said insulating and conductor sectors alternately, wherein means are provided for varying the degree of overlap, wherein the other member of the switch is also carried by said hour hand and comprises a finger in constant engagement with a metallic plate, said finger also riding in a track by the clock, and wherein both of said switch members are carried on a radially movable portion of said hour hand and said track is adapted to move said radially movable portion to vary the radial position of the first-mentioned switch member and wherein the degree of said overlap is varied radially to register with said radial variation of said first-mentioned switch member.

2. In a current control clock, the unitary structure comprising a twelve hour dial and hour hand, a casing for the same, a pair of sector disks, one of said disks being of insulating material and the other of conductor material, the sectors of said disks being intercalated and partially overlapped, switch members carried by the hour hand mechanism within said casing, one of said switch members riding alternately on said overlapped sectors and the other switch member being associated with means within the casing for moving the said first-mentioned switch member radially on said sectors.

3. The structure of claim 2 wherein the casing is of insulating material and comprises mating sections receiving the said disks therebetween, said sections canting the disk sectors of the insulating disk slightly out of the plane of said disk.

4. In a current control clock, the combination including an hour hand spindle, an arm fixed on said spindle, a radially movable segment on said arm and a pair of fingers on said movable segment, one of said fingers being adapted to move on a pair of concentric tracks, and means for shifting said track-engaging finger from one to the other of said concentric tracks at the end of each twelve hour period to move said movable member radially.

5. In a current control clock, the combination of time mechanism, a switch, and means controlled by the time mechanism for alternately continuing and discontinuing a current through said switch, wherein means are provided for varying the time of on and off positions of the switch, and wherein said last-mentioned means includes an insulating disk and a metallic conductor disk, said disks being adapted to be intercalated with the portions of the conductor disk passing between and partially overlapping the portions of the insulating disk, wherein one member of the switch is carried by the hour hand of the time mechanism and rides over said insulating and conductor sectors alternately, wherein the other member of the switch is also carried by said hour hand and comprises a finger in constant engagement with a metallic plate, said finger also riding in a track carried on a radially movable portion of said hour hand and said track is adapted to move said radially movable portion to vary the radial position of the first-mentioned switch member and wherein the said overlap portion is varied radially to register with said radial variation of said first-mentioned switch member.

6. In a current control clock, the combination of time mechanism, a switch, and means controlled by the time mechanism for alternately continuing and discontinuing a current through said switch, wherein means are provided for varying the time of on and off positions of the switch, and wherein said last-mentioned means includes an insulating disk and a metallic conductor disk, said disks being adapted to be intercalated with portions of the conductor disk passing between and partially overlapping the portions of the insulating disk, wherein one member of the switch is carried by the hour hand of the time mechanism and rides over said insulating and conductor sectors alternately, wherein means are provided for varying the degree of overlap, wherein the other member of the switch is also carried by said hour hand and comprises a finger in constant engagement with a metallic plate, said finger also riding in a track carried by the clock, and wherein both of said switch members are carried on a radially movable portion of said hour hand and said track is adapted to move said radially movable portion to vary the radial position of the first-mentioned switch member.

7. In a current control clock, the unitary struc-

ture comprising in combination with a twelve hour dial time mechanism and an hour hand spindle for moving an hour hand around said dial once in every twelve hours, of an arm fixed on said spindle to move also around said dial every twelve hours, switch members carried by said arm including a member movable relatively to said hour hand, an annular metallic plate, one of the switch members being in constant engagement with said plate, means arranged at different radii from said spindle for moving said movable switch member, and intercalated and partially overlapped alternating conducting and non-conducting segments adapted to be engaged by one of said switch members.

8. In a current control clock of the class described, the unitary structure comprising, in combination with time mechanism, of circuit control mechanism actuated by said time mechanism including switch means for alternately opening and closing said circuit at uniform intervals during one period of time, common means for varying said interval, and additional means also responsive to said time mechanism but independent of said common means and arranged to effect non-uniform intervals of closed and open conditions of said circuit during other periods of time, said switch means being brought into action responsive to said time mechanism at the ends of the periods of time during which said additional means is in action.

JEROME DE HAES.