Nov. 7, 1950 L. P. BENJAMIN 2,529,371

ELECTRIC TIMER

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Fig. 1

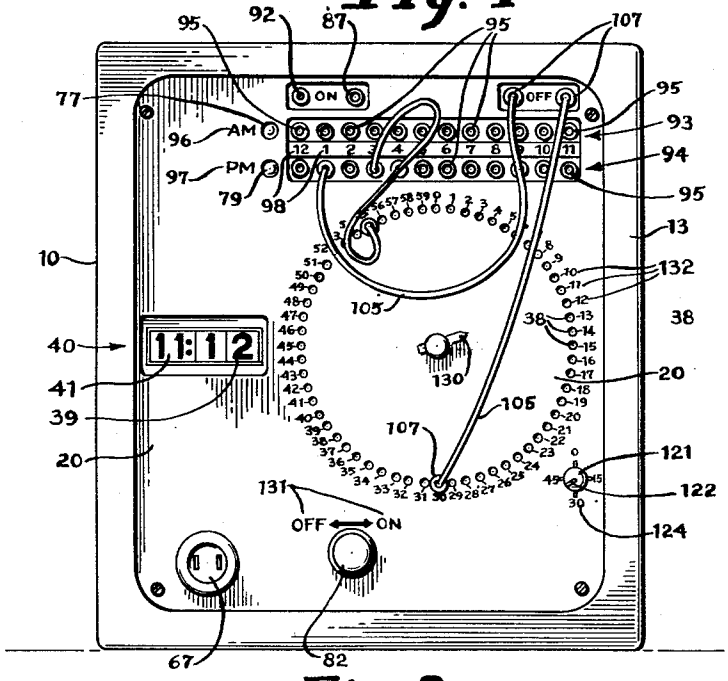
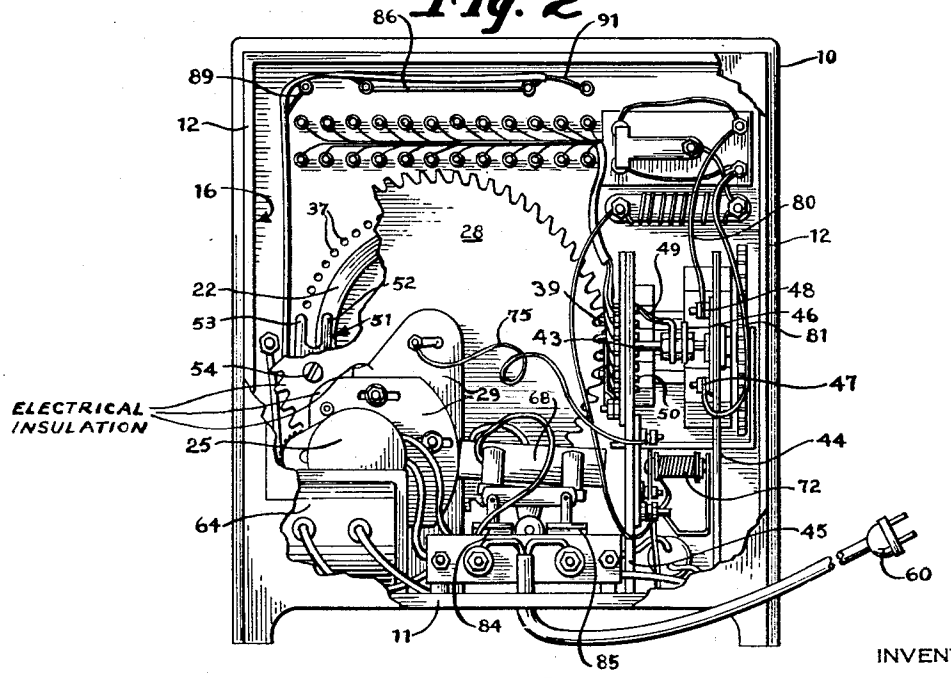


Fig. 2



INVENTOR.
LEONARD P. BENJAMIN
BY Lemonte, Allwine & Rommel
ATTORNEYS.

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ELECTRIC TIMER

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Fig. 3

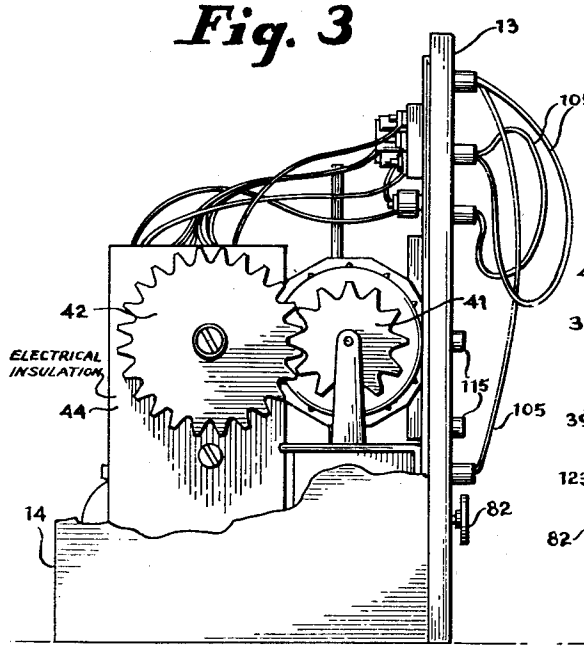


Fig. 4

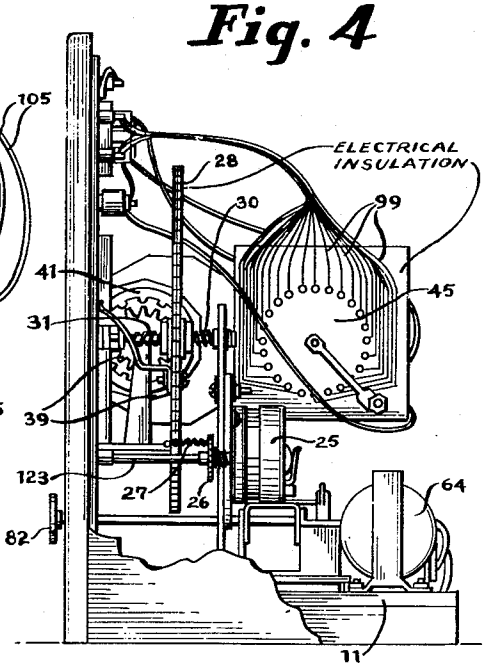


Fig. 5

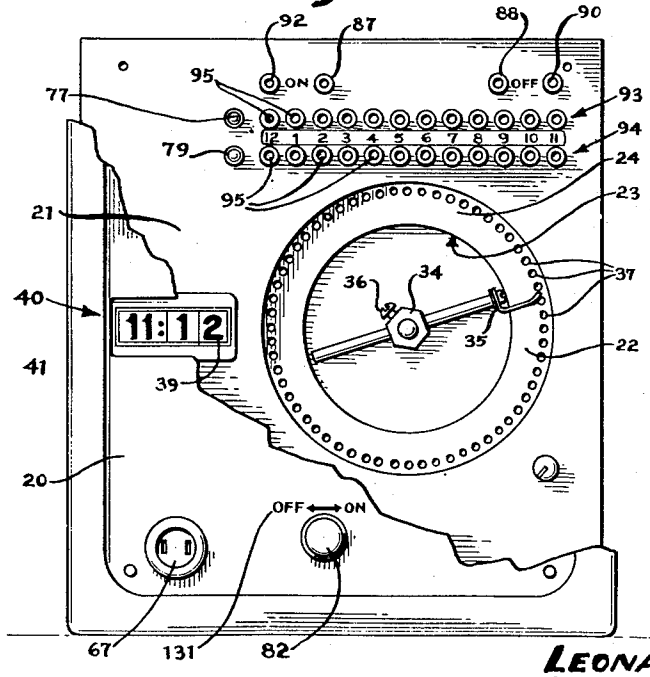
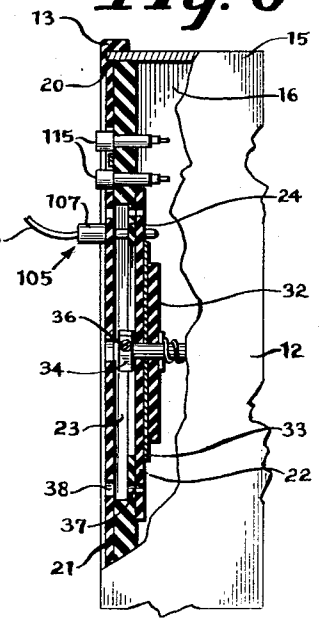


Fig. 6



INVENTOR.

LEONARD P. BENJAMIN

BY Fennaten, Allen & Rowe

ATTORNEYS.

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ELECTRIC TIMER

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Fig. 8

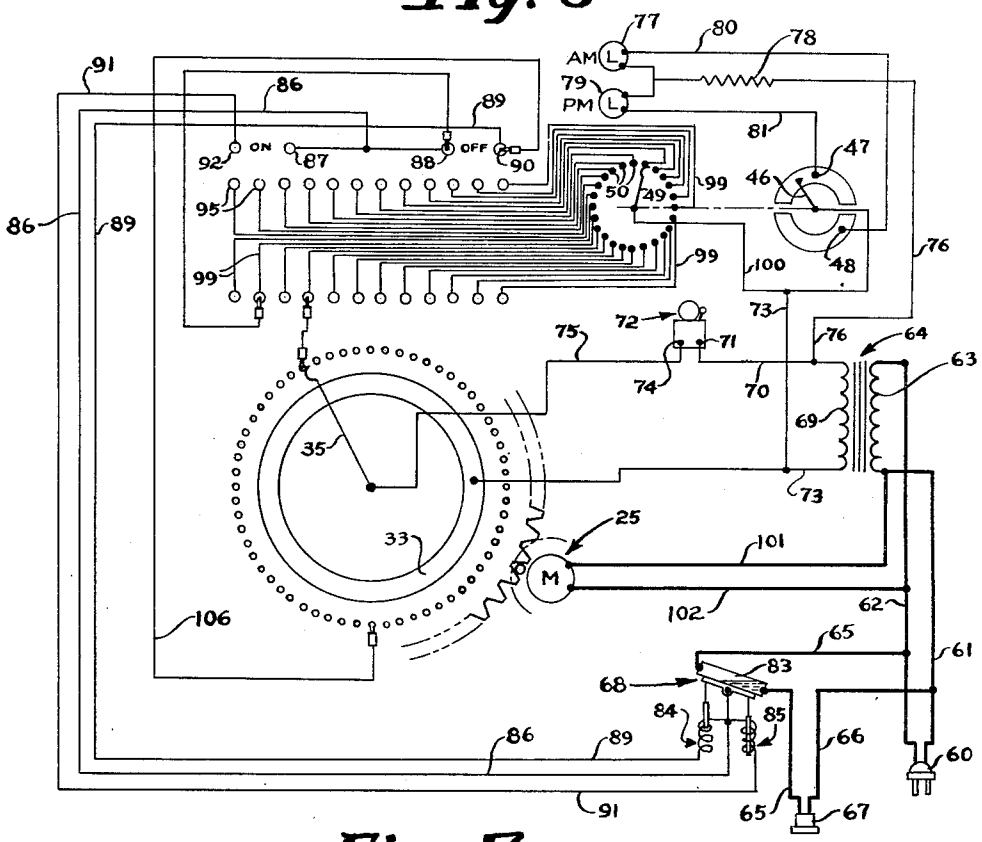
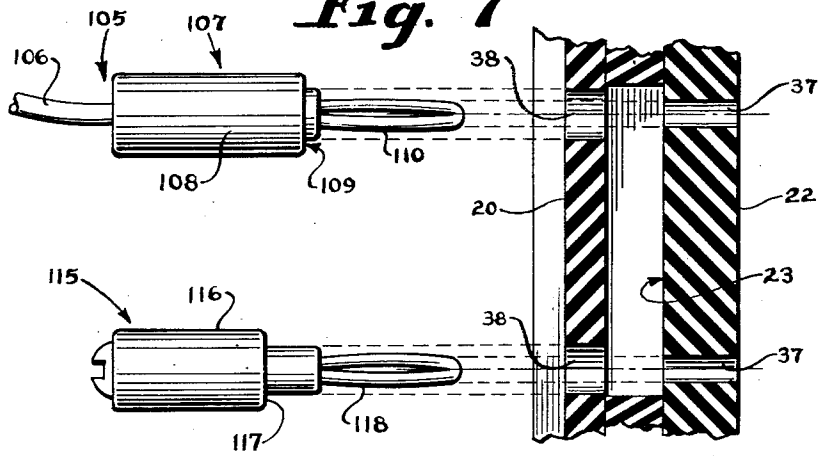


Fig. 7



INVENTOR.

LEONARD P. BENJAMIN

BY Lancaster, Allwine & Rommel

ATTORNEYS.

Patented Nov. 7, 1950 2,529,371

UNITED STATES PATENT OFFICE

2,529,371

ELECTRIC TIMER

Leonard P. Benjamin, Huntington, W. Va.

Application March 17, 1950, Serial No. 150,287

9 Claims. (Cl. 161—1)

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This invention relates to electro-mechanical timing apparatus which will cause a signal to be sounded or will cause a mechanism to commence or cease operation at a predetermined time. It is an improvement, in some respects, of the timing apparatus disclosed in my copending application for United States Patent Serial Number 794,643, filed December 30, 1947.

An important object of the invention is to provide apparatus for these purposes which is so constituted that it is possible to make any number of settings, up to sixty, at the same time.

Another important object is to provide apparatus of this kind which will function at any preselected minute during the twenty-four hours ensuing from the time of setting.

Still another important object is to provide a compact assembly of parts making up the novel apparatus, so that it may be housed within a carrying case of quite small dimensions and take up but limited space when in use. This compact arrangement is made possible, in part, by the dual functions of portions of the assembkly.

A further important object is to provide an apparatus for the purposes described which embodies an automatic "on-and-off" electric switch for suitable appliances associated with the new apparatus, a special application of electric plugs in association with specially-designed openings therefor, whereby certain of the plugs will be limited in insertion into the openings so that electrical contacts subsequently will or will not be made, and a new arrangement of an electric bridge associated with certain of the plugs and an electric contact plate for predetermined sequence of electrical operations.

In my application for patent referred to above, I disclosed two electrically operated timing means but in my present application, one of the changes embodied over the prior construction is the elimination of one of these means.

Other objects and advantages of the invention will be apparent during the course of the following detailed description of the invention, taken in connection with the accompanying drawings, forming a part of this disclosure, and in which drawings:

Fig. 1 is a front elevation of the new electro-mechanical timing apparatus, with illustrative application of means to connect certain jacks and contacts of the apparatus.

Fig. 2 is a rear elevation, with the rear wall of housing of the apparatus removed.

Fig. 3 is one end elevation of the apparatus with portions of the walls of the housing removed.

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Fig. 4 is the opposite end elevation with portions of the walls of the housing removed.

Fig. 5 is a front elevation but with a portion of the front wall of the housing broken away in order to reveal the structure beneath.

Fig. 6 is a vertical section, substantially on the line 6—6 of Fig. 1.

Fig. 7 is an enlarged fragmentary showing of certain plugs employed for insertion in specific openings in the front wall of the housing.

Fig. 8 is a wiring diagram of the new apparatus.

In the drawings, wherein for the purpose of illustration, is shown a preferred embodiment of the invention, and wherein similar reference characters designate corresponding parts throughout the several views, the new timing apparatus preferably includes a case or housing 10, having a bottom wall 11, opposite end walls 12, a front wall 13, differing from the front wall of my timing apparatus described in my copending application referred to above, a rear wall 14, and top wall 15, all defining a chamber 16. Preferably the rear wall 14 may be provided with an opening, closed by a suitable closure so that the chamber 16 may be exposed to view if desired, such as for inspection or repairs of the mechanism therein.

The front wall 13, best shown in vertical section in Fig. 6, comprises an outermost wall section 20 which may have a border or frame extending over the adjacent outer face portions of the walls 11, 12 and 15, an intermediate wall section 21 back of the section 20 and in abutment therewith and in abutment with the adjacent inner face portions of the walls 11, 12 and 15 and an innermost wall section 22. The wall section 21 is provided with a central opening 23 from front to rear, although the frontmost part of the opening is of greater size than the rearmost part, whereby a part of the wall portion 22 surrounding the rearmost part of the opening provides a flange 24. The wall section 22 covers the rearmost mouth of the opening 23, whereby a chamber is provided. The functions of this chamber will be described in conjunction with a shaft 31, support 34 and contact arm 35.

Contained within the chamber 16 is an electrically-operated means 25, shown, for example, in Fig. 4 and which may be a conventional electric clock, to cause rotation of a member 26 which may be a disc or wheel with the drive shaft of the clock fixed to the center of the member 26. The member 26 fixedly supports a resilient arm 27 projecting from the outermost face of the member 26 and spaced outwardly of the axis of rota-

tion of the member 26. The latter makes one revolution per minute, and the arm 27 may be a strong but springy retraction spiral spring, and is adapted to contact the teeth or cogs of a suitable wheel 28 of di-electric material. There are sixty teeth or cogs, equidistantly spaced about the periphery of the wheel 28, and the circumference of this wheel is sixty times the circumference of the circle described by the arms 27, whereby when the arm 27 engages a tooth or cog of the wheel 28 it will cause the latter to rotate 1/60 or 6° of a complete revolution. The housing of the means 25 may be fixedly supported upon a suitable bracket 29 of dielectric material which is, in turn, supported by the walls of the case or housing 10, and the bracket 29 may carry a spindle 30 to rotatably support the wheel 28, which wheel has a forwardly-extending shaft 31 which projects, as in Fig. 6, through a preferably circular panel or disc 32 of dielectric material which, is in turn, mounted upon a plate or disc 33 of electricity-conducting metal with its peripheral portions projecting outwardly of the periphery of the panel 32. This plate 33 may be carried by the wall section 22. Suitable expansion spiral springs, mounted upon the spindle 30 and shaft 31 tend to floatably position the wheel 28 along the spindle 30.

The outwardly projecting end portion of the shaft 31, after passing through the disc 32, extends through a suitable opening in the plate 33, with the wall of the opening spaced from the shaft, and an opening in the innermost wall portion 22, and into the opening 23 where it adjustably mounts a support 34 for a contact arm 35. The support 34 may be adjustably secured to the shaft, as by a set screw 36, and the contact arm 35 is preferably of light, springy, electricity-conducting metal, radially disposed with reference to the shaft 31. The free end portion of the contact arm 35 is positioned to sweep across, as is apparent in Fig. 5, one after another, sixty equally spaced-apart inner holes or perforations 37 arranged in a circle in the wall section 22 and which align axially with sixty like outer holes or perforations 38 in the wall section 20 and shown in Fig. 1, where the holes 38 are identified by the numerals 0 to 59 which indicate the minutes of an hour. It will be noted, in Fig. 7 that the holes 37 are of less diameter than the holes 38, for purposes later detailed. For example, the diameters of the holes 37 may be one-eighth inch and those of the holes 38 three-sixteenth inch. The means 25, thus operatively connected with the contact arm 35 will cause its free end to sweep from one hole or perforation in the wall sections 20 and 22 in one minute.

As in Fig. 4, the teeth or cogs of the wheel 28 mesh with the teeth or cogs of the outermost indicia-bearing wheel 39 of the two indicia-bearing minute wheels of a conventional minute and hour register or clock 40, whereby this wheel 39 will advance one minute in time recording for each revolution of the drive shaft of the means 25. The indicia-bearing hour wheel 41 of the register or clock 40, as shown in Fig. 3, is provided with twelve teeth which are adapted to mesh with the teeth of a twenty-four tooth wheel 42, whereby the wheel 42 will make a complete revolution in twenty-four hours.

The twenty-four tooth wheel 42 is fixed to a shaft 43, journalled in two spaced-apart dielectric material brackets 44 and 45 suitably carried by the housing 10. The shaft 43 mounts a brush 46 with its free end portion constructed and arranged to successively engage two electric contacts 47 and 48 (Fig. 8) which are spaced 180° apart with the axis of rotation of the shaft 43 as a center. These contacts may be carried by the bracket 44 and, consequently, the brush 46 makes two contacts per twenty-four hour day, twelve hours apart and the assembly just described may be termed the "A. M." and "P. M." electric switch means.

In addition, the shaft 43 mounts a second brush or movable contact unit 49 with its free end portion constructed and arranged to successively engage twenty-four electric equally spaced-apart contacts 50, arranged 11°40' apart with the axis of rotation of the shaft 43 as a center and carried by the bracket 45, and provide a contact unit so that the second brush or contact unit 49 makes a contact each hour of a twenty-four hour day. The contacts 50 may be carried by the bracket 45.

It will be noted in Fig. 2, for example, that the periphery of the metallic plate 22 does not extend to the holes 37 (a desirable spacing of the plate periphery and centers of the holes is one-half inch).

Carried by the wheel 28, preferably adjacent its periphery, and projecting toward the front wall 13 is a substantially U-shaped bridge 51 of electricity-conducting resilient metal with one arm 52 forming a brush contacting the metallic plate 22 while the other arm 53 forms a second brush and this sweeps over the mouths of the holes 37 as the wheel 28 rotates. In order to adjust the bridge 51 so that the arm 53 will be synchronized with the contact arm 35, there may be provided an arcuate slot in the wheel 28 to receive a screw clamp 54 secured to the bridge 51.

Referring now more specifically to the electrical system of the new timing apparatus, which preferably employs 110 volts, the line supply goes, by way of the conventional terminals of plug 60 and conductors 61 and 62, to the primary windings 63 of the transformer 64, while leads 65 and 66 extend from the conductors 61 and 62 respectively to a conventional appliance outlet 67 having two electric terminals, with a conventional mercury switch 68 interposed in the lead 65. One end of the secondary windings 69 of the transformer 64 is electrically connected, as by lead 70 to one terminal 71 of a two-terminal electrical signalling means 72, as a conventional buzzer. From the other end of the windings 69 extends a lead 73 to the brush 46 and to the plate 33. From the other terminal 74 of the signalling means 72 a lead 75 extends to the contact arm 35. There is also provided the electric circuit by lead 76 from lead 70 to one terminal of what may be termed the "A. M." lamp 77 exposed at the front wall 13 as by a suitable opening in the wall portion 20. A suitable resistance 78 is interposed in the lead 76 which latter also electrically connects one terminal of what be termed the "P. M." lamp 79. From the other terminal of lamp 77 a lead 80 extends to the contact 48, and from the other terminal of lamp 79 a lead 81 extends to the contact 47.

The mercury switch 68 may be manually actuated as by a conventional rotatable knob 82 extending outwardly from the front wall 13 and operatively connected with the pivotally-supported capsule 83 of the switch 68 to oscillate the same as is well known in the art. In addition, this switch 68 may be electrically actuated by means of two solenoids 84 and 85 with their armatures operatively connected with opposite end portions of the capsule 83 as is also well known in the art. One end of the windings of each solenoid

is electrically connected, as by lead 86 with one electric terminal or jack 87 of a two-terminal "on" connection, and one electric terminal or jack 88 of a two-terminal "off" connection, both opening forwardly in the front wall 13 and may be identified thereon by appropriate indicia as "on" and "off." The other end of the windings of the solenoid 84 is electrically connected, as by lead 89, with the other electric terminal or jack 90 of the "off" connection, while the other end of the windings of the solenoid 85 is electrically connected, as by lead 91, with the other electric terminal or jack 92 of the "on" connection.

Appropriately arranged, as in two parallel rows 93 and 94 of twelve each, are twenty-four spaced-apart terminals or jacks 95 also opening forwardly in the front wall 13. Preferably, the row 93 is adjacent the "A. M." lamp 77 and the row 94 is adjacent the "P. M." lamp 79. In order to designate these rows and the lamps, suitable indicia 96, as "A. M." may be placed on the outer face of the wall 13 adjacent the lamp 77 and row 93 and the indicia 97, as "P. M." may be placed on this face adjacent the lamp 79 and row 94. The two rows may be separated enough to enable suitable indicia 98, as the numerals 12, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11, to be placed on this face, with one numeral adjacent a jack 95 of each row. These numerals designate what may be termed the hour jacks of each row.

Electrically connected with each terminal or jack 95 is a separate lead 99 extending to and electrically connected with an appropriate contact 50 of the twenty-four contacts heretofore described.

From the lead 73, lead 100 extends to the brush 49 which successively engages the twenty-four contacts 50. Of course, the motor of the electrically-operated clock means 25 is electrically connected, as by leads 101 and 102 with the conductors 61 and 62 respectively.

Referring now to removable and interchangeable means to electrically connect certain selected jacks and contacts, there are provided plug assemblies 105, each comprising a flexible electrical conductor 106 with each end provided with a plug 107, one of which is best shown in Fig. 7, and including a plug body 108 having a forward face 109 from which projects an electrical terminal 110. The latter is of a length enabling it to extend through any of the outer holes or perforations 38, through the opening 23 and into, but not beyond, the inner holes or perforations 37 (being in frictional contact with the wall of the hole or perforation 37) whereby the terminal 110 cannot extend into the chamber 16 and cannot be contacted by the contact arm 35 because of the lengths of these terminals and because the face 109 will contact the outer face of the outermost wall section 20. Of course, the terminals 110 can make electrical contact with any jack 95.

In addition, there are provided plug assemblies 115, also best shown in Fig. 7, each including a plug body 116 having a forward face 117 from which projects a suitable electrical terminal or electricity-conducting portion 118. Here, the straight distance from the face 117 to the outer end of the terminal 118 is sufficient so that, when the face 117 of any plug assembly 115 contacts the outer face of the outermost wall section 20, the terminal will extend through the holes or perforations 37 and 28 and opening 23, as well as beyond the innermost wall section 22 and into the chamber 16, so it may be contacted

by the contact arm 35. Here, too, there is good frictional contact of terminal 118 and the walls of the hole 37.

I may add means 120 to indicate the part of a minute elapsed since a last registration of the minute and hour register or clock 40. Such means may be a rotating disc 121 extending through a suitable opening in the wall portion 20 and provided with a pointer or index 122. The disc 121 is preferably operatively connected with the shaft of the member 26 to rotate therewith. The connection 123 may be a flexible tubing in good frictional contact with this shaft. On the outer face of the wall section 20 there may be provided "second" indicia 124 as "0," "15," "30" and "45" to indicate the appropriate seconds of a minute of time.

In addition there is preferably provided a pointer or hand 130 mounted upon the shaft 31 and adapted to sweep over the outer face of the wall section 20 to point, in turn, to the sixty holes or perforations 38 which latter may be designated by suitable indicia 132 as has been described. Of course, the pointer or hand 130, with its longitudinal axis substantially intersecting the axis of one hole or perforation 38, will move clockwise in one minute so that this longitudinal axis will intersect the axis of the next adjacent hole or perforation 38. Additionally I may add indicia 131 to the front face of the wall section 20 adjacent the knob 82, such as "off" and "on" whereby the operator will be guided in the appropriate rotation of the knob 82.

In the use of the new electro-mechanical timing apparatus, if it is desired, for example, to deactivate, at 1:30 p. m., a suitable electrical appliance, such as an oven (not shown) plugged in at the outlet 67, and the knob 82 rotated to the "on" position (whereby the mercury switch 68 is closed), one plug terminal 110 of a plug assembly 115 is inserted in the jack 95 of the row 94 indicated by the indicia 98 as "1" and the other plug terminal 110 is inserted in one of the two "off" jacks 88 or 90. Into the other of the two "off" jacks is inserted a similar terminal 110 of a second plug assembly 115 with the other terminal 110 of this second plug assembly 115 inserted in the appropriate hole or perforation 38 designated by the indicia 132 as "30" (these two plug assemblies 115 are shown in position in Fig. 1). When the appropriate contact 50, i. e., the contact wired by lead 99 to jack 95 (of row 94) designated by indicia 98 as "1" is engaged by the brush 49, and the contact arm 35 contacts the terminal 110 inserted in hole 38 at "30" electric current will flow through the windings of the solenoid 85 and its armature will be attracted and thus tilt the capsule 83 of the mercury switch 68 to the position shown in Fig. 8 and thus break the electric circuit. If the operator desired to turn on or activate the appliance at 1:30 p. m., the only differences reside in the proper manipulation of the knob 82 and insertion of the terminals 110 in the "on" jacks 87 and 92.

In the event the operator employs a plug assembly 115, in order to remind him of an operation to be undertaken at, say, fifty-one minutes after the hour, he inserts a terminal 118 in the appropriate hole 38 (i. e., that indicating "51"). In this instance, the terminal 118 will project also, through the hole 37 and beyond the inner face of the front wall section 22. As a result, in the sweep of the arm 53 of the bridge 51 across the inner mouths of the holes 37, the arm will contact the terminal 118 and current

will flow through the bridge 51, metallic plate 33, lead 73, secondary windings 69, lead 70, the windings of means 72, lead 75, contact arm 35 (because the arms 35 and 53 are adapted to contact the terminal 118 at the same time) to terminal 118. It is clear from the above, that a number of the plug assemblies may be employed to cause signals at various desired times during the hour.

From the foregoing it is clear that a setting may be made to cause an appliance to be energized or deenergized at a predetermined time over a time interval of twenty-four hours and that, at the same time, one or more settings may be made so that there will be a signal at a predetermined time or signals at predetermined time intervals over an hour period.

The contact arm 35 has, as set out, dual functions in the apparatus, and may be employed either independently or in conjunction with the bridge 51, and the same rotor (shaft 31) rotates the wheel 28 carrying the bridge 51, as well as the contact arm 35.

Various changes may be made to the form of the invention herein shown and described without departing from the spirit of the invention or scope of the claims.

What is claimed is:

1. In an electric timer, a wall portion provided with opposite faces and a plurality of spaced-apart perforations extending from face to face and arranged in a circle; a contact plate carried on one face of the wall portion; electric switch means including a shaft, a rotatable member carried by the shaft, an electric contact arm of resilient electricity-conducting material carried by the shaft and constructed and arranged to sweep over one like mouth of said holes, one after another, said arm being disposed closely adjacent that face of the wall free of said plate, an electric bridge having two brushes of resilient material and being carried by said rotatable member with one brush extending toward said arm and constructed and arranged to sweep over the other mouths of said holes, one after another, with the other brush in contact with said plate; means to rotate said rotatable member; signal means having two electric terminals; an electric appliance outlet having two terminals; a plurality of hour jacks; electric commutator means; means electrically connecting said jacks with said commutator means; mechanical means operatively connecting said rotatable member with said commutator means to mechanically actuate said commutator means; means electrically connecting said commutator means with one terminal of said signal means; means electrically connecting the other terminal of said signal means with said contact arm; a pair of "off" jacks; a pair of "on" jacks, a source of electric current; connecting means electrically connecting said source of electric current with the terminals of said appliance outlet; an electric switch interposed in said connecting means; electric means operatively connected with said "on" jacks to close said switch; means operatively connected with said "off" jacks to open said switch; removable means electrically connecting a selected hour jack with either of said "off" jacks; removable means electrically connecting a selected hour jack with either of said "on" jacks, both of said last two means including a portion of electricity conducting material detachably extending into any selected of said perforations and of a length insufficient to extend outwardly

of said one face of said wall; and removable means electrically connecting said arm and first brush, including a portion of electricity conducting material detachably extending into any selected perforation and of a length sufficient to extend outwardly of both of said faces.

2. An electric timer according to claim 1 in which said means to rotate said rotatable member includes spaced-apart teeth carried by said rotatable member and an arm movable to engage and press against said teeth, one after another, to rotate said rotatable member step by step; said commutator means includes a movable contact unit and a fixed contacts unit; and said mechanical means includes a toothed wheel with its teeth in mesh with said first-named teeth and operatively connected with said electric commutator means to move one of said units into and out of electrical contact with the other unit.

3. An electric timer according to claim 1 in which said means to rotate said rotatable member includes spaced-apart teeth carried by said rotatable member, a clock, having a shaft and an arm eccentrically mounted on said shaft of said clock and movable to engage and press against said teeth, one after another, to rotate said rotatable member step by step; said commutator means includes a movable contact unit and a fixed contacts unit; and said mechanical means includes a toothed wheel with its teeth in mesh with said first-named teeth and operatively connected with said electric commutator means to move one of said units into and out of electrical contact with the other unit.

4. An electric timer according to claim 1 in which said means to rotate said rotatable member includes spaced-apart teeth carried by said rotatable member, a clock, having a shaft and an arm eccentrically mounted on said shaft of said clock and normally paralleling the shaft of said clock and movable to engage and press against said teeth, one after another, to rotate said rotatable member step by step; said commutator means includes a movable contact angular unit and a fixed contacts unit; and said mechanical means includes a toothed wheel with its teeth in mesh with said first-named teeth and operatively connected with said electric commutator means to move one of said units into and out of electrical contact with the other unit.

5. An electric timer according to claim 1 in which said means to rotate said rotatable member includes spaced-apart teeth carried by said rotatable member and an arm movable to engage and press against said teeth, one after another, to rotate said rotatable member step by step; said commutator means includes a movable contact unit and twenty-four spaced-apart fixed hour contacts providing a second unit and said mechanical means includes a toothed wheel with its teeth in mesh with said first-named teeth and operatively connected with said electric commutator means to move one of said units into and out of electrical contact with the other unit.

6. In an electric timer, minute electric switch means including a rotatable member and a contact arm rotatable with said member; electrically-operated means to cause rotation of said member; hour electric switch means; "A. M." and "P. M." electric switch means; hour and minute indicating means including a rotatable minute wheel and a rotatable hour wheel; mechanical means to cause one complete operation of said hour electric switch means over a period of twenty-four hours and to cause one complete

operation of said "A. M." and "P. M." electric switch means, through rotation of said wheels by said rotatable member; "on-and-off" electric switch means; a plurality of "on" jacks; a plurality of "off" jacks; means electrically connected with said jacks to actuate said "on-and-off" switch means; a plurality of hour jacks including "A. M." hour jacks and "P. M." hour jacks; means electrically connecting said hour jacks with said hour electric switch means; a wall defining a plurality of spaced-apart "minute" perforations opening at one like mouth of each to the path traversed by said contact arm; electrically-operated signal means; means electrically connecting said signal means with said minute electric switch means; electric applicant outlet means; means electrically connecting said outlet means with said "off-and-on" electric switch means; means to supply electric current to said electrically-operated means, to said "off-and-on" electric switch means, to said signal means, to said hour electric switch means, to said "A. M." and "P. M." electric switch means and to said minute electric switch means; manually-removable means to selectively electrically connect a selected "on" jack with a selected hour jack, including electricity-conducting terminal portions adapted to enter said jacks and said perforations; manually-removable means to carry an electric current from another selected "off" jack to a selected "minute" perforation or to carry an electric current from another selected "off" jack to another selected "minute" perforation including electricity-conducting terminal portions adapted to enter said jacks and perforations; and manually-removable means, including an elongated electricity-conducting portion, to plug in a selected "minute" perforation to cause electrical actuation of said signal means when said contact arm engages said electricity-conducting portion within said last-named selected "minute" perforation.

7. In an electric timer according to claim 6 in which said "A. M." and "P. M." electric switch means includes a two-contact unit and a one-contact unit, one of said units being rotatable with said hour wheel.

8. In an electric timer according to claim 6 in which said wall includes an outermost wall portion containing portions of all of said perforations, an innermost wall portion containing the other portions of all of said perforations, an intermediate wall portion containing an opening, said wall portions defining a chamber extending to said perforations, with said contact arm disposed within and rotatable within said chamber and extending to the mouths of said perforations.

9. In an electric timer according to claim 6 in which said wall includes an outermost wall portion containing portions of all of said perforations, an innermost wall portion containing the other portions of all of said perforations and an intermediate wall portion containing an opening, said wall portions defining a chamber extending to said perforations, with said contact arm disposed within and rotatable within said chamber and extending to the mouths of said perforations, and said minute electric switch means includes a plate of electricity-conducting material, an electric bridge carried by said rotatable member, said bridge having two brushes with the first brush movable in a path, upon rotation of said rotatable member, over the innermost mouths of said perforations spaced from said mouths to which said contact arm extends, and the second brush engages said plate; said electricity-conducting portions being of a length to extend outwardly of any of said innermost mouths and into the path of travel of said first brush, and said terminal portions being of a length insufficient for them to project outwardly of any of said innermost mouths when they are inserted in said perforations.

LEONARD P. BENJAMIN.

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