Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 1

Fig. 1

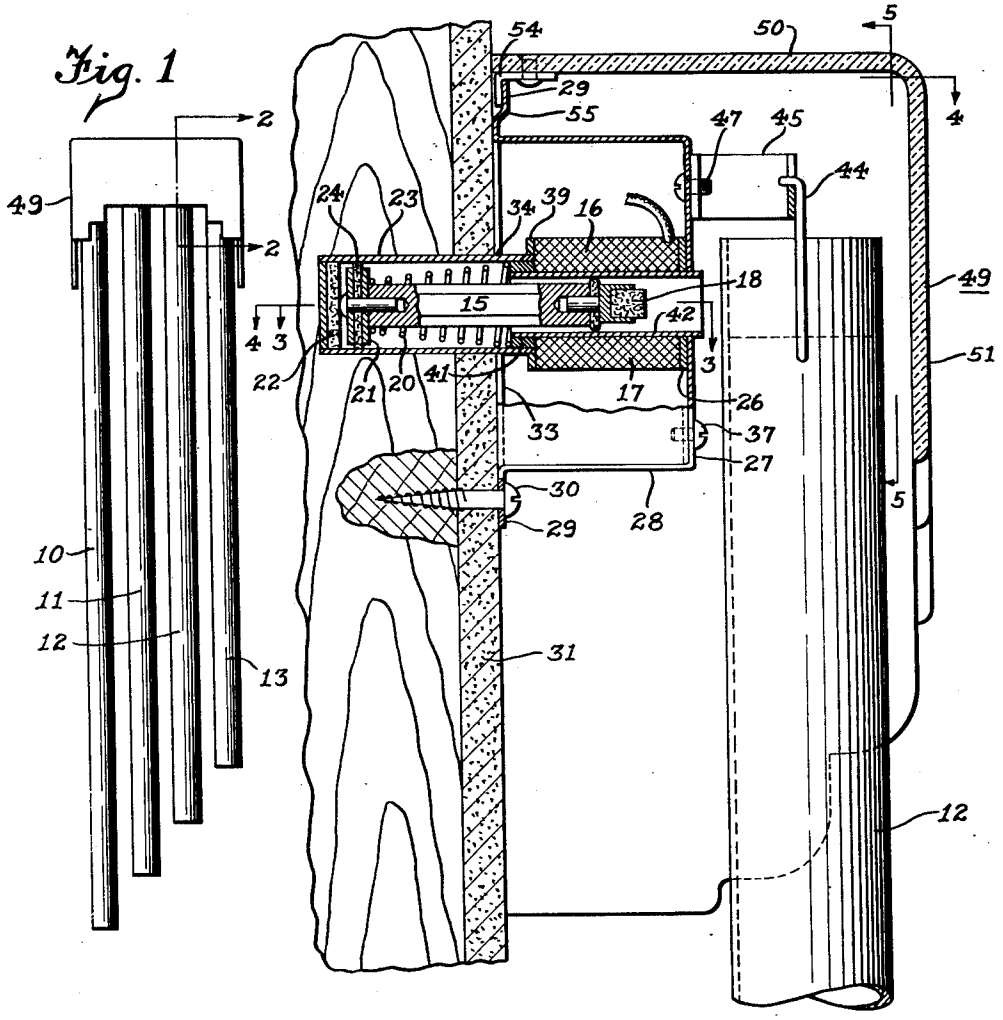


Fig. 2

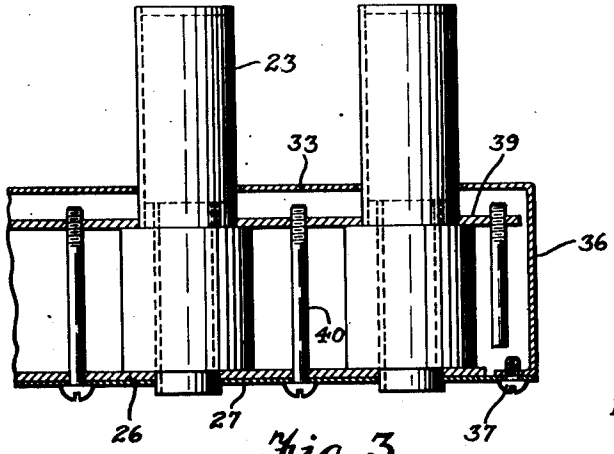


Fig. 3

INVENTOR

BY Gilbert L. Bossard

Maréchal & Noe

ATTORNEYS

Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 2

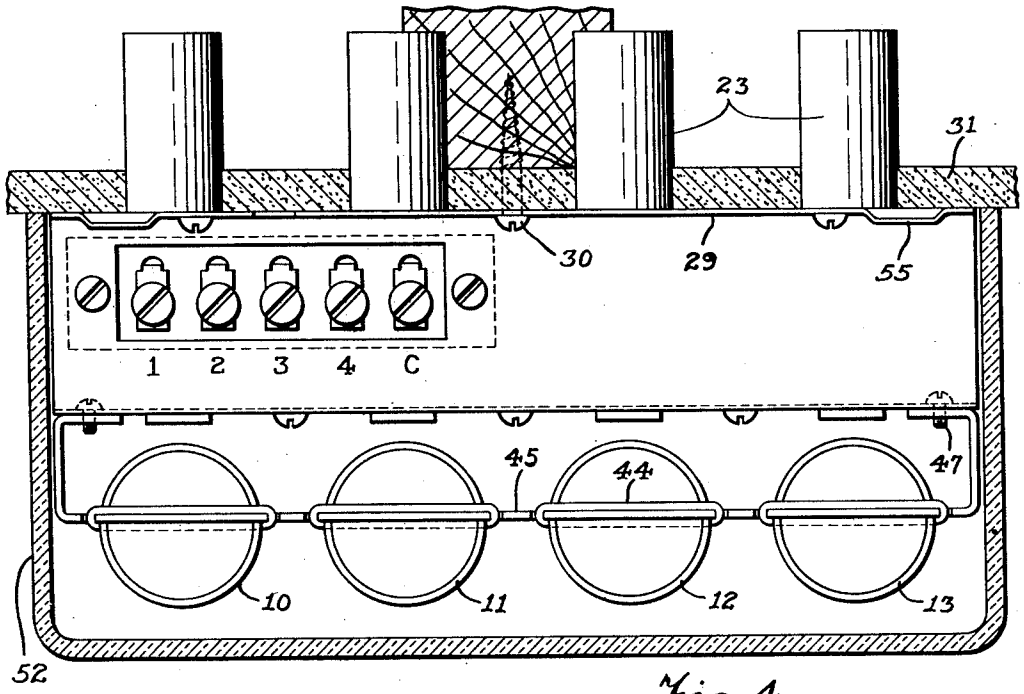


Fig. 4

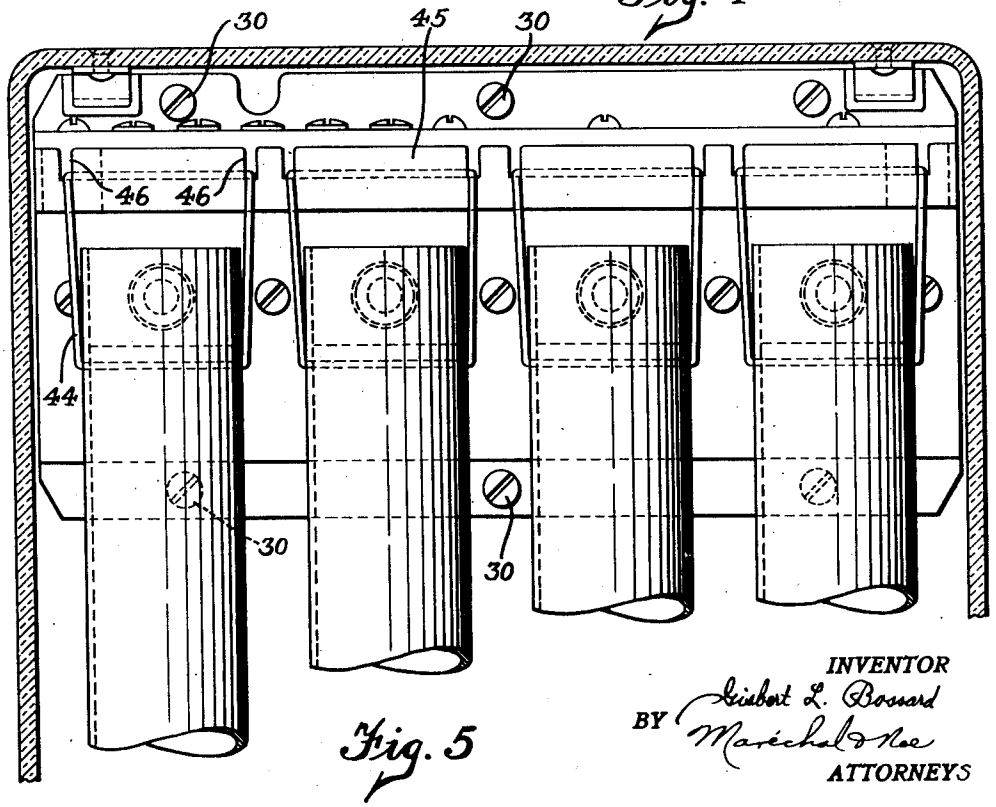


Fig. 5

INVENTOR
Gilbert L. Bossard
BY Marechal & Nee
ATTORNEYS

Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 3

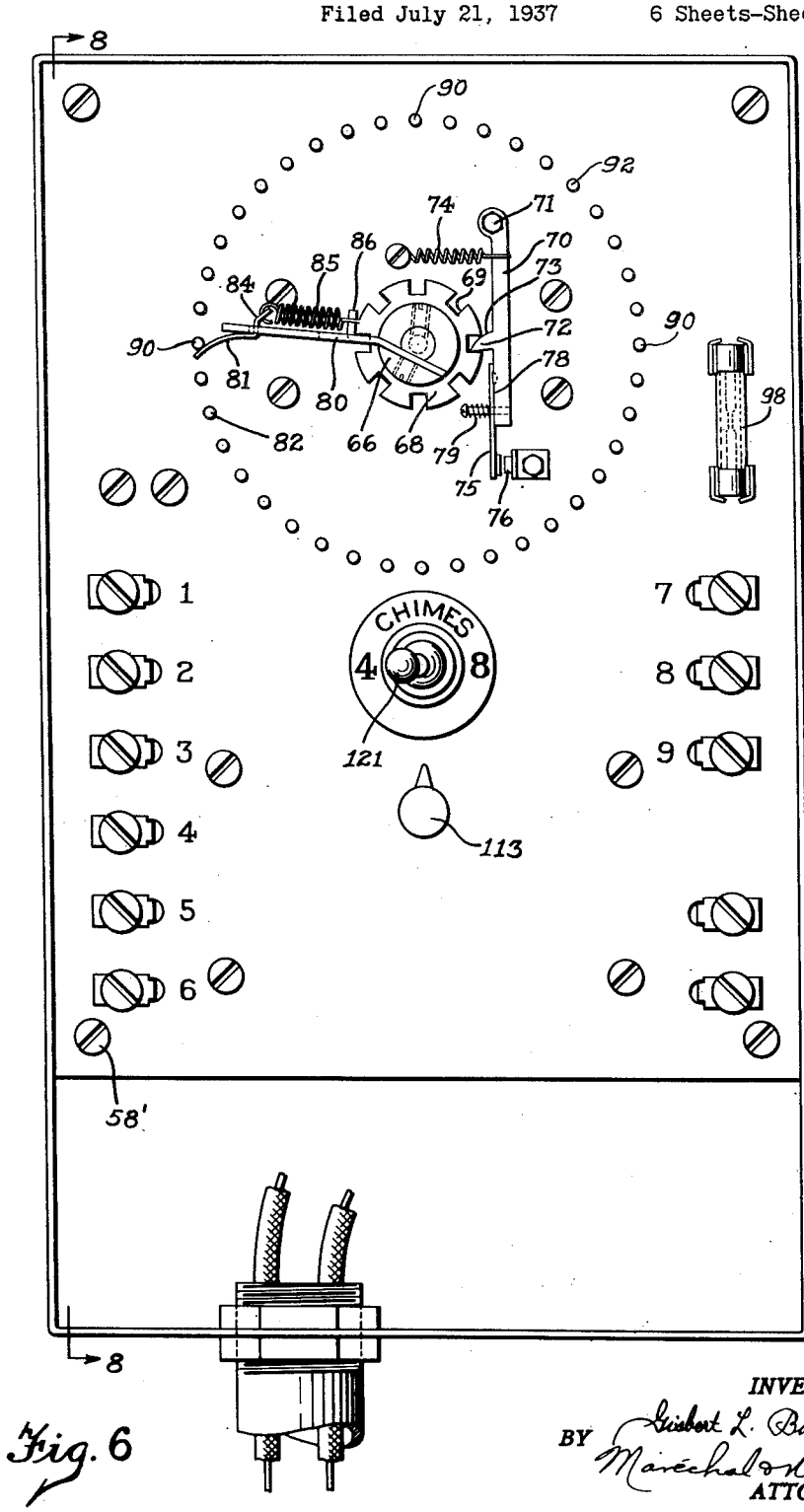


Fig. 6

INVENTOR
BY Gilbert L. Bossard
Marechal & Lee
ATTORNEYS

Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 4

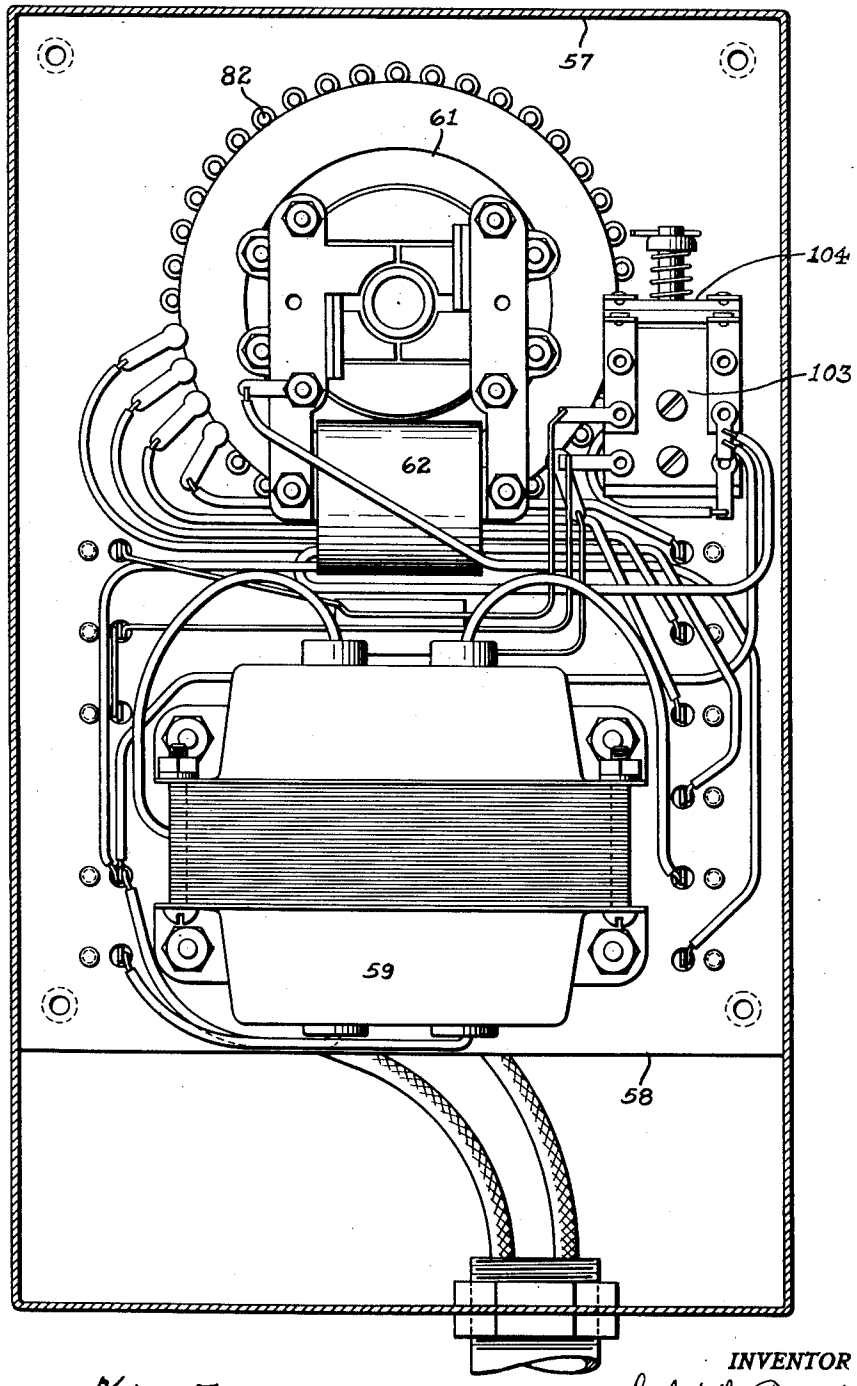


Fig. 7

INVENTOR
Gisbert L. Bossard
BY Maréchal & Lee
ATTORNEYS

Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 5

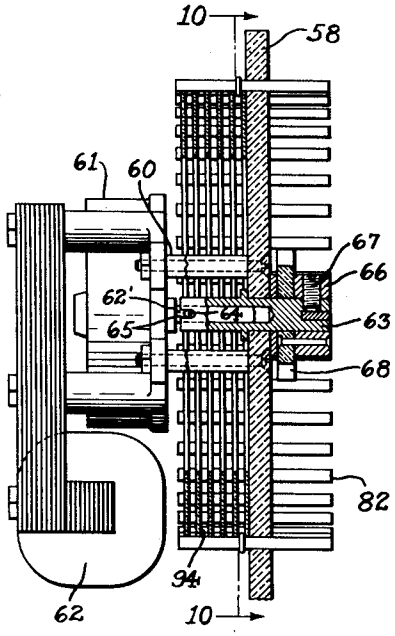


Fig. 9

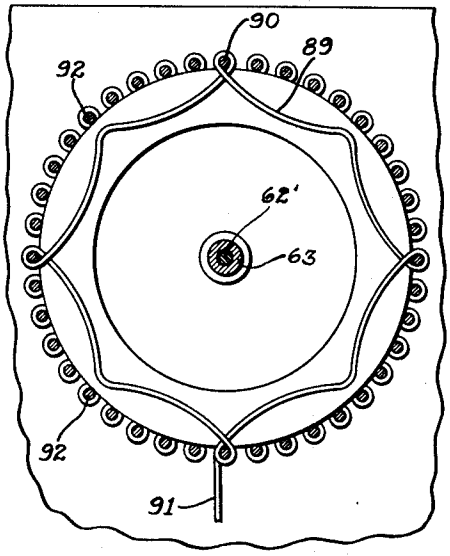


Fig. 10

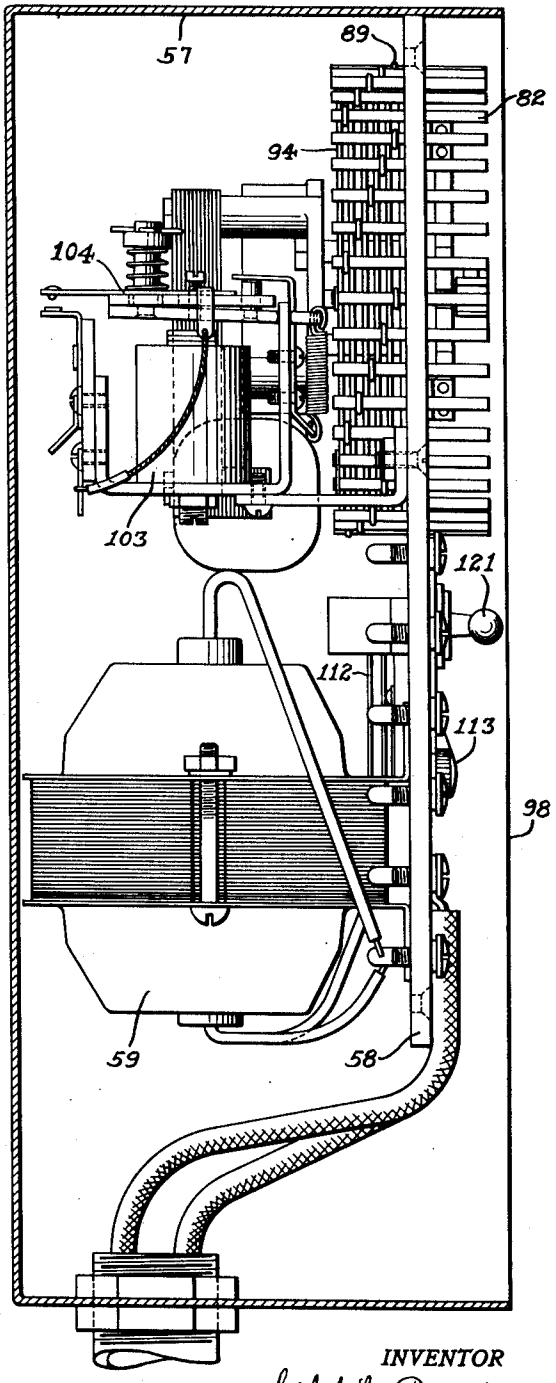


Fig. 8

INVENTOR
Gisbert L. Bossard
BY Maréchal & Hoe
ATTORNEYS

Oct. 24, 1939. G. L. BOSSARD 2,177,515

CHIME

Filed July 21, 1937 6 Sheets-Sheet 6

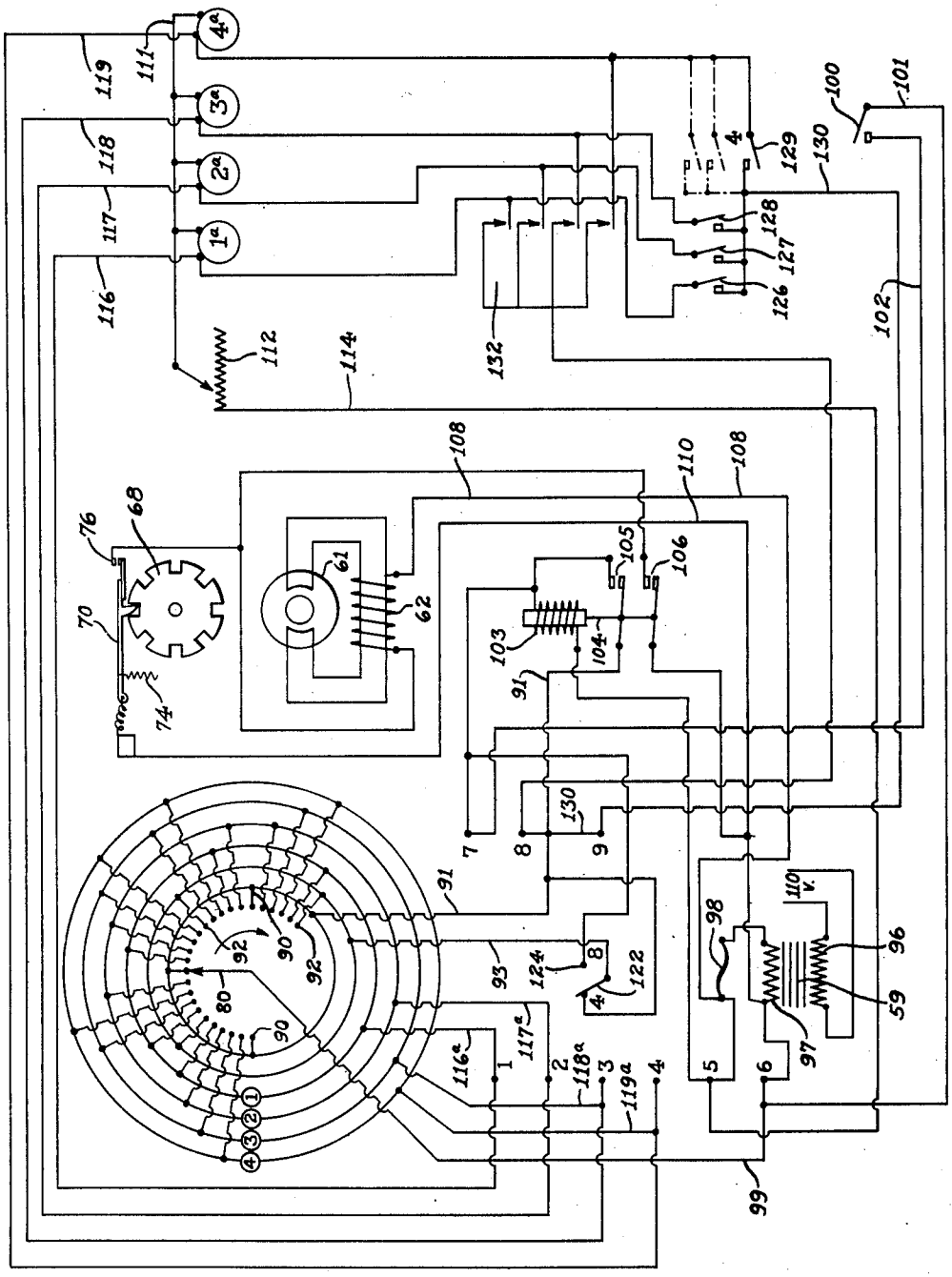


Fig. 11

INVENTOR
Gisbert L. Bossard
BY Maréchal & Nee
ATTORNEYS

Patented Oct. 24, 1939 2,177,515

UNITED STATES PATENT OFFICE

2,177,515

CHIME

Gisbert L. Bossard, Dayton, Ohio, assignor to Mary Agnew, Hopkinsville, Ky.

Application July 21, 1937, Serial No. 154,709

18 Claims. (Cl. 84—103)

This invention relates to electrically controlled devices for controlling a plurality of different electrical circuits adapted for successive energization.

One object of the invention is the provision of an electrically operated apparatus having a plurality of electrical circuits connected to contacts which are successively engaged by a motor driven contact member, a suitable lost motion attachment being provided between the contacts and the motor providing a snap action from one contact to another.

Another object of the invention is the provision of an electrically actuated apparatus incorporating different electrical circuits connected to a series of contacts which are swept over by a motor operated contact member, one of the contacts being incorporated in the motor energizing circuit, the construction being such as to provide a substantial degree of motor operation while maintaining an electrical engagement between the contact in the motor energizing circuit and the contact engaging portion of the motor driven member, additional means being provided to continue the operation of the motor for a predetermined time.

Another object of the invention is the provision of an apparatus, such as an electric chime having a plurality of chime members operated by solenoid plungers, the plungers being energized successively by a motor driven apparatus including a rotatable arm and a series of projecting contacts over which the contact engaging portion of the arm moves with a snap action from one contact to another.

Another object of the invention is the provision of an electrically actuated chime adapted to produce a predetermined sequence of chime notes each time a circuit controlling motor is energized, and having simple electrical means operable to readily change the sequence of notes produced.

Another object of the invention is the provision of a motor driven circuit controller, controlled by a switch which may be held closed for only a very short time, and having provision insuring the initiation and completion of a full cycle of operations, and insuring the stopping of the motor at a predetermined time so that it will be ready to start again on a second cycle.

Another object of the invention is the provision of an electrically actuated chime or the like, having a relay providing a holding circuit and incorporating a switch which is actuated shortly after a sequence of operations is initiated to provide continued operation of a drive motor throughout a predetermined time interval and providing deenergization of the relay which is therefore maintained energized only a comparatively small part of a complete cycle of operations.

Another object of the invention is the provision of an electrically actuated chime or the like adapted to produce a predetermined energization of a number of different electrical circuits and controlled by an electric motor having a cam member which actuates a switch providing continued operation of the motor and in which the switch operating member also functions as a stopping means at the end of a cycle of operations, insuring a positioning of the motor operated parts such as to permit the motor to be again started for another cycle.

Another object of the invention is the provision of an electrically actuated chime incorporating a series of solenoids carried by a supporting member which may be mounted on a wall surface or the like, the solenoid plungers being contained, when in their inoperative positions, in cages or barrels which project rearwardly from the supporting member and which are adapted to be mounted in holes of comparatively small size in the wall or other supporting surface.

Another object of the invention is the provision of an electrically actuated chime incorporating a plurality of chime tubes operated by solenoids the coils of which are housed in a container having a depth only slightly exceeding the length of the solenoid coils.

Other objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawings, in which—

Fig. 1 is a front elevation of an electrically actuated chime, showing the chime tubes and the cover arranged over the upper ends of the tubes;

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a horizontal section on the line 4—4 of Fig. 2;

Fig. 5 is a vertical section on the line 5—5 of Fig. 2;

Fig. 6 is a front elevation of the cabinet in which the circuit controlling apparatus is contained;

Fig. 7 is an elevational view looking at the rear of the mechanism in the cabinet illustrated in Fig. 6;

Fig. 8 is a section on the line 8—8 of Fig. 6;

Fig. 9 is a side elevation shown partly in section

taken vertically through the contact members and the operating motor;

Fig. 10 is a section on the line 10—10 of Fig. 9; and

Fig. 11 is a diagrammatic illustration of the circuit connections.

Referring more particularly to the drawings by reference numerals, Figs. 1 to 5 inclusive show an electrically actuated chime mechanism including chime tubes 10, 11, 12 and 13 each of which is controlled by an electric solenoid. Thus, as illustrated in Fig. 2, the chime tube 12 is adapted to be struck by the plunger 15 of the solenoid 16 when the winding 17 is energized, the plunger 15 having an iron body part which is centered within the length of the coil 16, under the pull of the winding, when the striking tip 18 is a small fractional part of an inch away from the surface of the chime tube 12 so that the chime will be struck and the plunger will be retracted a very slight amount to permit the continued vibration of the chime. Normally the plunger 15 is held in a retracted position as shown in Fig. 2 by means of a spring 20 which bears against an end plate 21 fixed on the end of the plunger and holds the end of the plunger against a soft packing wad 22 contained in a barrel or cage 23, preferably made of brass. This brass cage guides the rear end of the solenoid plunger, which is provided with a non-metallic washer or bearing strip 24 of substantially the same diameter as the inside of the cage 23.

The solenoid coil 17 is supported by a housing plate 26 which is preferably a sheet metal stamping formed to provide a front plate 27, rearwardly extending upper and lower plates 28, and vertically extending back plates 29, the latter being adapted to be mounted flush or flat upon the surface of a wall or other holding object. Suitable attaching screws 30 pass through openings in the back portions 29 and serve to mount the housing plate 26 securely on the wall 31.

At the rear of the housing in which the solenoid coils are contained is a back plate 33, preferably a sheet metal plate having openings 34 receiving the several brass cages 23, the plate 33 being formed to provide forwardly extending side portions 36 which are attached by means of screws 37 to the housing plate 26. Some little distance in front of the back plate 33 is an iron strap 39 which extends along the series of solenoid coils, holding the coils against the front plate 27 of the housing, iron bolts or screws 40 serving to interconnect the strap 39 and the steel plate 27 magnetically as well as mechanically.

The ends of the cages 23 are preferably pressed into openings provided therefor in the strap 39. Pressed into the cage 23, as shown in Fig. 2, is a brass collar 41 which holds the rear end of a brass sleeve 42 around which the winding 17 is placed, the forward end of this brass sleeve 42 having a pressed fit in openings provided in the front plate 27 of the housing. It will be understood that the several solenoids, four in number in the particular construction herein illustrated, are all of similar construction and are similarly mounted in parallel arrangement with their axes extending horizontally and rearwardly in alignment with the central vertical planes of the chime tubes.

Several chime tubes are supported by flexible cords 44 which pass through openings in the upper ends of the chime tubes, and which are hung from a common supporting bar 45, the latter having slots 46 which receive the upper looped portions of the cords 44. These slots are so arranged that the cords will not touch the chime tubes except where they pass through the tubes, permitting unrestrained vibration of the chime tubes. The common supporting bar 45 is secured at its opposite ends by means of attaching screws 47 to the front plate 27. The holes in the bar through which the screws pass are preferably somewhat larger than the outside diameter of the screws to permit a slight adjustment in positioning of the bar. Inasmuch as the slots 46 may have a definite location with respect to one another and with respect to the predetermined spacing of the axes of the solenoids, it will be apparent that the chime tubes are very readily located so that they are exactly centered with the solenoids.

The upper ends of the chime tubes are protected and covered by means of a cover 49 having a top surface 50 and a depending front surface 51 suitably spaced from and covering the upper ends of all of the chime tubes. The cover is also provided with side walls 52 which house and enclose the side portions of the chime housing. The cover is readily secured in position on the chime housing by suitable attaching means at the rear end of the top wall 50. As shown this attaching means comprises depending members 54 which extend down into receiving sockets 55 provided in the top vertical plate 29 of the housing. To remove the cover 49 it is merely necessary to move the same vertically upwardly to disengage the depending portions 54 of the cover from the receiving sockets in the housing plate.

As will be readily apparent from Fig. 2, the total depth of the housing in which the solenoid coils are contained only slightly exceeds the length of the coils. The barrels or cages 23 project to the rear of the back end of the housing and are received in four round holes or openings in the wall 31. These four holes in the wall may be readily made by a suitable drill or similar tool and the engagement between the barrels or cages 23 and the wall openings assists in assuming the weight of the chime apparatus although the holes in the wall may be made slightly larger if desired so that the entire weight of the apparatus is assumed by the screws 30. The construction, however, provides a chime apparatus which will not project very far from the wall and in which the flat rear side of the apparatus may be mounted flush or flat upon the wall.

In accordance with the present invention the solenoids of the chime apparatus are adapted to be successively energized in a predetermined manner by an electrically actuated controlling mechanism including an electric motor and circuit controlling apparatus operated by the motor to produce a predetermined sequence of sounds, it being understood that the several chime tubes are all of different tune such, for example, C, F, A, C. It is preferred that the circuit controlling apparatus be mounted in a common cabinet and that there should be suitable electrical connections extending from the cabinet, which may be at a remote point in the building, to the chime apparatus in which the solenoids are contained.

As shown in Figs. 7 to 10 inclusive, the circuit controlling apparatus is contained in a cabinet 57 having a mounting panel 58 of suitable insulating material. Attaching screws 58' support the panel 58 at a suitable location near the front of the cabinet. Within the cabinet walls, which are preferably of sheet iron construction, is the transformer 59 adapted to transform the ordinary

house lighting voltage to a suitable low voltage, preferably of the order of 16 volts. Carried by the back of the panel 58 as by means of suitable supporting connections 60 is an electric motor 61 having winding 62 which is energized from the low voltage secondary of the transformer. The motor shaft 62' is suitably connected to a rotatable shaft portion 63 which is mounted for rotation in the panel 58. A suitable flexible connection between the motor shaft and the shaft portion 63 may be provided by a pin 64 on the motor shaft and pin receiving slots 65 in the shaft portion 63.

The front end of the shaft portion 63, as shown in Figs. 6 and 9, is secured to a hub 66 by means of a suitable set screw 67. The hub is pinned securely to a slotted or cam member 68, preferably made of Bakelite, and provided with a series of slots 69 spaced in a predetermined arrangement around its periphery. This member 68 forms a stopping means for the motor and also operates a switch lever 70 which closes a circuit shortly after the motor is energized to provide for continued operation of the motor. Thus as shown in Fig. 6, the lever 70 which is preferably a rigid brass member, is pivotally supported at 71 on the face of the panel 58. Projecting from the lever 70 is a projection 72 one side of which extends abruptly from the lever and the other side, as indicated at 73, is inclined so that when the slotted member 68 rotates clockwise from its position shown in Fig. 6 it will operate as a cam against the surface 73 of the projection and force the lever towards the right. The end of the projection 72 will then ride along the cylindrical outer surface of the slotted member until the next slot comes opposite the projection, which will then permit the lever 70 to move back to the left, this movement serving to impose a restraining effect on the continued rotation of the slotted member by reason of its engagement with the surface 73 which is so arranged that the spring 74 yieldingly holds the projection 72 in the slot. This tends to stop the motor driven slotted member 68 at a definite stopping point. The free end of the lever 70 carries a contact member 75 which engages a fixed contact 76 when the lever 70 is moved to the right from its retracted position, so that a circuit is completed from contact 76 to contact 75, these contacts thus completing a circuit which maintains the motor in operation as will be presently described.

The contact member 75 is preferably a rigid blade of brass or other similar metal held yieldingly against a flat surface 78 on the lever 70 by means of a spring 79, the construction being such that an electrical connection is made between the parts 75 and 76 just before the lever 70 is moved entirely clear of a slot 69 so that there will be assurance of an electrical connection between the parts 75 and 76 when the end of the projection 72 is riding on the cylindrical surface of the slotted member 69. Fixed on the member 75 is a semicircular ball portion 75' engaging a semicircular depression in the lever 70 and acting as a fulcrum point.

Carried by the hub 66 is a rigid arm 80, of brass or other similar material. The end of this arm carries a contact engaging portion or brush 81 which sweeps over a series of contact studs or pins 82, making contact successively with these contact pins, and providing for sequential energization of the circuits in which the pins are connected. These contact pins 82 are preferably brass studs having a forced fit in the panel 58 and extending from both sides of the panel as shown in Fig. 8, the forwardly projecting ends of the studs being engaged by the contact portion 81 of arm 80 as previously mentioned. This contact portion is such as to provide a snap action for one contact pin to another while the motor driven hub 66 operates at a uniform speed of rotation. There is thus some motion of the motor during which a contact pin remains in engagement with the contact portion 81. This contact portion 81 is preferably constructed as a copper brush or blade having a tail portion 84 projecting through an opening in the arm 80 and engaged by a spring 85 which is anchored at one end to a pin 86 on the arm 80. The spring 85 yieldingly urges the contact portion 81 in a clockwise direction with respect to the arm 80, as viewed in Fig. 6, and as the contact portion 81 projects out to a greater radial extent than the pins 82 when the spring 85 is compressed it will be apparent that the contact portion 81 snaps quickly into engagement with a succeeding contact pin 82 as soon as it releases from the preceding pin.

The rearwardly projecting ends of the pins 82 are connected electrically in a predetermined manner to the different solenoid circuits, and certain pins are connected to one another by means of wires 89, as shown in Fig. 10 for example, which are looped around certain of the pins and are preferably soldered in place. As shown in Fig. 10 four of the pins are interconnected by means of wire 89. These pins are arranged 90° apart. These particular pins, designated 90, connect to a wire 91 that is connected in the motor energizing circuit as will be presently described. Other pins 92 positioned at 45° away from the pins 90 are also interconnected to one another in a similar manner and are connected to a common wire 93 also forming a part of the motor energizing circuit. The remaining pins are connected by a similar looped wire arrangement as illustrated in Fig. 11 in a diagrammatic manner. The several connecting loops of wire which interconnect the pins with one another are separated electrically by means of insulating disks 94 shown in Figs. 8 and 9.

Referring now more particularly to Fig. 11 it will be seen that the transformer 59 is provided with a primary winding 96 which may be connected through a suitable switch, not shown, to a 110 volt power source. The secondary 97 of this transformer is connected through a fuse 98 which is preferably supported on the panel 58, to a contact 5 which is arranged conveniently upon the panel as shown in Fig. 6. The other end of the winding 97 connects to the panel connection or contact 6 which is electrically connected by a wire 99 to the motor driven brass arm 80. Contact 6 is also connected to a manually operated starting switch 100 through wire 101. Switch 100 is connected by wire 102 to the winding 103 of a relay having an armature 104 which closes switches 105 and 106 when the relay is energized. When the starting switch 100 is closed a circuit is completed through the secondary of the transformer and through the relay 103, this relay acting instantaneously as soon as the switch 100 is closed so as to close a holding circuit established from the contact 5 through relay 103, through switch 105 closed by the relay and through the wire 91 to the contact pin 90 which at that time is engaged by the motor driven contact arm 80. The relay 103 is

thus maintained energized even though the manually operated switch 100 is released immediately after it is closed, to insure starting of the motor even if the switch 100 is not held closed.

The motor circuit is established from the secondary of the transformer from contact 6 through the switch 106 which is closed by the relay, through the winding 62 of the motor and back through the wire 108 to the contact 5 of the transformer secondary. The motor will thus start to operate, and as it does so it will of course rotate the slotted member 68 so that after a short period of operation the slotted member 68 will cam the lever 70 in a counterclockwise direction and close a maintaining circuit through wire 110, the contact arm 70, contact 75, contact 76 (not through switch 106) so that the motor will continue operating until this maintaining circuit through the contacts 75, 76 is broken. This occurs of course as soon as the next slot receives the projection 72 of lever 70, after a 45° rotation of the shaft 63. It should be noted that the electrical connection through arm 80 and contact 90 is maintained for a substantial period during which the motor operates, keeping the holding circuit through the relay 103 and switch 105 closed until contact is made between the contact members 75 and 76. After this contact is made to complete the maintaining circuit of the motor, the contact blade on the end of the motor driven arm 80 moves away from the pin 90 and the relay 103 is thus deenergized during the continued operation of the motor. The relay is therefore energized only comparatively small periods of time during the initial starting operation of each cycle. As the relay 103 is deenergized and switches 105 and 106 broken before the next succeeding slot is engaged by the projection 72 of arm 70, it will be apparent that the motor will be deenergized and stopped as soon as the circuit through the contacts 75 and 76 is interrupted by the contact arm 70. And as previously mentioned, the resistance produced by the curved side 73 of the projection 72 operating against the shoulder on the slotted member at the end of the slot serves to impose a restraining resistance insuring that the motor will stop, and not overrun unless the motor is again energized.

The four chime solenoids, which are designated respectively 1*a*, 2*a*, 3*a*, and 4*a* in Fig. 11 are connected through a common wire 111 to a controllable resistance 112 which is preferably supported on the rear side of the panel 58. Its resistance may be controlled by a manually adjustable hand knob 113 adapted for convenient operation on the front of the panel. The resistance is electrically connected by wire 114 to the contact 5 leading to the secondary of the transformer. The four solenoid windings are connected electrically through wires 116, 117, 118, 119 to connection contacts 1, 2, 3, and 4 respectively arranged conveniently on the side of the panel 58. These connections are electrically connected by wires 116*a*, 117*a*, 118*a*, and 119*a* to the series of contact pins 82. For example, throughout the first 45° of rotation of the motor operated arm 80, after the contact brush 81 leaves the starting contact pin 90 with which it is shown engaged in Fig. 11, it successively energizes the solenoids 1*a*, 2*a*, 3*a*, and 4*a* in that order, and then engages a pin 92, and the motor stops, for at that time the next succeeding notch or slot in the member 68 causes the motor circuit to be broken. This break in the motor circuit produced by the lever 70 leaves the contact brush 81 in engagement with pin 92 ready for another cycle of operations. If the manual switch 100 is closed again a second sequence of operations will be produced, relay 103 being energized to close the motor switch 106 and then later being deenergized when the contact brush 81 leaves the pin 92 but the motor continuing to operate because by that time lever 70 has closed the maintaining circuit of the motor. The motor will thus operate to produce a different sequence of sounds by energizing solenoids 3*a*, 4*a*, 1*a*, and 2*a* in that order. The next succeeding 45° rotation of the motor driven arm may produce still another sequence of sounds by energizing the solenoids in some other different pleasing order. Each 45° rotation of the shaft 63 will therefore produce some predetermined series of chime notes through the entire 360° of a complete revolution.

It will be noted that the four contact pins 90 and the four pins 92 are all provided in the motor energizing circuit, with the connections as illustrated in Fig. 11. However there is provision enabling the motor to continue operation through more than 45° of rotation to produce a continuous 90° of movement and thus strike eight chime notes in succession. Thus as shown in Fig. 6 there is a manually operable switch member 121 which, in the position shown, holds a contact blade 122 to connect the pins 92 through the wire 93 to the pins 90 through the wire 91. However when this switch is moved so as to throw the switch blades 122 over to the contact 124, each time the motor driven arm engages a contact 92 a circuit will be completed through the relay 103 back to the secondary contact 5 thus closing the relay and maintaining the motor energized through the switch 106 which is of course closed when the relay is energized. Therefore even though the motor maintaining circuit through the contacts 75 and 76 is interrupted by the lever 70 moving into engagement with a notch in the slotted member 68, the motor will be maintained in operation by the closing of the relay. The contacts 75 and 76 will subsequently be closed and the relay deenergized and the motor continues until the next succeeding contact 90 is reached. There is thus provision for varying the sequence of sounds produced, and the number of chime blows struck in any one cycle of operations, this change being effected merely by operating the switch member 121.

The chime tubes are also adapted to be operated individually by conveniently located manually operable switches or push buttons 126, 127, 128 and 129, connected directly to the respective solenoids 1*a*, 2*a*, 3*a*, and 4*a* and connected to a common wire 130 which extends to the wire 91 so that when the motor operated arm 80 is engaged with a pin 90 a circuit will be completed back to the secondary of the transformer when any one of these switches or push buttons 126 to 129 is operated. However if the chime is under the control of the motor when any of these switches is closed no circuit will be completed merely by the manual closing of the switches because the contact arm 80 will not complete the circuit at that time. These switches may be placed at different convenient locations in the building and serve as calls with special significance to show where they originated by reason of the particular tone of the single chime tube which is vibrated.

A keyboard designated 132 may be provided

for the manual control of the several chime tubes, this keyboard including individual switches for the several different solenoids.

It will now be understood that the various circuits controlled by the motor operated arm may be operated in predetermined succession under the control of a motor, and by reason of the lost motion or snap action provided in the closing of the successive circuits through the contact pins, at least one of which functions in the motor controlling circuit, it will be seen that the motor may be started and may be operated through some substantial degree of rotation before the motor starting circuit is interrupted. There is therefore an assurance that a complete cycle of operations will be effected each time the starting switch is closed.

It should be understood that while the particular adaptation for which this electrical switching apparatus is illustrated herein is for the energization of solenoids, it may be used for other purposes and uses.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a device of the character described, a series of electrically actuated units adapted for operation in a predetermined succession, a motor, an arm driven by said motor, a series of contacts over which the arm travels and connected to said units, a starting switch, an energizing circuit for energizing the motor when the starting switch is closed, a holding circuit including a holding switch and control means therefor to maintain the motor energizing circuit after the starting switch is opened, at least one of said contacts forming a part of said holding circuit, and a motor operated switch for maintaining the motor circuit during a predetermined operation of the motor and arranged to open the motor circuit when said arm moves to engage a contact connected in said holding circuit.

2. In a device of the character described, a series of electrically actuated units adapted for operation in a predetermined succession, a motor, an arm driven by said motor, a series of contacts over which the arm travels and connected to said units, a manually operated starting switch, an energizing circuit for energizing the motor when the starting switch is closed, a holding circuit energized by said switch including a relay having a holding contact for temporarily maintaining the motor energizing circuit after the starting switch is opened, said arm and at least one of said contacts forming a part of said holding circuit to interrupt the same after said arm leaves said contact, and a motor controlled switch for maintaining the motor circuit during a predetermined operation of the motor and arranged to open the motor circuit when said arm moves to engage the contact connected in the holding circuit.

3. In a device of the character described, a series of electrically actuated units adapted for operation in predetermined succession, a motor, an arm driven by said motor, a plurality of series of contacts over which the arm travels, said contacts of one series connected to the actuated units to produce a predetermined successive operation thereof, said contacts of another series connected to said actuated units to produce a different predetermined successive operation thereof, a manual starting switch, a circuit for energizing the motor when the starting switch is closed, a holding circuit energized by said starting switch and including a holding device which maintains the motor energizing circuit after the starting switch is opened, several of said contacts, each arranged between successive series, forming a part of said holding circuit, and motor operated means for maintaining the motor circuit during a predetermined operation of the motor, said motor operated means being so coordinated with said contacts as to open the motor circuit only when said arm leaves a contact connected to a solenoid coil and moves to a contact connected in said holding circuit.

4. In a device of the character described, a series of electric units, a motor, a rotatable member having a contact engaging portion and driven by said motor, a lost motion connection between the contact engaging portion and the motor, a series of contact pins over which the contact engaging portion travels and connected to said units, a motor circuit and a starting switch therefor, at least one of said contacts forming a part of said circuit, and motor operated means for maintaining the motor circuit after said arm leaves said contact and during a predetermined operation of the motor.

5. In a device of the character described, a series of electrically actuated units adapted for operation in a predetermined succession, a motor, an arm driven by said motor, a series of contacts over which the arm travels and connected to said units, a starting switch, an energizing circuit for energizing the motor when the starting switch is closed, a holding circuit including a holding switch and control means therefor to maintain the motor energizing circuit after the starting switch is opened, said arm and a plurality of said contacts being connected in said holding circuit, and a motor operated switch for maintaining the motor circuit during a predetermined operation of the motor and arranged to open the motor circuit when said arm moves to engage a contact connected in said holding circuit.

6. An electrically controlled chime of the character described comprising a series of electrically actuated units adapted for operation in predetermined succession, a motor, a motor energizing circuit, a motor operated member, a series of contacts over which said member moves to energize said units in predetermined sequence, additional series of contacts connected to the same units in different sequences, a motor controlling contact between each successive series of coil energizing contacts, means for automatically stopping the motor with the motor operated member in engagement with a motor controlling contact, and means connected to the motor controlling contacts for energizing the motor circuit.

7. An electrically operated chime of the character described comprising a series of solenoid coils, plungers for said coils and chime members of different tone for said plungers, a control switch, an electric motor energized when said switch is closed, a motor operated member and a series of contacts engaged by said member and connected to said coils and energized by said motor operated member in predetermined sequences, motor driven means for stopping the motor after a predetermined operation thereof and at a plurality of predetermined positions of said

motor operated member, and means operable to render said motor driven means ineffective at certain of said plurality of positions to provide continued operation of the motor through a plurality of the chime sequences.

8. An electrically operated chime of the character described comprising a series of solenoid coils, plungers for said coils and chime members of different tone for said plungers, a control switch, an electric motor energized when said switch is closed, a motor operated rotary arm and a series of contacts connected to said coils and energized by said motor operated arm in predetermined sequence, a motor stop switch, motor driven control means therefor for stopping the motor after a predetermined operation thereof and at a plurality of predetermined positions of said motor operated arm, and manually adjustable means operable to render said stop switch ineffective at certain of said positions of the arm.

9. In an electric apparatus of the character described, an electric motor, means controlling the energization of said motor, a member positively connected to and rotated by said motor and having a series of slots, a lever controlled by said slots, switch means operated by said lever and controlling the energization of the motor so as to interrupt the motor circuit when said lever engages a slot, said lever having a cam surface which cams the lever away from the slotted member to close said switch means after the motor starts.

10. In an electric apparatus of the character described, an electric motor, means controlling the energization of said motor, a member positively connected to and rotated by said motor and having a series of slots, a lever controlled by said slots and having a cam surface engageable with the sides of the slots to immediately exert a stopping action on the motor, switch means operated by said lever and controlling the energization of the motor so as to interrupt the motor circuit when said lever engages a slot, a motor driven arm, a series of contacts adapted to be swept over by said arm, and electrically energized units connected to said contacts.

11. In an electric apparatus of the character described, an electric motor, means controlling the energization of said motor, a member positively connected to and rotated by said motor and having a series of slots, a pivotally mounted rigid lever having a cam detent controlled by said slots, a contact on said lever to control the interruption of the motor circuit when the detent engages a slot, and spring means for urging said lever toward the slotted member.

12. In an electric apparatus of the character described, an electric motor, means controlling the energization of said motor, a member rotated by said motor and having a series of cam surfaces, a lever controlled by said cam surfaces, switch means operated by said lever and controlling the energization of the motor so as to interrupt the motor circuit when said lever is moved in the direction of said cam surfaces, a rotatable motor driven arm, a series of contact pins, a contact carried by said arm and movable thereby to sweep over said contact pins, spring means supporting said contact for yielding movement on said arm and providing a snap action of the contact from one pin to another, and electrically energized units connected to said contacts.

13. In an electric apparatus of the character described, an electric motor, an arm rotated thereby, a series of projecting contact members connected in a plurality of electric circuits, a contact carried by said arm and movable thereby to sweep over said contact members, spring means supporting said contact for yielding movement on said arm and providing a snap action of the contact from one contact member to another.

14. An electrically controlled chime of the character described comprising a series of solenoid coils, a plunger for each coil and chime members for said plungers, a motor, a motor operated member, and a series of contacts over which said member moves to energize said coils in predetermined sequence, said motor operated member having a yielding contact portion adapted to snap quickly from one contact to another.

15. In an electric apparatus of the character described, a motor, a series of contacts connected in different circuits to be successively energized, a motor driven member having a contact engaging portion adapted to move over said contacts, a motor energizing circuit including at least one of said contacts, and a lost motion connection between the motor driven member and the contact engaging portion maintaining electrical engagement of a contact and the contact engaging portion during a substantial amount of motor operation.

16. An electrically operated chime of the character described comprising a support having a wall engaging surface, a plurality of parallel solenoid coils carried thereby, plungers for said coils, chimes carried by said support and operated by said plungers, plunger cages in which the plungers are housed in their inoperative positions, said plunger cages projecting rearwardly from the wall engaging surface of said support, and means for energizing said coils.

17. An electrically operated chime of the character described comprising a supporting housing having a front plate and a rear portion adapted for mounting against a wall, a plurality of parallel solenoid coils carried by the rear of said front plate, plungers for said coils operable through the front plate, chimes in front of said front plate and operated by said plungers, a common chime hanger bar on said front plate supporting all of said chimes, plunger cages in which the plungers are housed in their inoperative positions, said cages projecting rearwardly from the rear portion, and means for energizing said coils.

18. An electrically operated chime of the character described comprising a metal plate having a front portion, horizontal portions extending rearwardly therefrom and vertical rear portions adapted for engagement with a wall, a series of solenoid coils mounted on the rear side of said front portion, chimes carried by said plate at the front of the same, plungers for said coils operable through openings in the front plate into engagement with said chimes, spaced cages for the rear ends of the solenoids projecting rearwardly from the vertical rear portions of the plate, a rear plate adjacent the rear ends of the coils and having openings receiving the forward ends of said cages, and means rigidly securing said rear plate to said front plate.

GISBERT L. BOSSARD.