Sept. 28, 1943. F. MASON 2,330,439

SWITCH MECHANISM

Filed Jan. 26, 1940 2 Sheets-Sheet 1

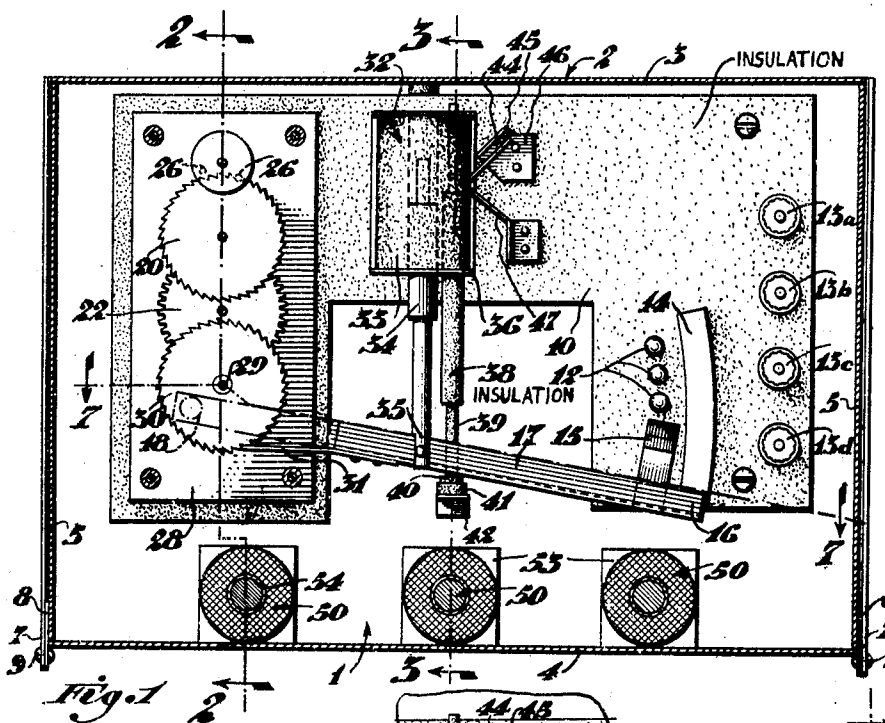


Fig. 1

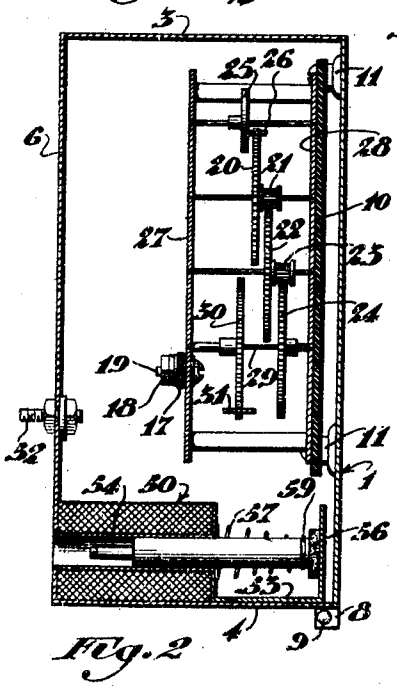


Fig. 2

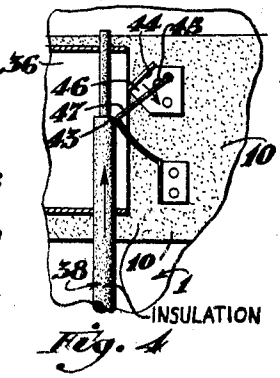


Fig. 4

Fig. 3

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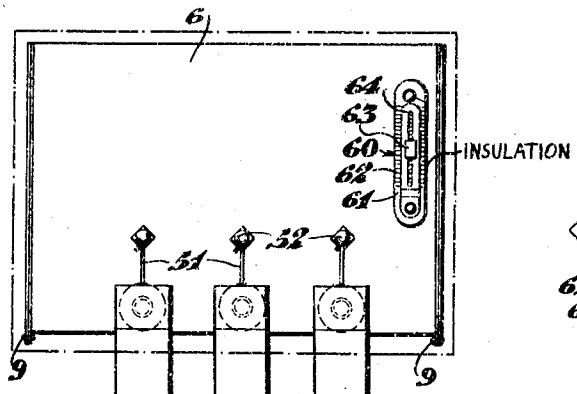


Fig. 5

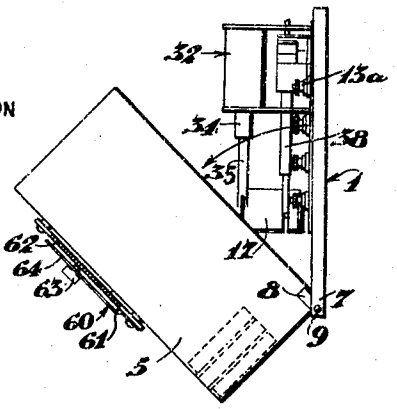


Fig. 6

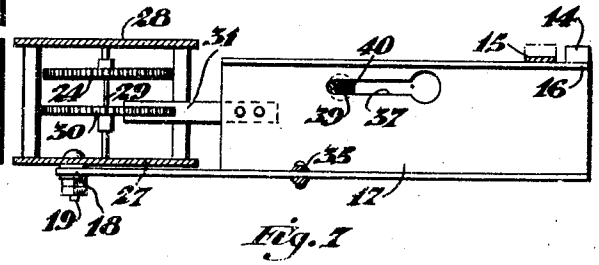


Fig. 7

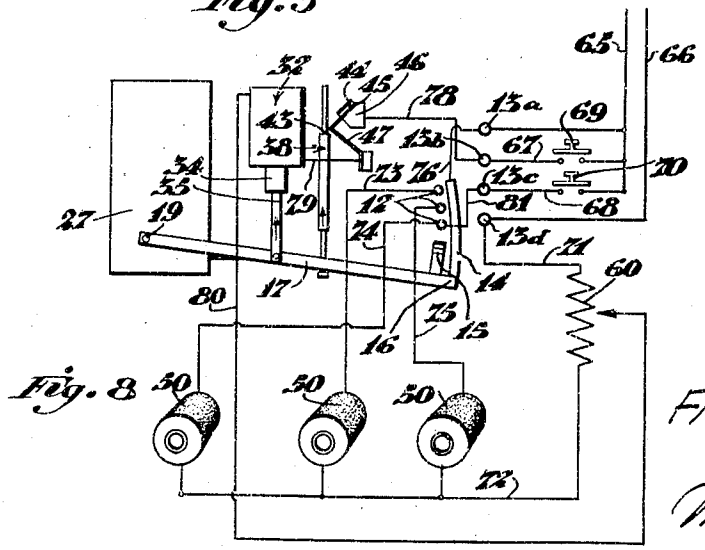


Fig. 8

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UNITED STATES PATENT OFFICE

2,330,439

SWITCH MECHANISM

Fred Mason, Covington, Ky., assignor to Nutone Chimes Inc., New York, N. Y., a corporation of New York

Application January 26, 1940, Serial No. 315,858

1 Claim. (Cl. 200—90)

This invention relates to chime signals of the type adapted to be used in homes and offices. More particularly, the invention relates to a chime signal which is capable, when once energized, of sounding a plurality of notes in succession. The notes may be of the same tone or, if it is desired to provide a melody of sound, of different tone.

Devices of this general type heretofore have been proposed in the art, but they have embodied motor driven rotary switches or like instrumentalities for controlling successive energization of the sounding units. Such controllers are very expensive and for that reason and others, the chimes have, on the whole, been much too costly to meet the public's demand.

The objective of the present invention has been to provide a very simple and inexpensive mechanism which is capable of accomplishing the desired purpose, and sufficiently rugged that it does not become out of adjustment during extended periods of usage. More specifically, an objective of the invention has been to provide an apparatus which is capable of sounding a succession of signals automatically in response to the depression of a push button switch.

It is intended that the control apparatus be of sufficiently compact size so as to be mounted upon a panel, or within a suitable dust cover, along with the signal sounding mechanism.

Another objective of the invention has been to provide a simple apparatus for controlling the energization of a single chime repeatedly, or of controlling the energization of a plurality of sounding units successively or simultaneously, so that single notes, chord effects, or melodies may be provided.

A further object of the invention has been to provide a chime unit comprising a plurality of chimes and a housing for supporting the chimes and containing the controller elements, all in compact relationship with one another.

Briefly, the apparatus of the invention comprises a plurality of contacts which are in respective connection with a single electrically operated sounding or signalling unit or a plurality of them. A contact making member is provided for traversing these contacts serially, so that current can pass through them when they are contacted. In the preferred structure, the traversing member is in the form of a swinging arm.

A clockwork escapement mechanism is employed to control the rate of movement of the traversing member or contactor over the contacts whereby the periodicity of signalling is controlled. For retracting the member after it has traversed the contacts, an electrically operated return unit is provided, for instance, a solenoid. Thus, the contact making member is urged across the contacts in one direction either by a spring or by gravity under the control of the clockwork mechanism, and returned electrically across the contacts in the other direction.

The electrical retracting member, besides operating the traversing arm, actuates a switch for effecting its own deenergization during the period that the arm is traversing the contacts for energization of the sounding units. In the preferred structure, this switch is controlled through a lost motion link actuated in conjunction with the contactor, the switch arm being free to move within the range of the contacts without actuating the link, but operating it so as to control the switch when the traversing arm has completed its course of travel. Through this latter construction, the restoring device is prevented from interfering with the movement of the contactor arm once it has started to traverse the signal contacts.

The next feature of the invention is directed to the construction and assembly of the controller and the sounding instrumentalities. The controller and contact elements are mounted upon an insulating panel provided with facilities for making the necessary electrical connections. This panel is spaced from and secured to the back wall or base of a housing for the signal elements. A cover is hinged to this base so that it is free to be swung therefrom. Electro-magnetic strikers are mounted on the cover so that, when the cover is swung open, the striker units are carried with it. The plungers of the solenoids operate through appropriate apertures in the cover and, externally thereof, the chimes to be struck by the plungers are supported.

From the practical point of view, this arrangement presents several important advantages, the primary one of which is the ease of assembly of the apparatus. The cover, striker, and sound supporting members may be assembled separately from the controller mechanism and the two then hinged together—it being necessary only to connect the solenoids with the appropriate terminals provided upon the base plate. The savings in cost of manufacture provided through this arrangement are appreciable.

Other features of the apparatus and further advantages of it are disclosed in the accompanying drawings which illustrate a preferred embodiment of the invention. From the foregoing principles of the invention which have been disclosed and the following detailed description,

those skilled in the art readily will comprehend the various modifications to which the present invention is susceptible.

In the drawings:

Figure 1 is a face view of the apparatus shown partly in section.

Figure 2 is a sectional side elevation taken on the line 2—2 of Figure 1.

Figure 3 is a sectional side elevation taken on the line 3—3 of Figure 1. (The clockwork mechanism behind the retraction unit is not shown in this figure.)

Figure 4 is a sectional elevation illustrating the switch for control of the retraction device.

Figure 5 is a front elevation showing the signalling units.

Figure 6 is a side elevation with the cover partly swung forward to illustrate the relationship of the cover to the control mechanism.

Figure 7 is a sectional view taken on line 7—7 of Figure 1.

Figure 8 is a diagram of a typical electrical circuit for the apparatus.

As shown in Figures 1, 2, and 3, the device is comprised of a base plate 1 which is adapted to be mounted upon a wall for support of the structure. A cover or housing, which is indicated generally at 2, is comprised of top and bottom walls, 3 and 4 respectively, side walls 5, and the front wall 6. The base plate 1 is provided with ears 7 and the side walls likewise are provided with cooperating ears 8, with hinge pins 9 passing respectively through the pairs of ears so that the cover is hinged to the base plate and is free to be swung forwardly and downwardly from it. These parts thus constitute a housing within which the control and signal operating mechanism is located. An ornamental cover arranged to conceal or decorate the sounding units and housing may be provided, if desirous.

A panel member 10 is attached through the supports 11 to the back panel 1, and preferably is spaced slightly from the back panel to provide clearance space for wire connections. This panel member 10 is constructed of insulating board or the like, and supports a plurality of contacts 12 and a plurality of terminals 13 (*a*, *b*, *c*, and *d*), the latter being provided for convenience in making the necessary electrical connections.

The contacts 12 are spaced apart from one another and reside, in an arc, adjacent slide conductor 14. A brush 15 is positioned to engage the contacts 12, and a brush 16, in electrical connection with the brush 15, is adapted to slide across the conductor 14 so that electrical connection is completed between each contact and the conductor 14, as the brush 15 slides across each contact.

Brushes 15 and 16 are carried by a traversing arm 17 which is pivoted as at 18 to swing about a stationary pivot 19, whereby the brushes 15 and 16 are moved in a path to bridge the contacts 12 and the conductor 14.

The clockwork escapement mechanism comprises a train of gears 20, 21, 22, 23, and 24 which are in engagement with one another and an escapement wheel 25, which carries a pair of pins 26 for alternate engagement with the teeth of the gear 20. The gears of this train are journalled in the usual manner between plates 27 and 28, one of the latter being supported from the panel 10.

A shaft 29, upon which the gear wheel 24 is mounted, carries a ratchet wheel 30. A pawl 31, supported from the arm 17, engages the ratchet teeth of wheel 30. The arm 17 is shown in the position which it reaches after the brush 15 has traversed the contacts 12; when the arm is raised, the pawl passes the ratchet teeth of the wheel 30, but when the arm is released, the pawl engages the ratchet teeth and exerts a rotating effect upon the train of gears. The escapement wheel 25 is operated in this manner to control the rate of rotation of the gears, or, in other words, to control the rate of movement of the arm 17.

In the apparatus which is disclosed in the drawings, the switch arm gravitates downwardly to move the brush 15 across the contacts 12. If the device is intended for operation in other positions than that shown, a spring may be employed to urge the arm in the desired direction.

For retracting the traversing member, after it has completed a course of travel, a solenoid 32 is employed. This unit comprises a coil portion 33, a plunger 34, and a link 35 pivotally interconnecting the plunger and the arm 17. Upon energization of the solenoid, the plunger moves in the direction of the arrow, as shown in Figure 4. The solenoid coil is supported within a clevis 36 and is mounted upon the panel 10.

Arm 17 has a slotted opening 37 for controlling a lost motion switch actuator 38. The actuator comprises a counter-turned portion 39 which is free to slide through slot 37, and a cap 40 disposed beneath arm 17 to rest upon a cushion 41. The cushion is supported from a bracket 42 mounted on the base plate 1. The upper part of the switch actuator is journalled slidably through the clevis 35 which supports the solenoid 32 and comprises a shoulder portion 43.

The actuator 38 operates a switch for controlling the circuit to the solenoid and is comprised of a stationary contact 44 (Figures 1 and 4) and a movable contact 45; the stationary contact 44 is supported from a bracket 46, while the movable contact 45 is carried upon a flexible knee 47. Both brackets are mounted upon panel 10.

The brackets are so arranged that the contacts 44 and 46 nomally are in engagement with one another, but the knee 47 extends in the path of travel of the shoulder 43 of the switch actuator 38, so that when the shoulder engages the knee, it is moved as shown in Figure 4 to break the contact engagement.

Counterturned portion 39 and edges of slot 37 cooperating with it constitute a lost motion mechanism, the edges of the slot alternately engaging the shoulder at the one end of the counterturned portion 39, and the cap 40 at the other end. Thus, as arm 17 moves upwardly upon retraction of the solenoid plunger, the edges of slot 37 engage the shoulder of the counterturned portion 39 and operate the switch actuator so that the shoulder 43 breaks the engagement of contacts 44 and 46 by the time the brush 15 has moved beyond the last of the contacts 12. Upon downward movement of switch arm 17, the edges of slot 37 engage cap 40 and urge the switch actuator 38 along with it, so that the shoulder 43 is moved past the knee 47 (to permit the contacts to return into engagement) by the time the brush 15 has passed the last contact 12 at the other end of the row.

The signalling instrumentalities of the device, as shown in the drawings, comprise tubular chime members 49 and cooperating solenoid strikers 50, though it will be understood that the invention is equally well adapted to use in conjunction with chime bars and resonators for them, or other

sounding units. The chime members are supported, through stringers **51**, upon pegs **52** which are attached to the forward walls **6** of the housing, as shown in Figure 3. The solenoids **50**, however, are supported within the housing upon the bottom wall **4**, with their forward faces abutting wall **6**. The rear faces of the solenoids are supported by the front walls of U-shaped brackets **53**.

The coils of the solenoids are wound about tubular cores **54**, which extend forwardly of the coils and through appropriate apertures in the panel **6** of the housing; the plungers of the solenoids **50** are, therefore, free to pass through the front panel and into striking engagement with their associated chimes **49**.

Normally, the solenoid plungers are retracted rearwardly, abutting cushions **56**, which are supported upon the rear walls of brackets **53**. The springs **57** surround the plungers and at the one end rest against the rear faces of the front walls of brackets **53**, and at the other are held by rings **59** which are carried upon the plungers.

By virtue of the hinged construction of the housing, it may be swung forward freely so as to expose the clockwork escapement and contactor mechanism with the solenoids being swung downwardly and out of the way along with the cover. This arrangement makes for compactness of the structure and convenience in the assembly of it, as previously described.

As shown in Figure 8, a control rheostat **60** for adjusting the intensity of the current passing to the solenoid is provided upon the front wall **6** of the cover. The rheostat is comprised of a base **61**, a resistance **62** wound around the base (which is spaced as shown in Figure 6 from the front panel), and a sliding contact member **63** traversing a slot in a support arm **64**.

A typical circuit for the chime is shown in Figure 7. Energy from a suitable transformer is supplied through the leads **65** and **66**. These two leads are connected, respectively, to the terminals **13***a* and **13***d*. Leads **67** and **68** are taken from the lead **65** to the terminals **13***b* and **13***c* respectively. The connectors **67** and **68** contain push buttons **69** and **70** corresponding to the usual wires taken from the front and back door push buttons of a home.

A lead **71** is taken from terminal **13***d* to one end of the control resistance **60**, and one set of leads, from the windings of the solenoids **50**, is connected, through lead **72**, to the other end of the control resistance. Leads **73**, **74**, and **75** interconnect the respective contacts **12** with the other terminals of the respective solenoid coils. From the terminal **13***a*, a lead **76** is taken to the slide contact **14**. As the brushes **15** and **16** interconnect the contacts **12** with the slide **14**, current may pass from the lead **65** through the lead **76**, and the slide **14** through a given one of the contacts and its associated lead **73**, **74**, or **75** to the given one of the solenoids **50**, and return, through the lead **72**, the resistance, and the terminal **13***d*, to the lead **66**.

From the terminal **13***b*, a lead **78** is taken to the stationary contact **44** of the retractor control switch. A terminal of the retractor solenoid **32** is connected through a lead **79** to the movable contact **45**, and the other terminal of the solenoid is connected through a lead **80** to the slide **63** of the variable resistance.

For the purpose of differentiating between signals originating from the front door and back doors, the device is arranged so that, when the back door push button, for instance, the push button **70** is depressed, only a single signal will be sounded. For this purpose, the terminal **13***c* (in connection with the push button **70**) is connected through a lead **81** to a given one of the contacts **12**, so that when the push button is depressed, a current flows from the lead **65** through the push button of the lead **81**, and the given lead **74**, to the solenoid, and from the solenoid through the lead **72**, the resistance, to supply lead **66**.

When the front door push button is depressed momentarily, a circuit to the retractor solenoid **32** is completed through the lead **78**, the closed contacts **44** and **45**, the retractor solenoid, the lead **80** and the terminal **13***d* which is in connection with the supply line **66**. The solenoid thereupon operates to move the switch arm **17** rapidly across the contacts **12**. As it does so, however, the arm **17** lifts the switch actuator **38** which, in turn, engages the knee of the retractor control switch so as to break the contacts **44** and **45** and therefore deenergize the solenoid. Thereupon, arm **17** is free to traverse the contacts **12**, consecutively so that the solenoids **50**, which are in respective connection with the various contacts **12** of the row, are operated serially.

If desirous, the slide contactor **14** and the cooperating brush **16** may be omitted, and the connection from lead **13***a* be taken to brush **15** through the escapement mechanism or through the arm **17** of the device.

If desired, a single solenoid instead of a plurality may be energized through each of the contacts of the series. This arrangement is useful in instances where a succession of signals of a given tone are to be sounded.

Having described my invention I claim:

A switch mechanism for a signal comprising a plurality of contacts arranged in spaced relationship, an arm pivotally mounted and having a portion thereof arranged to engage said contacts consecutively, a clockwork escapement mechanism including a ratchet wheel operatively associated therewith, a pawl carried by said arm for engaging said ratchet wheel, whereby movement of the arm in one direction is controlled by the escapement mechanism through engagement of the pawl with said ratchet wheel, with said arm being free to move in the opposite direction independently of the escapement mechanism, a solenoid for moving the arm across the contacts in that direction in which the arm is independent of the escapement mechanism, a switch comprising a movable element and a stationary element, one of which is in circuit connection with said solenoid, a link member having abutments thereon positioned to be engaged respectively by said arm as it approaches the terminal contacts at each end of the series of contacts, the said link member in turn arranged to actuate said movable switch element, the said switch normally being closed when the arm has traversed the series of contacts under control of the escapement mechanism, and the said switch being opened by movement of the said link when the arm is at the opposite end of said contact.

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