March 28, 1939. G. L. BOSSARD 2,152,300

CHIME

Filed July 31, 1933 2 Sheets-Sheet 1

Fig. 1

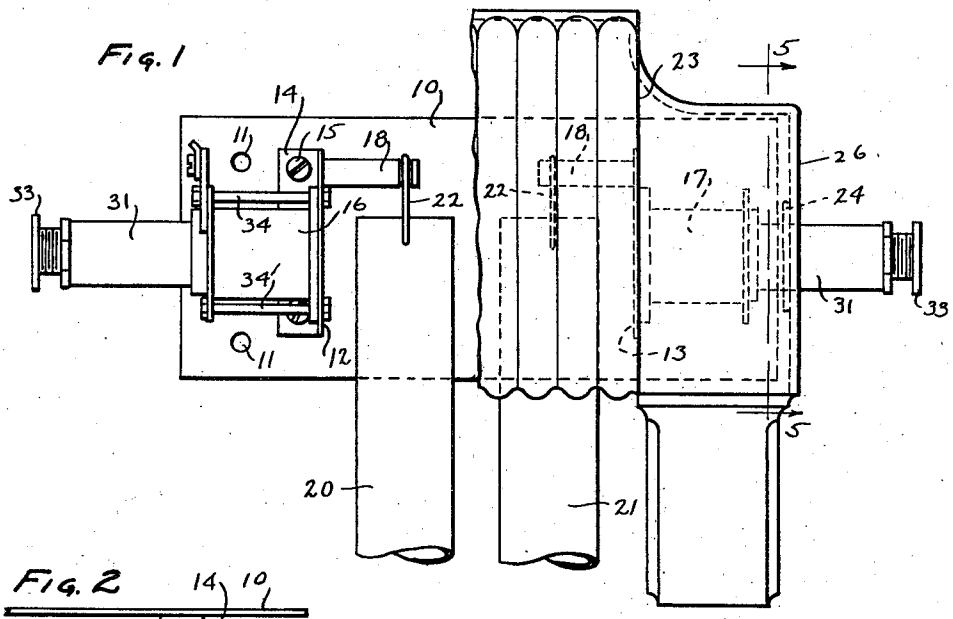


Fig. 2

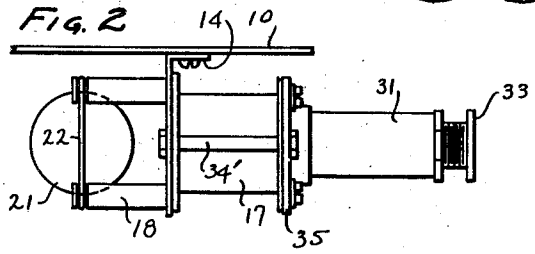


Fig. 5

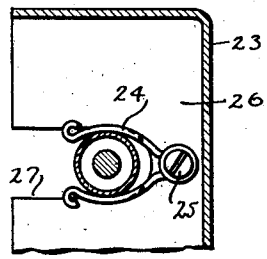


Fig. 3

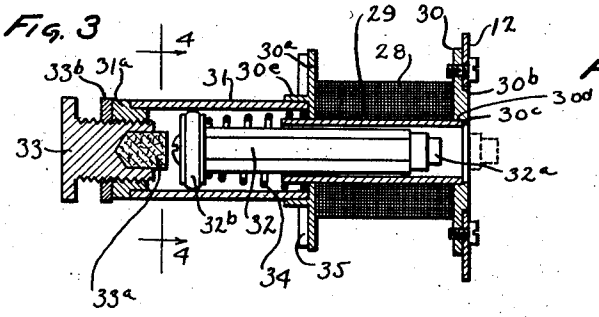
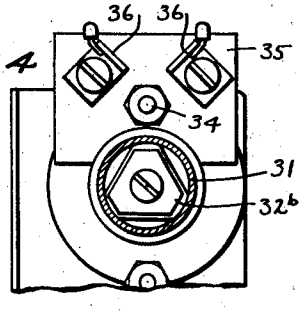


Fig. 4



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Fig. 6

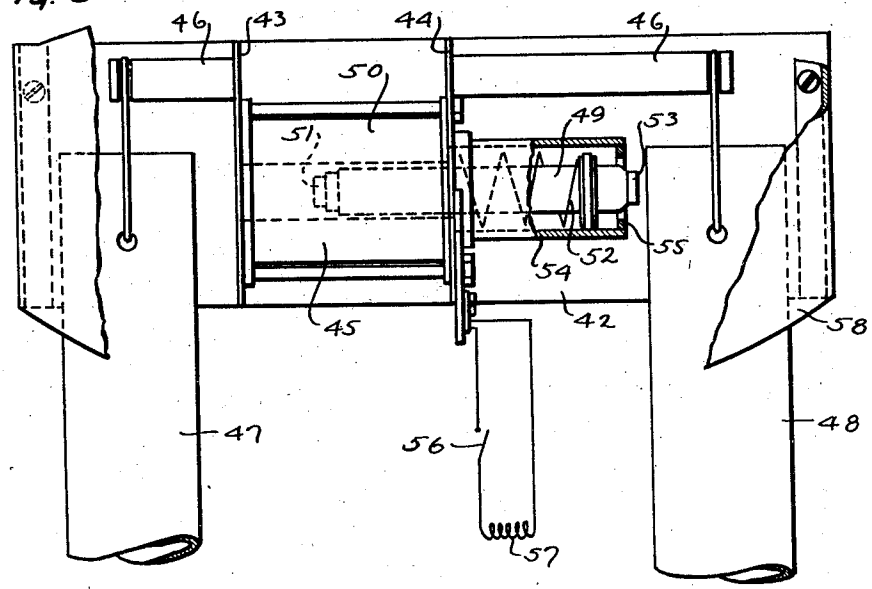


Fig. 7

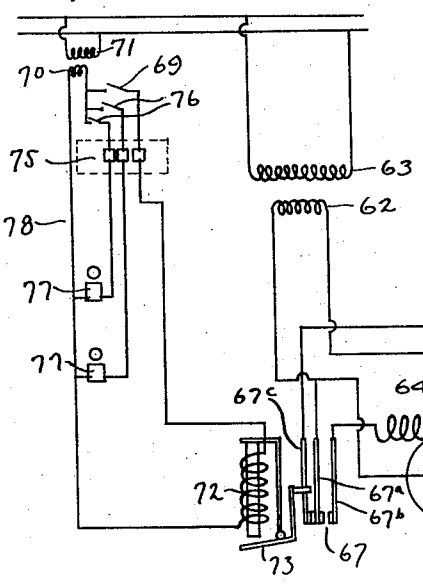
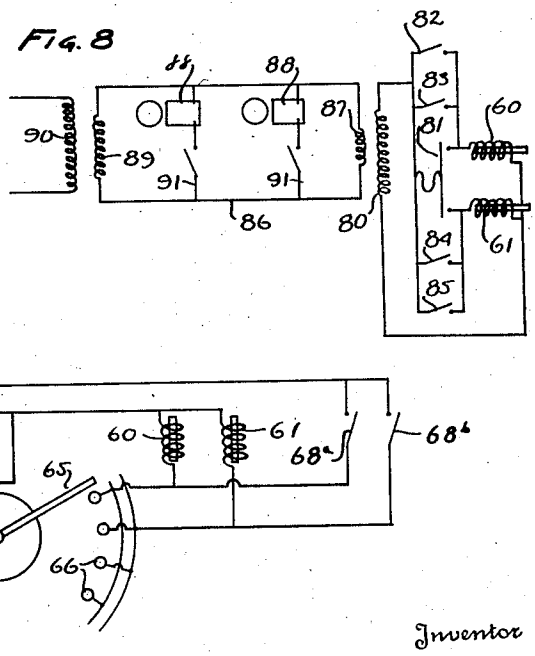


Fig. 8



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UNITED STATES PATENT OFFICE

2,152,300

CHIME

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Application July 31, 1933, Serial No. 682,956

3 Claims. (Cl. 177—7)

This invention relates to electrically operated chimes.

One object of the invention is the provision of a solenoid operated chime embodying few parts of compact, cheap and sturdy construction.

Another object of the invention is the provision of a chime having electrical solenoid means for sounding the chime tube or tubes, both the solenoid means and the chime tubes being carried on a supporting means which is adapted to be supported vertically on the surface of a wall or the like.

Another object of the invention is the provision of a chime embodying a plurality of chime tubes and adapted to be operated by a manual switch located at a point remote from the chime itself, the wiring connections being so arranged that a low voltage relay coil may be substituted for an ordinary bell in an existing wiring system, the controlling motor and the solenoids being energized from a low voltage transformer source which is separate from the transformer source provided in the closing or energizing circuit.

A further object of the invention is the provision of a solenoid operated chime embodying a plurality of chime tubes energized from a single solenoid plunger which strikes one tube when the solenoid coil is energized and is returned so as to strike another tube when the coil is de-energized.

A further object is the provision of a simple and efficient solenoid adapted for striking chimes or the like.

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 a chime embodying the present invention, a portion of the cover being removed for purposes of illustration;

Fig. 2 is a top plan view of one end of the chime shown in Fig. 1, with the cover removed;

Fig. 3 is a central horizontal section taken through one of the solenoids;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a vertical section on the line 5—5 of Fig. 1;

Fig. 6 is a front elevation of a chime in which the tubes are operated from a single solenoid plunger;

Fig. 7 is a wiring diagram of the connections made to the two solenoids of the chime shown in Fig. 1; and

Fig. 8 is a diagram of electrical connections of the chime adapted to simultaneously sound both chimes or to sound either one as desired.

Referring more particularly to the drawings by reference numerals, the apparatus shown in Fig. 1 embodies a supporting back plate 10 preferably made as a single flat sheet of metal. This back plate is adapted to be supported vertically on the outer surface of a wall or the like, being provided with suitable attaching screw holes 11, or with other equivalent fastening means. Projecting forwardly from the plate 10 are two parallel vertical plates or walls 12 and 13, which are also preferably formed of sheet metal, the inner ends of these plates being bent over as indicated at 14 and suitably secured as by attaching screws 15 to the back plate.

The plates 10, 12 and 13 constitute a mount for the two solenoids generally designated 16 and 17. Projecting from either the plate 10 or from the plates 12 and 13 are a plurality of chime supporting posts 18, these posts being shown horizontally spaced apart and fixed to the upper portions of the plates 12 and 13. They are provided in pairs on the two plates, and arranged somewhat farther apart than the diameter of the chime tubes 20 and 21 which they support by means of the cords 22. These cords extend over the posts 18 and hang the chime tubes between the two plates 12 and 13 where they may be struck by the solenoid plungers.

The two solenoids 16 and 17 are of similar construction although they are arranged to project laterally in opposite directions from the two supporting plates on which they are arranged, so that the solenoid axes are in alignment and parallel to the pack plate. This provides a construction in which the solenoids are arranged comparatively flat on the front of the back plate and permits the entire chime to be of minimum depth in order that it may be supported on a wall surface without requiring a recess or hole in the wall for reception of some of the operating parts.

To provide an attractive appearance and also to protect the operating parts from dust or accidental bodily contact with extraneous bodies, a protective cover 23 is arranged over the upper ends of the chimes and over the inner portions or the solenoids. This cover, which may be a casting or stamping of suitable metal or other material, is preferably attached by means of spring wire clips 24 which are adapted to straddle the tubular ends of the solenoids, as shown in Figs. 1 and 5. The spring wire clips 24 are each fastened by a screw 25 to the two opposite ends

26 of the cover, and the cover is slotted as indicated at 27 so that it may be applied to the chime apparatus by moving it horizontally towards the back plate so that the tubular ends of the solenoids are received in the slots and engaged by the wire clips.

The solenoid 17, shown in detail in Figs. 2, 3, and 4, comprises a coil or winding 28 arranged on the sleeve or tube 29 of insulating material, the tube being mounted at its ends in the two iron end plates 30 and 30a. The plate 30 is screwed or bolted to the supporting plate 12 and is provided with a circular projection or flange 30b which centers the solenoid with respect to a hole in the plate 12 of very slightly larger diameter. The hole in the plate 30 is flanged at 30c to provide a groove 30d receiving the end of the tube 29 with a force fit. The tube is thus held in a desired relationship in the plate 30 and positively prevented from moving beyond its proper position. The construction is such that the minimum diameter of the hole in plate 30 is somewhat larger than the inside diameter of the tube 29 which prevents the plunger of the solenoid from ever touching the metal plate 30 and maintains a suitable small gap between the plunger and the plate.

The other end of the tube has a force fit with a hole in plate 30a, which is provided with a flange extension 30e into which is forced a plunger guide tube 31, preferably made of brass. Within the coil, and slidably arranged in the tubes 29 and 31 is the iron plunger 32, preferably having a soft striking tip 32a of leather or the like and preferably of hexagonal or other non-circular cross section. The inner end of the plunger has an enlarged guide portion 32b which is guided in the tube 31. This portion is preferably formed of two triangular shaped plates held in place by a screw in the end of the plunger and holding between them a pad of a suitable fibrous material.

As the plates and pad of the guide portion 32b are triangular, as shown in Fig. 4, free passage of air past the guide portion is permitted during operation.

Fixed in the end of the tube 31 is an interiorly threaded ring 31a. A threaded adjusting plug 33 is supported by this ring so that it may be screwed in or out to suitably locate the end of a soft abutment pad 33a which limits the inward movement of the plunger when the plunger returns from an extended position, under the action of the coiled spiral spring 34. Threaded on the plug is a lock nut 33b holding the plug in any position of adjustment.

Normally the plunger 32 is held back yieldingly against the soft abutment pad 33a in the position shown in full lines in Fig. 3, but when the coil is energized the plunger is moved to the right somewhat beyond the dotted line position and then promptly returned to the dotted line position, as the center of the flux conducting path of the plunger is so arranged as to return the plunger from engagement with the chime tube after striking. The plunger has a natural tendency to rebound which is assisted by the centering action just mentioned. This construction corresponds in general with the arrangement set forth in my Letters Patent entitled "Chime", Nos. 1,924,395 and 1,960,079, of which this case is a continuation in part with respect to some of the matter therein set forth.

The spring 34 which normally holds the plunger against the abutment pad, and returns the plunger to that position as soon as the coil is deenergized, is of conical spiral form, the smaller end of the spring being engaged with one side of the guide portion 32b, and the larger end being received and centered by means of the end of tube 29 which projects a little distance, as shown in Fig. 3, beyond the plate 30a. Being spiral in form, the spring may be compressed to a very small over-all length when the coil is energized and the plunger projected to the right. The normal position of the plunger, in its retracted position, may be readily varied in order to vary the force of the striking blow, which varies the volume of sound produced. Moreover the arrangement is such that when the plunger is in its retracted or normal position the amount of current flowing through the coil 28 is a maximum, but as the plunger moves into the coil, the current in the coil decreases due to the change of the magnet reluctance of the solenoid magnetic circuit. Consequently the pull of the current is a maximum at the time the solenoid starts to move. With the solenoid in its centered position in the coil, as with the energizing circuit held closed, the current is a minimum, and the danger of over-heating when the circuit is held closed is therefore a minimum.

The cylinder or tube 31 provides a dust free compartment for the plunger, and guides the outer end of the plunger so that it is held centered at all times, insuring the greatest efficiency of action. The various parts are of very simple formation and capable of being readily and cheaply produced and assembled into the completed structure.

The two plates 30 and 30a are held together by means of a plurality of screws or bolts 34' of steel or iron which serve to some extent as return flux paths. One of these screws or bolts passes through an insulating strip 35 held against one side of the plate 30a. The insulating strip has a curved cut-out portion as shown in Fig. 4, which fits on the cylindrical upper side of the boss or flange extension 30e. The insulating strip is provided with metal tabs 36 to which connecting wires may be soldered, these tabs 36 being connected to the insulated leads of the coil 28. The entire solenoid construction is therefore such that it may be very readily connected as a unit electrically as well as mechanically to any desired supporting construction and in desired electrical circuits.

Fig. 6 shows another form of chime construction in which a back plate 42 in the form of a sheet metal plate having suitable attaching holes in the same manner as in the construction illustrated in Fig. 1 is arranged to support the two spaced plates 43 and 44 which project outwardly from the back plate and form supporting means for a single solenoid 45. Each of the plates 43 and 44 is provided with a pair of horizontally spaced posts 46, projecting outwardly so as to support the two chime tubes 47 and 48 at opposite ends of the chime apparatus a suitable distance from the plates 43 and 44 so that they may be struck by a common solenoid plunger 49. The plunger 49 is arranged within a coil 50 provided between the two plates 43 and 44, the coil construction and support being similar to the solenoid coils already described. When the coil 50 is energized the striking end 51 of the solenoid is moved rapidly to the left and strikes the chime tube 47 and is then returned a fractional part of an inch away from engagement

with the chime tube 47 and held in that position as long as the coil is energized. When the coil is de-energized, however, the plunger 49 is moved rapidly to the right by means of a coil spring 52 so that the opposite end of the plunger is brought into striking engagement with the chime tube 48. A striking cushion pad 53 is provided on this end of the plunger, and the end of the plunger guiding tube 54 adjacent the chime tube 48 is open. A collar or ring 55 is pressed in the end of the tube 54 preventing the plunger and spring from dropping out of the solenoid during shipment or in case of removal of the chime tube 48. After striking the chime tube 48 the plunger rebounds a little distance away from that tube to a normal position shown in Fig. 6 from which it is moved to the left when the coil is again energized. It will thus be apparent that when the manually controlled switch 56, which is provided in series with a transformer secondary 57, is energized, the chime 47 will be struck, giving a note of certain predetermined pitch. Then when the switch 56 is opened the spring 52 will cause the plunger to strike the second chime tube giving a note of a different pitch which may harmonize with the tone of the tube 47. Thus a plurality of notes are sounded by means of an apparatus of very simple construction and embodying only a single solenoid coil and plunger.

The front and sides of the solenoids and the upper ends of the tubes are covered and protected by a cover plate 58 the sides of which are flanged for suitable connection to the back plate 42 by means of suitable connecting screws.

The two chime tubes 20 and 21 of the construction shown in Fig. 1 may be arranged so that either solenoid may be independently energized by independent switches adapted to connect either coil to the low voltage secondary of a transformer. The two switches may be arranged at different points in a building so that one switch for example may be used as a door bell switch to indicate when a person is at the door and another switch may be used as a call signal and adapted to be operated from a suitable point within the building. It is preferred, however, that the solenoids be energized in a predetermined manner to produce a desired sequence of sounds. Thus the chime tube 20 may be so arranged as to sound the note "g" while the chime tube 21 sounds the note "b-flat", and an operating motor is provided, controlling the energization of the solenoids, for striking first the tube 20, then the tube 21, the tube 21 being struck the second time followed by sounding the tube 20 again. This motor means may comprise an induction disk motor of the construction shown in my prior Patent No. 1,924,395 above referred to, and as shown diagrammatically in Fig. 7 herein. The coils of the two solenoids 16 and 17 are indicated at 60 and 61 and are connected to a common transformer secondary 62. The transformer primary 63 is adapted to be connected to a suitable source of 110 volt alternating current or the like. The secondary 62 is adapted to produce a voltage of about 16 volts which is suitable for the energization of the motor winding 64 and for the solenoids. The armature of the motor is mechanically connected to a switch arm 65 which is adapted to sweep over a series of contact members 66, alternate contacts being connected to the two solenoid coils.

When the motor is started, the switch arm 65 successively energizes the solenoids in a predetermined manner, the switch 67 being closed. The closing of the switch 67 is effected when the manually controlled push button 69 is closed. This push button is in series with the secondary 70 of a 6-volt transformer having a primary 71 adapted to be connected to a suitable 110 volt house supply line. The switch 67 and secondary 70 are in series with a relay coil 72 which is adapted to be energized by 6-volt alternating current. The coil 72, when energized, causes a pivotally mounted armature 73 to be attracted which has the effect of moving the flexible blade 67*a* of switch 67 into electrical contact with the blade 67*b*. It will be observed that the secondary 70 of the low voltage transformer which is provided for the energization of relay coil 72 is an independent source of current from the source that energizes the solenoids and the motor.

When the armature 73 is attracted it is withdrawn from the notch in a stop plate driven by the motor 64 and held in its attracted position until a predetermined sequence of operations is completed, after which it may return to a notch in the stop plate in the manner disclosed in Patent 1,924,395 above mentioned.

When the armature is attracted it has the further effect of breaking the connection between blade 67*a* and blade 67*c* which is connected to the two call or signal switches 68*a* and 68*b* which are adapted for manual operation and connected to the two solenoid coils 60 and 61 respectively. The switches 68*a* and 68*b* are therefore rendered ineffective during the time the motor is energized.

The wires which extend from the manual control switch 69 to the secondary 70 and to relay coil 72 may be arranged in an apartment or other building so as to extend from the front or main door where the switch 69 may be located, to the position in the apartment where the chime is to be located, and may extend to the basement or to some other common point of the building where the secondary 70 of the energizing transformer may be located. These wires are ordinarily already provided in a building as part of ordinary 6-volt bell circuit systems. Where a building has existing wiring for energizing an ordinary bell which is connected to the secondary of a 6-volt transformer, the bell may be readily replaced by the magnet coil 72 of the chime apparatus herein set forth without necessitating other changes in the electrical connections of the energizing circuit. Fig. 7 shows the chime connected in the bell ringing system embodying the annunciator 75, bell ringing switches 76, bells 77 and the wiring 78 which is provided in the building walls. The power for energizing the solenoids themselves and for operating the motor is thus from an independent transformer source of suitable voltage for the power required and arranged either at a point near the chime if the motor is provided at that point, or arranged in the basement of a building if the motor is to be located there. It will be apparent that any bell of an existing 6-volt bell system may be replaced by the relay coil 72 of the present chime apparatus without adding additional wires to extend through the walls of the building, since the chime apparatus and the motor, as well as the transformer including the coils 62 and 63 may be provided in the room where the chime is to be arranged and the only connections requiring wires that extend through the building are in the 6-volt circuit.

The two solenoids of the construction shown in Fig. 1 need not be operated by a motor in the manner above set forth, but may be controlled entirely by manual switches, as shown in Fig. 8,

for example. The two solenoid coils 60 and 61 may be simultaneously connected to the 16-volt secondary 88 by means of a double switch 81 in order that both chimes may be sounded in unison as a chord. However, the advantages of independent operations of the two solenoids may also be retained, suitable manually operated switches 82 and 83 being provided at desired points for energizing merely the solenoid coil 60, while additional manual switches 84 and 85 may be arranged for energizing merely the solenoid coil 61. The double switch 81 may be used at the front door of a building or apartment, while the switches 82 to 85 may be arranged in various rooms for use as a signal call or one may be arranged at a side door of a building. The secondary 88 of the transformer may be energized from any suitable source of electric current but as shown in Fig. 8, the chime is adapted for connection in an existing bell ringing system employing 6 volts in the wires 86 which extend through the building. The primary 87 which cooperates with the secondary 88 is, therefore, a 6-volt coil connected to the wires 86 and replaces an ordinary 6-volt bell. Several bells 88 may be used in the same system with the transformer primary 87, since they are all adapted for 6-volt operation. The various bells in the transformer primary 87 are energized from the secondary 89 of a 6-volt transformer having a primary winding 90 which is preferably energized from 110 volt alternating current. The manual switches 91 which control the several bells are arranged in the bell ringing circuits, but the transformer primary 87 is adapted for constant energization in order that the control switch or switches for the solenoid coils may be arranged in circuit with the secondary 88. By reason of this arrangement the solenoids, which are preferably arranged for 16-volt operation in order that ample power may be obtained, may, therefore, be used in connection with a 6-volt bell ringing circuit without requiring the use of additional wires through the building and employed in a system with ordinary bells without affecting normal operation of the bells themselves.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms 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. A solenoid operated device of the character described comprising a support, a solenoid coil substantially horizontally supported thereon, a plunger movable in said coil and having a striking tip at both ends thereof, a pair of sounding members mounted on said support in line with said solenoid and one at each end thereof, an energizing circuit including a control member for said coil for moving the solenoid plunger against one of said sounding members and maintaining the plunger substantially at a limiting position until said control member is operated, said control member manually determining the time of deenergization of the coil, the length of said plunger being so coordinated with the length of the solenoid coil as to slightly space the end of the plunger from said one sounding member when the energization of said coil is maintained, and spring means for moving the plunger to an opposite limiting position to strike the other sounding member, said spring being of such length as to provide a normal position of the plunger, when the coil is deenergized, in which the end of the plunger is slightly spaced from said other sounding member.

2. A solenoid operated device of the character described comprising a support, a solenoid coil mounted on said support, a plunger movable in said coil and having a striking tip at both ends thereof, first and second sounding members mounted on said support in line with the axis of said plunger, one at each end of the plunger, an energizing circuit including a manually operable control switch for controlling the energization and deenergization of said coil, said plunger, when the coil is energized, being moved against said first sounding member and then held substantially at a limiting position slightly withdrawn from said first sounding member by the force of said solenoid coil, until said switch is operated to break the energizing circuit, and mechanical means in which energy is stored by movement of the plunger to said limiting position for forcibly moving the plunger against the second sounding member when said switch is operated to deenergize the coil, said mechanical means comprising a spring engaging said plunger and of such length as to provide a normal position of the plunger, when the coil is deenergized, to maintain the striking tip slightly withdrawn from said second sounding member until the coil is again energized.

3. A solenoid operated chime of the character described comprising a support, a solenoid coil mounted on said support with its axis substantially horizontal, a pair of chime tubes mounted on said support one at each end of said solenoid coil, a plunger in said solenoid coil adapted when said coil is energized to strike one of said chime tubes, means for manually controlling both the energization and deenergization of said coil, and spring means for moving said plunger into engagement with the other of said tubes upon deenergization of said coil, said spring means providing a normal position of the plunger, when the coil is deenergized, such as to hold the end of the plunger slightly spaced from said other tube.

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