March 29, 1949. C. MILLER 2,465,655

AUDIBLE SIGNALING DEVICE

Filed Nov. 2, 1946 4 Sheets-Sheet 1

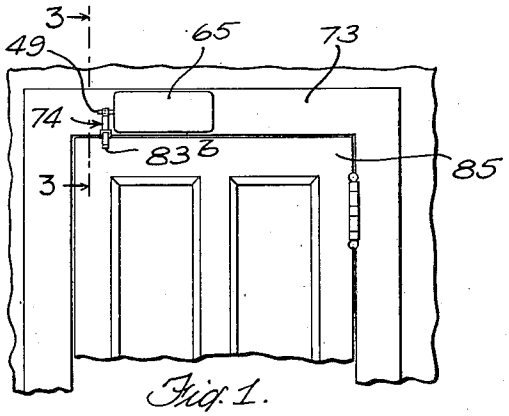


Fig. 1.

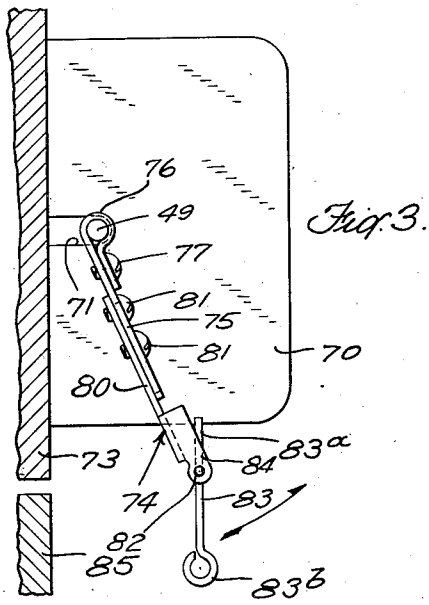


Fig. 3.

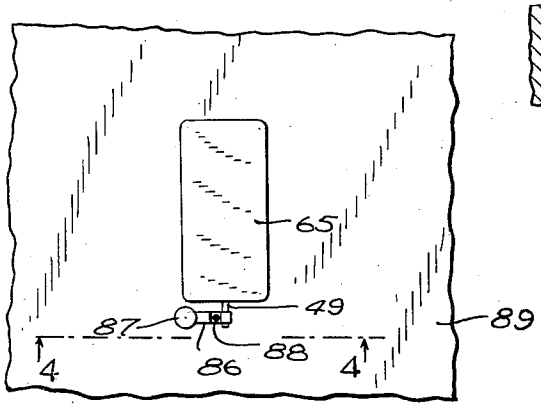


Fig. 2.

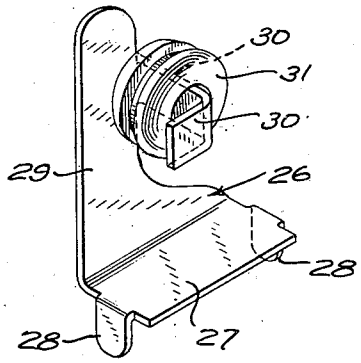


Fig. 5.

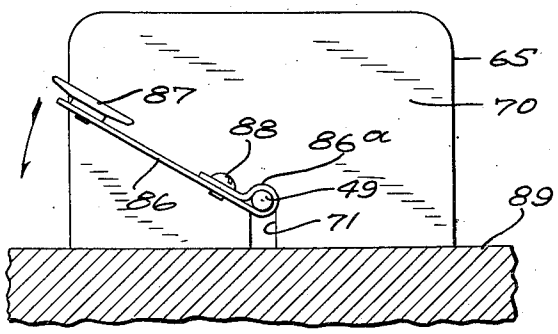


Fig. 4.

INVENTOR
CHRISTIAN MILLER
BY
William T. Kniesner
ATTORNEY

March 29, 1949. C. MILLER 2,465,655

AUDIBLE SIGNALING DEVICE

Filed Nov. 2, 1946 4 Sheets-Sheet 2

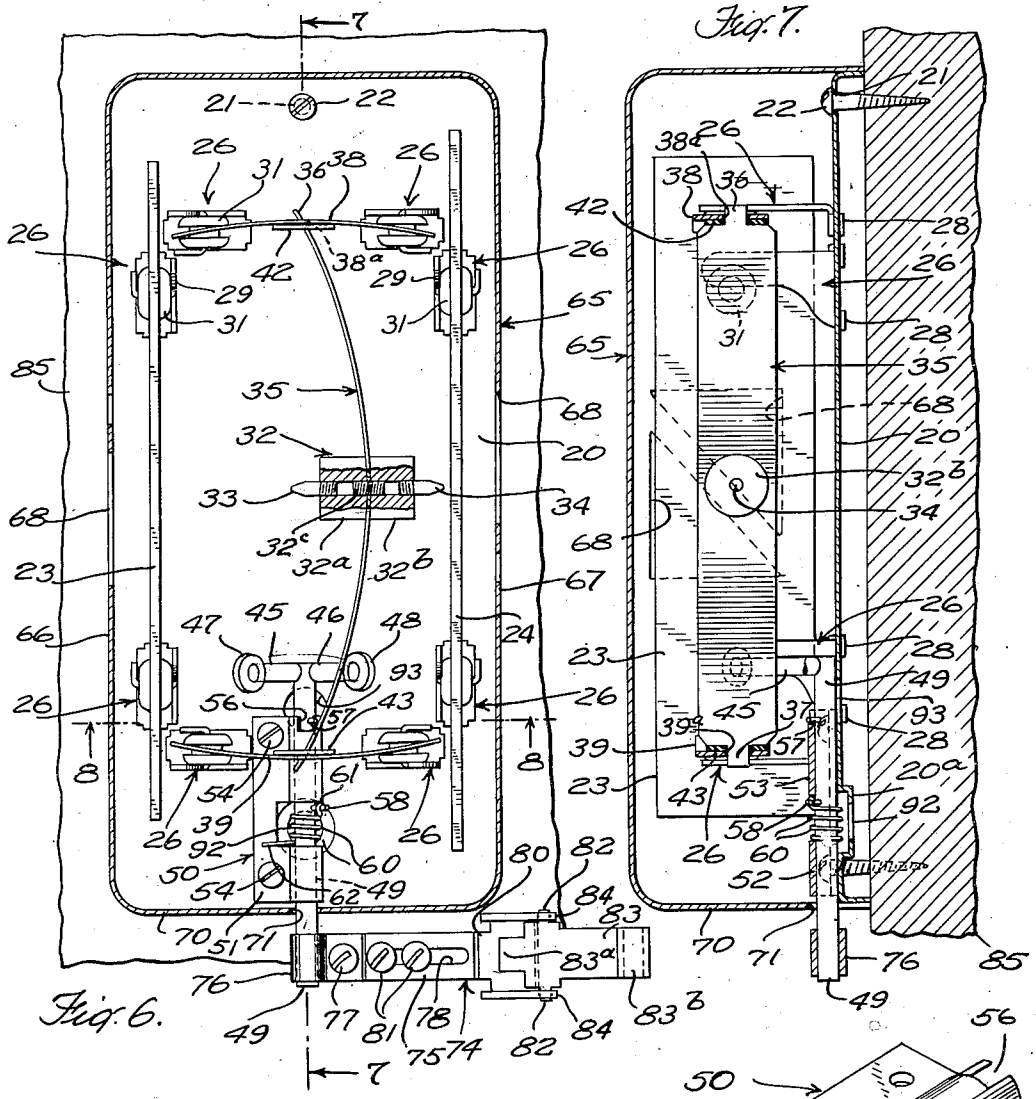


Fig. 6.

Fig. 7.

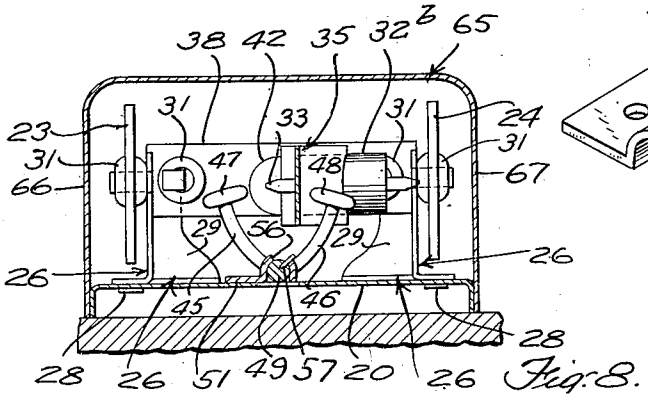


Fig. 8.

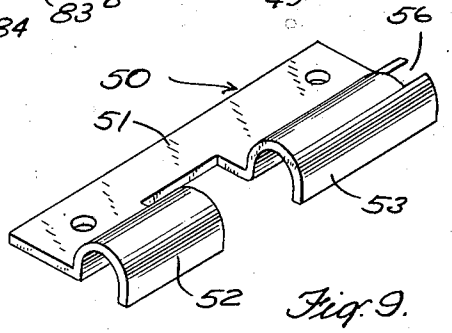


Fig. 9.

INVENTOR
CHRISTIAN MILLER
BY
William T. Kruesner
ATTORNEY

March 29, 1949. C. MILLER 2,465,655

AUDIBLE SIGNALING DEVICE

Filed Nov. 2, 1946 4 Sheets-Sheet 3

Fig. 10.

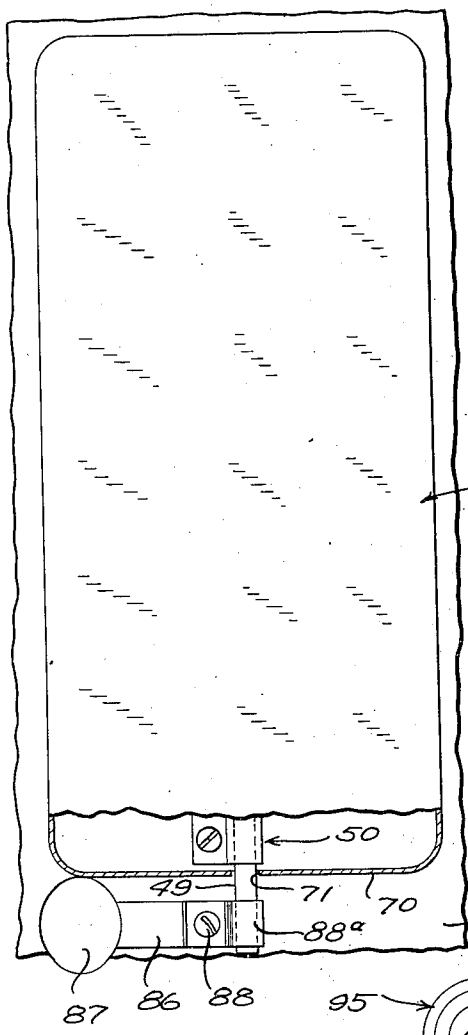
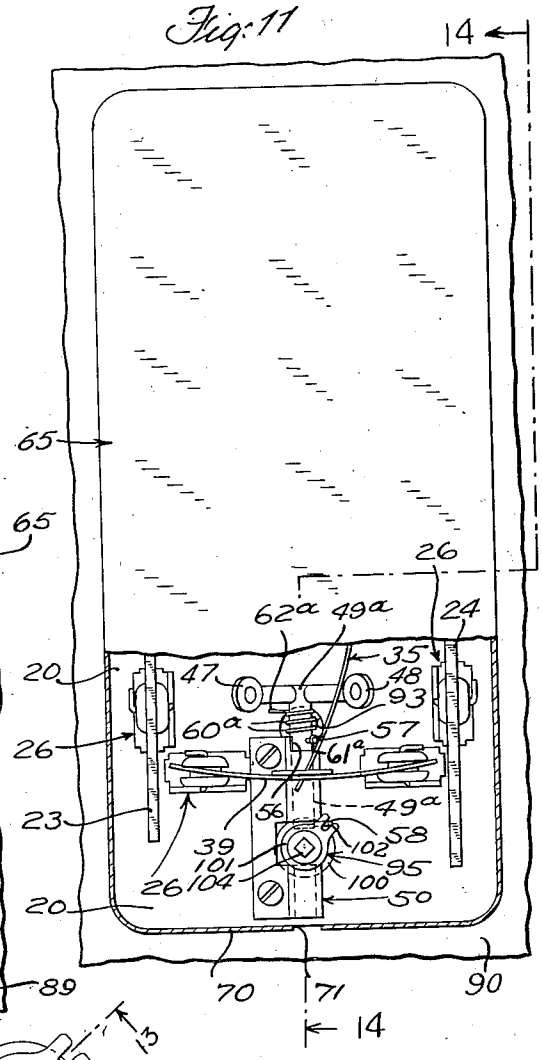


Fig. 11



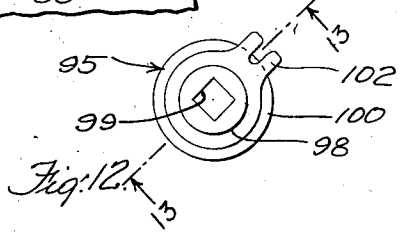


Fig. 12.

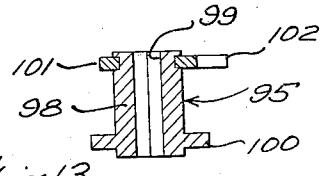


Fig. 13.

INVENTOR
CHRISTIAN MILLER
BY
William T. Kruesman
ATTORNEY

March 29, 1949. C. MILLER 2,465,655

AUDIBLE SIGNALING DEVICE

Filed Nov. 2, 1946 4 Sheets-Sheet 4

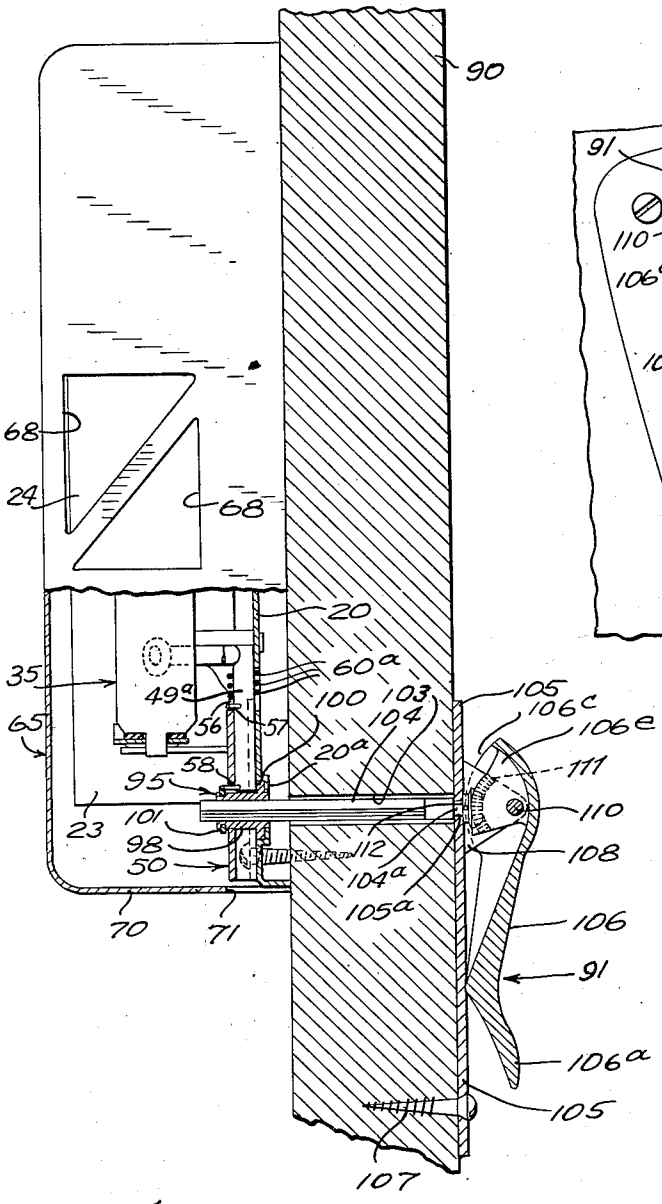
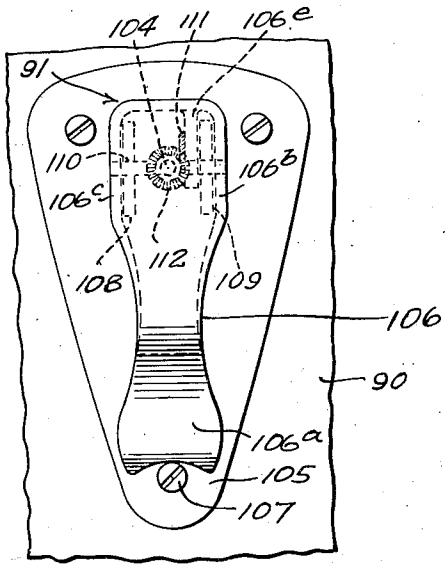


Fig. 14.

Fig. 15.



INVENTOR
CHRISTIAN MILLER
BY
William T. Kniesner
ATTORNEY

Patented Mar. 29, 1949 2,465,655

UNITED STATES PATENT OFFICE

2,465,655

AUDIBLE SIGNALING DEVICE

Christian Miller, Norwalk, Conn., assignor to Edwards & Company, Inc., Norwalk, Conn., a corporation of New York

Application November 2, 1946, Serial No. 707,469

10 Claims. (Cl. 116—169)

1

This invention relates to audible signalling devices, more particularly to signalling devices to sound one or more musical notes.

One of the objects of this invention is to provide a practical signalling device of the above-mentioned kind that will be of simple construction and action, capable of ready assembly in manufacture, and well adapted to meet varying requirements of practical use. Another object is to provide a signalling device of the just mentioned character so constructed that, with little change or rearrangement of parts, it will be capable of easy, inexpensive and quick adaptation for operation by various kinds of actuators according to the desired use to which the device is put, such as, for example, automatic actuation by the opening or closing of a door, manual actuation as at the front door of an apartment or dwelling, manual actuation as when used as a desk or table signal, and the like.

Another object is to provide an improved signalling mechanism in which the striker or strikers that coact with a sounding element or elements are controlled and actuated in an improved way and by simpler and more reliable mechanism. Another object is to provide a mechanism of the last mentioned kind that will be of improved construction and action, simple to fabricate and assemble, and more dependably achieve the desired striking action, including, where employed, improved successive striking of more than one sound element. Another object is to provide a mechanism of the last mentioned character that will facilitate adaptation of the signalling device to various modes or control of operation. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which are shown illustratively several of the various possible embodiments of this invention,

Figure 1 is a fragmentary small-scale elevation showing the signalling device mounted for actuation by the movement of a door;

Figure 2 is a fragmentary small-scale plan view showing the device arranged as a table or desk signal;

Figure 3 is an end elevation as seen along the line 3—3 of Figure 1;

Figure 4 is an end elevation as seen along the line 4—4 of Figure 2;

Figure 5 is a perspective view of an internal supporting element of which a number are employed;

Figure 6 is a plan view or elevation, certain

2

parts being shown in section or broken away, of the device arranged to be actuated by a door;

Figure 7 is a vertical sectional view as seen along the line 7—7 of Figure 6;

Figure 8 is a transverse sectional view as seen along the line 8—8 of Figure 6;

Figure 9 is a perspective view of a combined mounting and bearing element employed in the construction;

Figure 10 is a plan view, certain parts being broken away and shown in section, of the signalling device arranged as a table or desk signal;

Figure 11 is an elevation, as seen from the inside of a door panel, wall, or the like, of the signalling device arranged for actuation from the other side of the wall or panel;

Figure 12 is a plan view on a larger scale of an operating hub member employed in the construction of Figure 11;

Figure 13 is a center vertical sectional view thereof as seen along the line 13—13 of Figure 12;

Figure 14 is a vertical sectional view as seen along the line 14—14 of Figure 11, certain parts being shown in elevation;

Figure 15 is an elevation as seen from the left in Figure 14 showing the actuating mechanism on the other side of the wall or door panel.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring first to Figures 6, 7 and 8, the signalling unit comprises a base 20 preferably of sheet metal and peripherally flanged, to rest against the desired supporting surface, the base having suitable holes 21 by which it may be secured to the supporting wall, door panel or the like, when desired, as by screws 22. Adjacent the longitudinal side edges of the base 20 are mounted two sounding elements 23 and 24, illustratively in the form of rectangular metal plates, sometimes called "chime plates" or "chime bars," and where they are to emit different notes they are correspondingly differently dimensioned as indicated or suggested in the drawings. They are suitably supported, each preferably at two spaced points which preferably coincide with internodes, and the two supports for each bar preferably include a suitable yieldable material such as soft rubber, felt or the like, to minimize interference with sound-emitting vibration. Each mounting therefore preferably comprises a support and bushing of such yieldable material and all of the mountings are preferably identical in construction, and hence it will suffice to describe only one of them in detail.

In Figure 5 such a mounting is shown in perspective. It comprises an L-shaped sheet metal stamping generally indicated by the reference character 26, having a flat base 27 to rest against the sheet metal base 20 that is provided with

suitable holes through which are passed the spaced ears 28 (Figure 5) which are then bent over on the under-side to secure the mounting in place. Upstanding from the base 27 is a vertical leg 29 which has cut and bent out of its plane a long arm or leg 30 that extends at right angles to the part 29 to receive a rubber or felt bushing 31, which is held assembled thereto by the bent-over outer end of the arm 30.

In Figure 6 four such mountings 26 are shown secured to the base 20 in appropriately spaced relation to support the chime bars 23 and 24 in substantial parallelism and in spaced relation, the yielding bushings 31 of the mountings passing through holes in the chime bars that are located at the internodes and the bushings 31 being preferably peripherally grooved as shown in Figure 5 to a diameter commensurate with the diameter of the holes in the chime bars into which the bushings are strained.

Preferably I provide for the successive striking of the two sounding elements 23 and 24 and in that case a single cycle of operations may comprise the striking first of one and then of the other. Intermediate of the chime bars 23 and 24 I provide a striker 32 (Figure 6) having opposed striking elements 33 and 34 which are preferably made of a suitable wood or plastic material. The striker 32 is mounted substantially at the midpoint of a flat or leaf spring 35 made of any suitable flat spring material such as spring steel and shaped to provide end tongues 36 and 37 (see Figure 7) to facilitate supporting the spring at its two ends. The striker 32 preferably is given some weight or mass according to the inertia which it is desired that it have when set into motion, and conveniently can be made of metal, comprising two cylindrical parts 32^a and 32^b which are internally threaded and are mounted on either side of the spring 35 by a threaded headless stud 32^c which passes through a suitable hole in the spring 35, the two parts 32^a, 32^b serving as nuts to clamp the spring 35 therebetween. The striker elements 33, 34 are conveniently threaded into the outer ends of the parts 32^a, 32^b respectively.

I have found numerous advantages if the spring 35 is supported at each of its ends in a resilient and yieldable mounting, and then provide means that operate upon the spring intermediate of its ends for effecting changes in the direction in which the spring is to be bowed for effecting striking of a sounding element. Considering first the resilient mountings for the two ends of the springs, they preferably comprise springs which conveniently and preferably take the form of flat or leaf springs 38 and 39 that extend transversely of the general direction of the flat spring 35, they conveniently comprise any suitable flat spring stock such as spring steel, and are provided at their respective ends with holes to receive yieldable bushings 31 of mountings 26, identical to those mountings above described for supporting the chime bars and hence being located and secured in position by corresponding holes in the base 20 through which the ears 28 (Figure 5) extend to be bent over underneath the base 20. With this arrangement many advantages are achieved in utilizing the needed number of identical parts such as the mountings 26 of Figure 5.

The mounting cross-springs 38, 39 are also preferably identical and are dimensioned or constructed to have the desired degree of resiliency or yield under the forces imposed thereon by the action of the flat bowed spring 35, forces which are applied at substantially the midpoints of the mounting springs 38, 39 where the latter are given supports at both ends.

Each supporting spring 38, 39 has a central rectangular hole as indicated at 38^a and 39^a in Figures 6 and 7 to receive the tongue ends 36 and 37 respectively of the spring 35 which is thereby held against turning out of a plane that is at right angles to the base 20. To lessen the effects of metal-to-metal contact, I interpose washers 42 and 43 between the ends of the spring 35 and the supporting springs 38 and 39 respectively, the washers being made of any suitable cushioning material such as felt, relatively soft rubber or the like, and they may thus also take part in the resilient action at the supported ends of the spring 35. The tongue ends 36, 37 pass through the washers and thus the latter are held against displacement.

The several parts thus far described are so dimensioned and interrelated, as indicated in Figure 6 and as described above, that the flat spring 35, in its at-rest position to one side or the other of the vertical axis in Figure 6 where it is shown to the right of that vertical axis, is bowed, and preferably to an extent that there exists a spacing between the striker element (either element 33 or 34) and the adjacent chime or sounding element (either 23 or 24) so that the striker element is normally held out of engagement with the sounding element. Spring 35 is bowed, and under its tendency to straighten out, its ends exert forces upon the supporting cross-springs 38 and 39 and thus flex or bow them in directions away from each other, somewhat as shown in Figure 6. The resiliency or yieldability of the bushings 31 that extend through the cross-springs 38 and 39 give the supports at the ends of the springs substantial flexibility and range of relative movement to provide virtually universal supports, being self-adjusting to the changing conditions that accompany changes in flexing of the cross-springs 38 and 39 themselves.

Spaced substantially from an end of the bowed striker actuating spring 35 I provide means to apply force to the bowed spring 35 in a direction to effect reversal of the bowed condition of the spring and this means preferably comprises two lever arms 45 and 46 (Figures 6, 7 and 8), one to each side of the spring so that either may apply the force according to the direction in which the spring is to be bowed. Preferably the lever arms are provided with suitable cushioning means such as knobs or bushings 47 and 48 of rubber to avoid metal-to-metal contact thereof with the spring 35 and preferably there is a substantial spacing between these spring engaging parts of the two lever arms.

The latter are preferably carried by a shaft 49 to which the lever arms are secured in any suitable manner or they may be integrally formed therewith, and to achieve the above-mentioned spacing the arms may be divergent as shown in Figure 8.

Suitable means are provided for rotatably supporting the shaft 49 so that it may be oscillated to actuate the spaced lever arms 45—46 and such means may comprise a combined bearing and mounting member generally indicated by the reference character 50 and shown also in Figure 9 in detached perspective. It may comprise a relatively heavy sheet-metal stamping having a flat securing portion 51 to rest against the base 20 against which also the shaft 49 rests

(see Figure 8), and having one or more, illustratively two, bearing portions 52 and 53 which are substantially U-shaped in cross-section to overlie the shaft 49 and with the base plate 20 closing off the U-shaped bearing portions the shaft 49 is thus supported for oscillating or rocking rotary movement. The member 50 may be secured to the base plate 20 as by screws 54 (Figure 6) threaded into the base plate 20, the securing portion 51 having suitable holes as shown in Figure 9.

One of the U-shaped bearing members, preferably the member 53, is cut away to provide a slot 56 to accommodate a pin 57 (Figures 6 and 8) force-fitted into a suitable radially extending hole in the shaft 49, the end walls of the slot 56 coacting with the pin 57 to limit the arc or range of rocking movement of the shaft and of the lever arms 45 and 46 to the desired extent.

As shown in Figure 6, shaft 49 is provided with another pin 58 force-fitted into a radially extending hole and positioned at the other end of the bearing member 53 so that, in coaction with the pin 57, axial movement of the shaft 49 relative to its bearings is precluded and the spaced lever arms 45, 46 are held for force-applying movement to the bowed spring 35 at the desired point along the length of the spring 35.

Extending about the shaft 49 is a coiled spring 60, one end of which is shaped into a hook or loop 61 which engages over the pin 58 and the other end 62 engages with a fixed part, conveniently the part 51 of the bearing member 50. Spring 60 is tensioned to bias the shaft 49 in clockwise direction as viewed in Figure 8 and yieldably holds the shaft with the right-hand end of the slot 56 (Figures 6 and 9) acting as a stop with which the pin 57 engages, to limit the extent of rotary movement of the shaft in clockwise direction.

With the shaft 49 in its biased position as just described, lever arm 46, which is preferably bendable for adjustment purposes, occupies a position to the right of the spring 35 (bowed toward the right as in Figure 6) so that its spring-engaging part, namely bushing 48, is spaced materially from the spring 35. When the spring 35 is bowed to the left from the position shown in Figure 6 and the shaft 49 rocked counter-clockwise from the position shown in Figure 8 to the extent permitted by the left-hand end wall of slot 56, a similar relationship will exist between the bowed spring 35 and the lever arm 45 with its rubber bushing 47. Lever arm 45 is also preferably bendable for adjustment purposes. With this relationship of the parts, the spacing between the spring-engaging portions of the levers 45 and 46, that is, the spacing between the bushings 47 and 48, is less than the range of transverse movement of that portion of the spring 35 that extends between them as the spring undergoes change or reversal from one bowed position to the other.

If the shaft 49 is rocked in counterclockwise direction in Figure 8, against the bias of spring 60, part 48 moves transversely into engagement with the bowed spring 35, and applies a transverse (to the left) force to the spring at a point substantially spaced from either of its ends, thus gaining a substantial mechanical advantage and requiring less force than if the spring-distorting force were applied at or closely adjacent to an end of spring 35. As the force application continues spring 35 is distorted, passing from the single curvature or bowing as shown in Figure 6 through a double curvature somewhat like an ogee curve, its lower half being convex toward the left and its upper half being convex toward the right, whence it somewhat suddenly snaps over into a single curvature that is the reverse of that shown in full lines in Figure 6, thus reversing its bowed condition. In undergoing this transition the two end cross-springs 38 and 39 become more tensioned or more bowed, thus lengthening somewhat the spacing of the effective supports at the ends of the spring 35 and washers 42 and 43 become more compressed. As the spring snaps over into reverse bowed condition, the energy stored in these tensioned and compressed parts is released, acting upwardly at the lower end of the spring 35 and downwardly at the upper end and thus giving greater impetus to the snap action with which the spring reverses its bowed condition.

By the time that the spring 35 commences snapping into reverse bowed shape, the counterclockwise swing of shaft 49 has just about reached its limit and pin 57 is about to engage the left-hand end wall of stop slot 56, and that position of the shaft brings the other lever arm 45 and the bushing 47 to such a position to the left of that shown in full lines in Figure 6 that it is not in the path of continued bowing movement of the spring 35 to the left.

The snap action of the spring 35 in reversing its bowed condition gives the striker structure 32 a relatively high velocity of movement to the left and the energy thereby stored in the striker, or its inertia, carries it to the left beyond what would be the normal at-rest position of the parts, causing the striker element 33 to give the chime-bar 23 an energetic blow and setting it into vibration. This action can be aided by the above described forces resulting from the energy stored in the resilient and yielding supports at the two ends of the spring.

Having struck the chime bar 23, the striker structure rebounds and assumes a position in which the striker element 33 is spaced from the chime bar 23 by about the same distance that the striker element 34 is indicated in Figure 6 as being spaced from the chime bar 24. Spring 35, in assuming the reversibly bowed condition, that is to the left, remains spaced from the lever arm 45 and rubber bushing 47, and if shaft 47 is now swung in counterclockwise position (Figure 8), lever part 47 moves to the right and into engagement with the spring 35 to distort the spring and cause it to reverse its bowed condition, again with a snap action, to impact the striker element 34 against the other chime bar 24, lever arm 46 and rubber bushing 48 moving out of the path of rightward movement of the spring 35, the parts coming to rest, upon rebound of the striker structure, in position substantially as shown in Figure 6. The reverse rocking stroke of the shaft 49 can be effected by the release of the energy stored in the spring 60 during the initial stroke.

Fitted over the entire assembly and secured in any suitable way (not shown) to the base 20 is a box-like cover 65 which can be in the form of a sheet metal stamping and telescopically fitted over the flanges of the base 20 as shown in Figures 7 and 8. Suitable walls of the cover 65, preferably the side walls 66 and 67, that are respectively adjacent the sounding elements 23 and 24 are provided with suitable holes or apertures 68 for better sound emission, the entire closure functioning as a resonator to improve the

quality of sound emitted by the vibratable chime bars.

The lower end wall 70 as seen in Figures 6 and 7 of the cover 65 is provided with a slot 71 that is in line with the shaft 49. When it is desired to install the device and actuate it as a signal to indicate the opening of a door, shaft 49 is given a length such that it extends through the slot 71 and beyond the lower end wall of the cover. In such case the device is mounted, as by securing the base 20 with the aid of screws 22 (Figure 7) to the upper part of a door-frame 73 as shown in Figure 1, with the projecting portion of shaft 49 extending horizontally. To the shaft 49 is secured an actuating device generally indicated by the reference character 74 and better shown in Figures 3 and 6, and constructed preferably to respond to door-opening movement but not to door-closing movement. The device 74 is preferably adjustable and preferably comprises a heavy strap metal part 75 bent to form a loop 76 to receive the projecting end of shaft 49 and provided with a screw 77 for clamping the loop securely to the shaft 49. With this arrangement the angularity, illustratively that shown in Figure 3, of the actuating lever part 75 may be adjusted or set during installation of the signalling device. Part 75 is provided with a lot 78 (Figure 6) and underlying it is a heavy sheet metal lever part 80 that has two spaced screws 81 threaded into it and passing through the slot 78, whereby the effective lever arm or length of the device 74 as a whole may be adjusted during the installation.

The lower end of lever part 80 is provided with spaced upstanding ears 84 which are apertured to receive the trunnions 82 of a door-engaging part 83 which is in the form of a lever of the first-class having a part 83^a that can engage the lever part 80 and having a portion 83^b, preferably formed into a rounded-over loop (see Figure 3), for coaction with the door 85 (Figures 1 and 3) as the latter moves in opening direction, a direction to the right in Figure 3. Where the door is hinged at the right as shown in Figure 1, the signalling device is preferably mounted so that the pivoted lever 83 hangs down in the path of the door near its left-hand upper edge and were the door to be hinged at its left the signalling device is simply mounted more to the right on the door frame 73 and also to position the pendant lever 83 in the path of opening movement of that portion of the door remote from the hinge.

Accordingly as the door 85 opens or moves to the right in Figure 3, the rounded-over part 83^b is engaged by the door and the door swings the pendant lever 83 in counterclockwise direction until the part 83^a engages the part 80 whereupon the continued opening movement of the door causes the adjustable lever 75—80 to be swung in counterclockwise direction throughout such an arc as corresponds to the raising of the device 74 necessary for the door 85 to by-pass it. By the above described adjustments of the parts relative to each other and to the door 85, that arc of swing, communicated to the shaft 49, corresponds substantially to the initial counterclockwise rocking stroke of shaft 49 as described in connection with Figures 6, 7 and 8, being effective to reverse the bowing of springs 35 and cause the chime bar 23 to be struck, and energy stored in the spring 60. Once the door has passed out of engagement with the part 83^b, the energy stored in spring 60 is freed to give the shaft its reverse stroke of rotary movement and to reverse the bowing of flat spring 35 to cause the striking of the chime bar 24, and at the same time to restore the door actuator structure 74 to the position shown in Figure 3. Upon subsequent closure of the door, the door engages the part 83^b to the right thereof in Figure 3 and by-passes the lever structure 75—80 inasmuch as the lever 83 is free to swing in clockwise direction relative to that structure.

Where the signalling device is to be employed as a signal on a table or desk 89, as indicated in Figures 2 and 4, it simply rests on the table or desk by way of the interengaged flanges of the base 20 and walls of the cover 65 and the projecting end of shaft 49 has secured to it a lever 86 at the free end of which it carries a fingerpiece 87 (Figures 2, 4 and 10). The lever 86 is preferably adjustably secured to the projecting shaft portion as by forming the lever 86 out of suitably heavy strap metal, and shaping it into a clamping loop 86^a (Figure 4) to clamp the shaft 49 under the clamping pressure applied by a clamping screw 88. Where the initial rocking stroke of the shaft 49 is in counterclockwise direction as seen in Figure 8 and also in Figure 4, the finger lever 86 is so mounted to the shaft 49, as shown in Figure 4, that a depressing movement of the lever effects the first rotary stroke of the shaft 49 to cause one sounding element to be struck, the spring 60 giving the shaft 49 its second and reverse stroke, thus to cause the other chime bar to be struck and to restore the finger lever 86 to upward position for subsequent manual actuation.

Where it is desired to install the signalling device for actuation by a caller at the door of an apartment, dwelling or the like it is secured in position, as shown in Figure 14, on one side of the wall or door panel, indicated at 90, and an actuating mechanism generally indicated at 91 is mounted on the other side. For such an installation the shaft 49 of Figures 6 and 7 is replaced by a shorter shaft 49^a as shown in Figures 11 and 14, shaft 49^a being exactly like shaft 49 excepting that it terminates just beyond the inner end 53 of the mounting and bearing part 50 of Figure 9 to a sufficient extent to carry the above described pin 58 (see Figure 11). It also has the pin 57 coacting with the stop slot 56 and a coiled spring 60^a is also provided but one end of it is looped as at 61^a onto the pin 57 and the other end 62^a rests against a fixed part such as the base 20, in order thus to bias the shaft 49^a just as the shaft 49 of Figures 6, 7 and 8 is biased. In the latter figures, in order to accommodate the spring 60, the underlying portion of the base 20 is drawn and flanged or depressed (to the right in Figure 7) as indicated at 20^a, having a round hole 92 in the depressed portion which thus provides an annular bearing or ledge. In Figures 11 and 14, with the spring 60^a about the upper end of the shaft, the base 20 is simply provided with a large hole 93 into which the turns of the spring can project.

The annular ledge 20^a and the walls of the hole 92 form stepped bearing surfaces for a rotary member generally indicated by the reference character 95 and better shown in Figures 12 and 13. Member 95 comprises a cylindrical hub 98 having a square hole 99 extending coaxially therethrough; its lower end is of a diameter to neatly fit into the hole 92 (Figure 14) and it has a peripheral flange 100 which is just accommodated in the annular bearing seat formed by the annular drawn and flanged part 20^a so that the left-

hand face of the part 100 falls in the same plane with the left-hand face of the base 20.

The spacing between the bearing parts 52 and 53 of the device 50 (Figures 9 and 11) is such that when the part 50 is put in position and secured to the base 20, the flange part 100, flush with the face of base 20, is prevented from moving out of the annular bearing seat formed for it by the draw or flange 20a, because, as shown in Figure 11, at least four substantially uniformly spaced parts of the device 50 overlie the flange 100, and thus the part 95 is dependably mounted for rotary movement about an axis at right angles to the axis of shaft 49a which terminates closely adjacent to the hub part 98 (Figures 11 and 14). The hub part 98 projects beyond the plane of the uppermost portions of the bearing parts 52 and 53 and has secured to it a disc 101 (Figures 11–14) which is provided with suitable extensions, like teeth, to provide a radially extending slot 102 of substantial length and in which is received the pin 58 (see Figure 11) carried by the shaft 49a.

In the wall or door panel 90 is a hole 103 (Figure 14) through which extends a square shaft 104 that passes into or through the square hole 99 in the hub 98 of the signalling device, its right-hand end as seen in Figure 14 being turned down as at 104a to provide a trunnion which is rotatably supported in a hole 105a of a base plate 105 that forms part of the actuator structure 91, which in turn is provided with any suitable manually operable means, preferably in the form of a lever 106 (see also Figure 15) that simulates a "door knocker" in appearance, having a hand-grip 106a at its lower end so that the arm 106 may be swung toward or away from the base or escutcheon plate 105 which is secured to the part 90 as by screws 107.

Projecting from the plate 105 are spaced ears or lugs 108 and 109 provided with holes to take a pivot pin or screw 110 and the under side of the upper end of the arm 106 is shaped, as by casting, stamping, molding or the like, to provide two spaced ears 106b and 106c between which are received the ears 109 and 108 of the base plate 105 and also having holes therein for the pivot pin 110.

On the inside face of arm 106 is an ear 106e on which is secured or formed a curved rack or gear segment 111, coaxially with the axis of pivoting which axis preferably intersects the axis of the square shaft 104. A gear segment 111 meshes with a tooth or gear member 112 which is secured to the rounded portion 104a of the shaft 104. Ear 106e has a hole in it for the passage therethrough of the pivot pins 110.

The unit 91 thus mounted on the other side of the panel or wall 90, has its shaft extending through the hole 103 in the wall 90 and into the square hole 99 of the driving hub 98 and, depending upon the thickness of the wall or panel 90, the square shaft 104 can project (to the left in Figure 14) beyond the hub 98 to a substantial extent up to the front wall of the cover 65, and thus the signalling unit on the one side and the actuating unit on the other side can be accommodated to a wide range of thicknesses of wall or doors without having to change the length of the square shaft 104.

Upon swinging the manual lever or arm 106 counterclockwise in Figure 14, the square shaft is given a rotary stroke of movement which is communicated to the driving hub 98 which, through the pin and slot connections 58 and 102 (Figure 11) gives the shaft 49a and the lever arms 45 and 46 a stroke of rotary movement against the tension of the spring 60a to effect reversal of the bowing of the spring 35 and striking of one of the chime bars (chime 23), the movement of all of the driving mechanism, including the swing of the external actuator arm 106 of the unit 91 being limited by the coaction of the pin 57 with the slot 56. Upon release of the manual actuator 106, the energy stored in the spring 60a (Figures 11 and 14) effects a reverse actuation and drive of the parts, causing the other chime bar 24 to be struck and the driving mechanism and manual actuator 106 restored to normal position.

I claim:

1. An audible signalling apparatus comprising a resonator casing having therein two spaced sounding elements, a spring having striker means and extending in the space therebetween, said casing having means therein for supporting said spring at its ends, the distance between the supporting means being less than the length of the spring whereby the latter is supported in bowed condition toward or away from one of said sounding elements according as said spring is first strained and then snaps out of one bowed condition to reverse bowed condition, a spring-opposed rock shaft having bearing means in said casing for supporting it with its axis generally parallel to the line joining the ends of said spring, said shaft having two spaced arms for engaging one side or the other of said spring intermediate its ends according to the direction of swing of said shaft, operating means external to said casing and having connection with said shaft, and means limiting the arc of rocking of said shaft so that either arm may strain the spring to snapping position, the spacing between said two arms being greater than the length of the arc through which that part of the spring that is engaged by an arm travels during that portion of the reversal of its bowing that corresponds substantially to its snapping movement that follows completion of straining movement by the arm, whereby on each stroke of the limited arc of swing the leading arm is out of the path of snap movement of the spring and is free from impeding the snap of the spring to strike a sounding element.

2. A signalling apparatus comprising a sounding element, a flat spring, a striker carried thereby, a pair of supports holding the ends of said flat spring, said supports being spaced apart by a distance less than the length of the spring whereby the latter is bowed toward or away from the sounding element, a rock shaft extending alongside an edge of said flat spring substantially parallel to the line joining the ends of the spring, a pair of arms carried by said shaft extending to points on opposite sides of said spring and spaced apart by a distance sufficient to permit the leading one of said arms to be clear of said spring during rocking motion of said shaft in a direction to bring the other of said arms into engagement with a face of said spring to move the spring through a dead-center position to permit said spring to snap to its oppositely-bowed position, an actuating lever extending substantially radially from said shaft and an extension of said lever hinged to the end of said actuating lever, said lever and extension having coacting abutments to stop the swing of said extension beyond a position of substantial parallelism with said lever in one direction, whereby said extension and lever act as a single lever to rotate said shaft in one direction to actuate said spring responsive to en-

gagement of the end of said extension by a moving object, and said extension can swing independently in the opposite direction without rotating said lever and shaft.

3. A signalling apparatus as claimed in claim 1 in which said shaft extends through a wall of said casing and said operating means comprises a lever on the external portion of said shaft for rocking actuation of said shaft in opposition to its spring, said lever having a finger piece whereby, when said casing rests on a horizontal surface, said finger piece may be depressed to effect sounding of said elements, said limiting means operating to limit the range of depressing movement of said finger piece.

4. A signalling apparatus as claimed in claim 1 in which said shaft extends through a wall of said casing and said operating means comprises a lever having two hingedly connected parts, one part being connected to said shaft externally of the casing and the other being engageable by a door or the like, the hinged connection between the two lever parts having coacting stop means to limit hinging action on only one direction of movement of the door and thereby effect actuation of the rock shaft against the opposition of its spring, whereby in reverse direction of movement of the door the latter simply swings one lever part relative to the other without actuation of the rock shaft.

5. An audible signalling apparatus comprising a resonator casing having therein two spaced sounding elements, a spring having striker means positioned in the space between said sounding elements, two spaced supports for the ends of said spring, said supports being non-rotatable and extending substantially at right angles to said sounding elements, but being resilient in a direction substantially parallel with said sounding elements, the distance between said supports being less than the length of the spring whereby the latter is supported in bowed condition toward or away from one of said sounding elements according as said spring is first strained and then snaps out of one bowed condition to reverse bowed condition, a rock shaft extending parallel to the line joining the ends of said spring and having two spaced arms extending substantially at right angles to said rock shaft for engaging one side or the other of said spring intermediate its ends according to the direction of rotation of said shaft, and means for actuating said shaft.

6. An audible signalling apparatus comprising a resonator casing having therein two spaced sounding elements, a spring having striker means and extending in the space therebetween, said casing having means therein for supporting said spring at its ends, the distance between the supporting means being less than the length of the spring whereby the latter is supported in bowed condition toward or away from one of said sounding elements according as said spring is first strained and then snaps out of one bowed condition to reverse bowed condition, a fork having its two spaced arms extending one to either side of said spring intermediate its ends and means

mounting said fork for reversible movement transversely of a line joining the ends of said spring, the spacing between said arms being such that on each stroke of movement of the fork the leading arm is out of range of the snapping movement of the spring that takes place upon completion of spring-straining action by the trailing arm.

7. An audible signalling apparatus comprising two spaced sounding elements, a spring extending in the space therebetween and having supporting means at its two ends spaced to support it in bowed condition, said spring carrying striker means intermediate its ends to impact said sounding elements according as said spring is strained and snaps out of one bowed condition to reverse bowed condition, a member at one side of said spring for applying force to the spring intermediate its ends to strain it out of one bowed condition, a member at the other side of said spring for applying force to the spring intermediate its ends to strain it out of its other bowed condition, and means for actuating said two members, said actuating means comprising means movably mounting said two members for reversible movement in directions generally transverse to the line joining the two ends of said spring to effect force-application to the spring by one member and movement of the other member out of the path of snap-movement of the spring as the latter effects reversal of its bowed condition.

8. A signalling apparatus comprising a sounding element, a flat spring having striker means and having means supporting it at its ends, said supporting means being spaced apart by a distance less than the length of the spring whereby the latter is bowed toward or away from the sounding element, said supporting means each comprising spring means biasing the supporting means toward each other and tending to lessen said distance, and means for straining said spring and said spring means to effect snap-over action of the flat spring to strike said sounding element.

9. A signalling apparatus as claimed in claim 8 in which said straining means comprises a fork having two spaced arms one in each side of said flat spring.

10. A signalling apparatus as claimed in claim 8 in which said straining means comprises a fork having two spaced arms one in each side of said flat spring, and resilient sound-damping means interposed between said flat spring and said two arms.

CHRISTIAN MILLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
150,388	Barton	May 5, 1874
277,741	Jones	May 15, 1883
770,437	Mayland	Sept. 20, 1904
1,859,345	Schantz	May 24, 1932
2,412,978	Fish	Dec. 24, 1946