

Jan. 21, 1958

J. W. CHRISTY

2,820,913

REPEATER MECHANISM FOR CHIMES

Filed Sept. 2, 1954

4 Sheets-Sheet 1

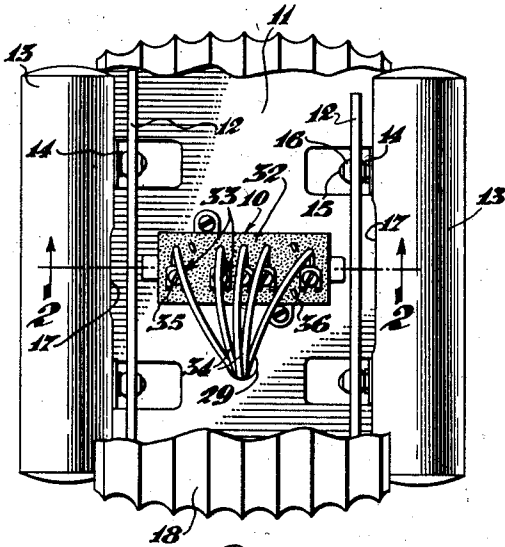


Fig. 1

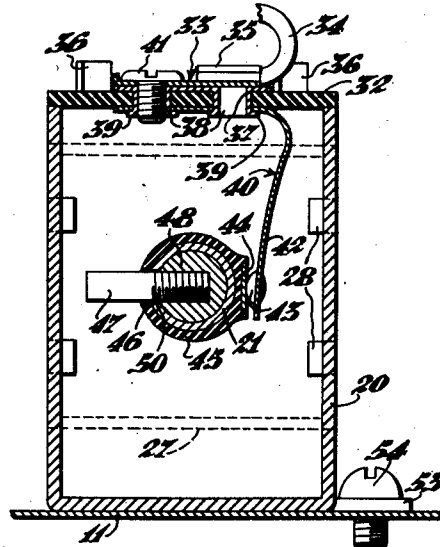


Fig. 3

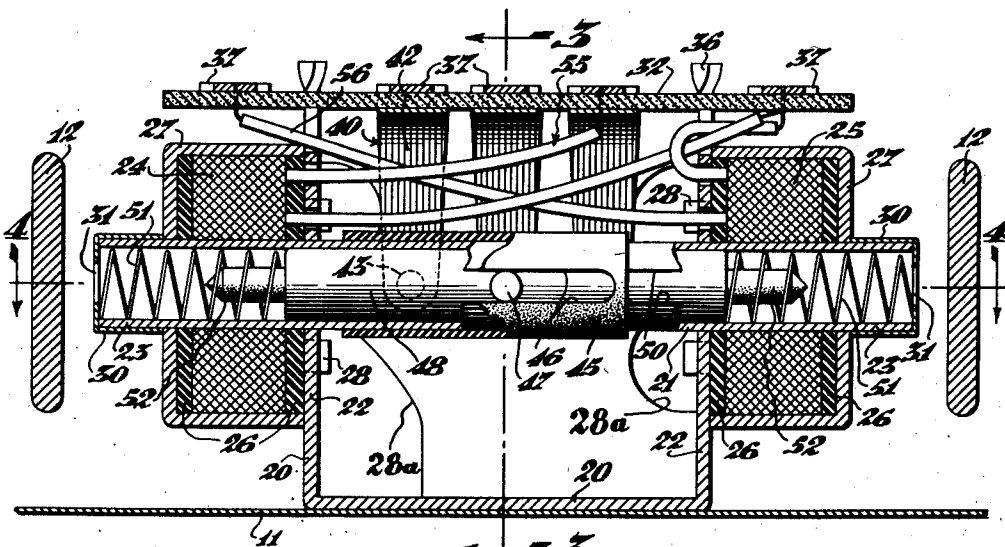


Fig. 2

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4 Sheets-Sheet 2

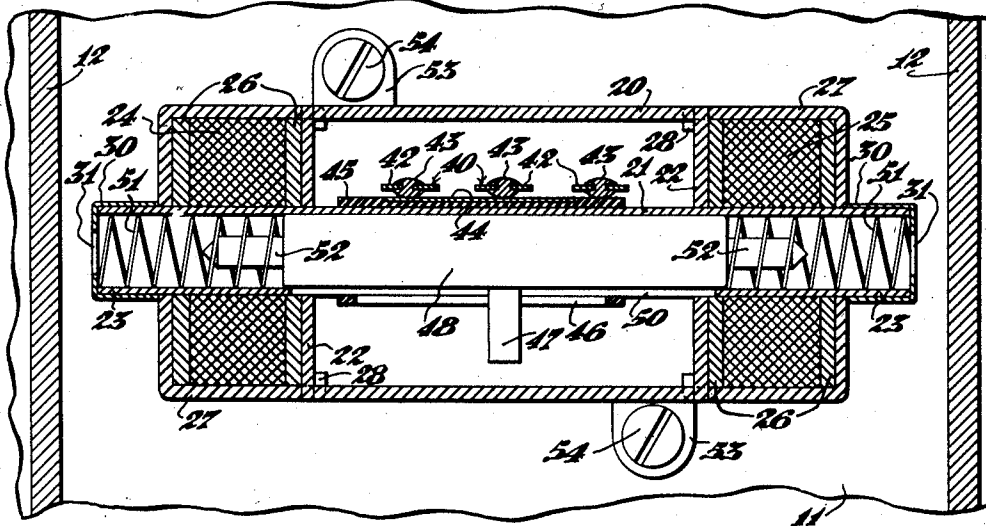


Fig. 4

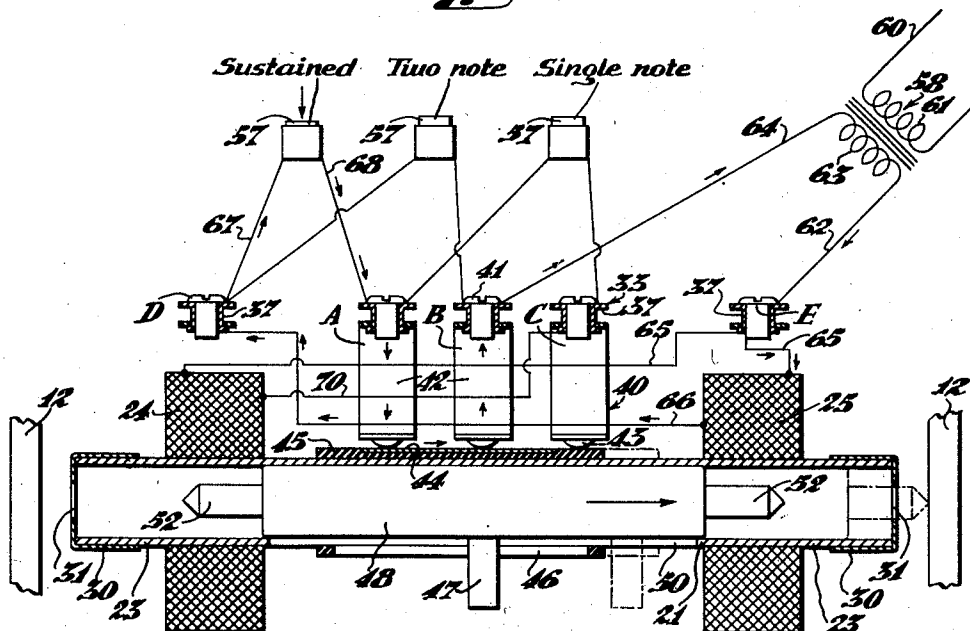


Fig. 5

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4 Sheets-Sheet 3

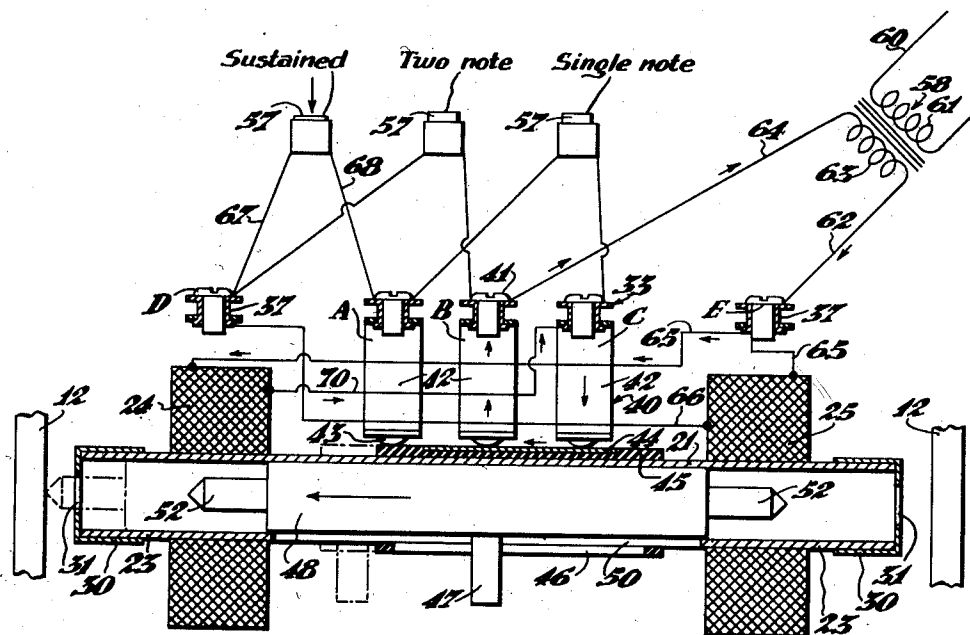


Fig. 6

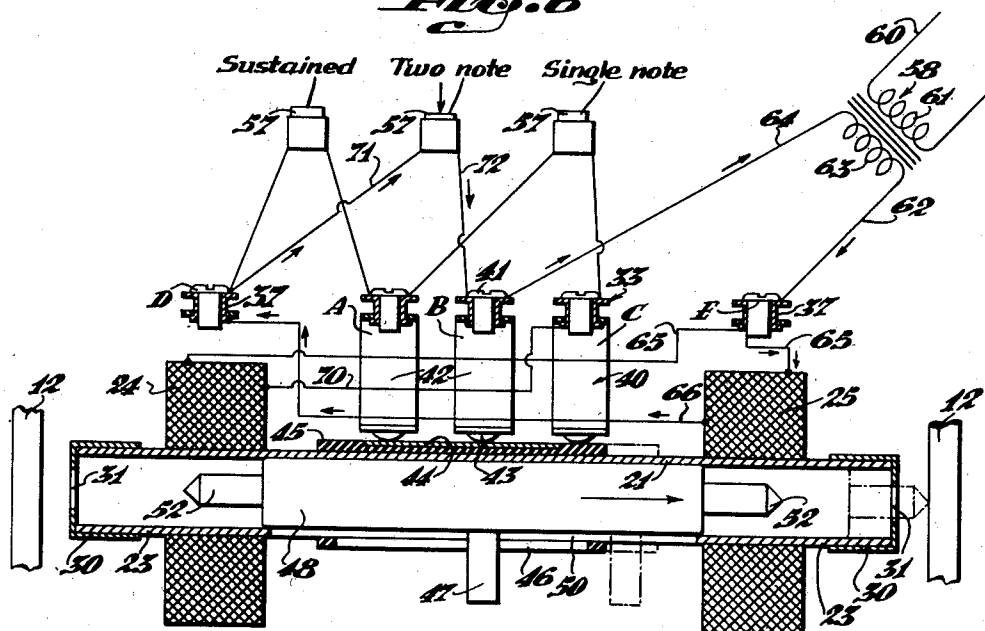


Fig. 7

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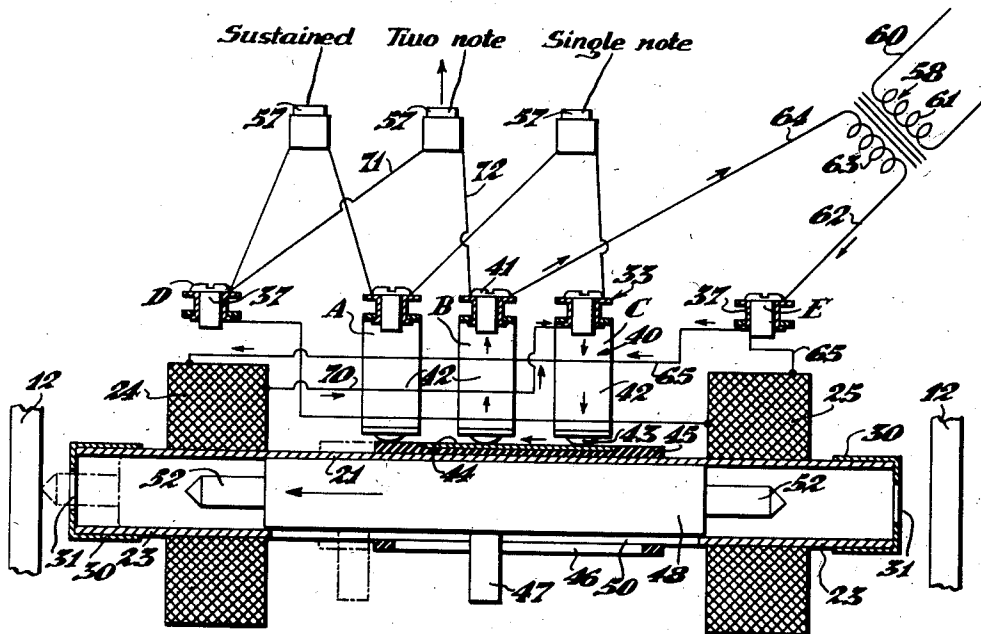


Fig. 8

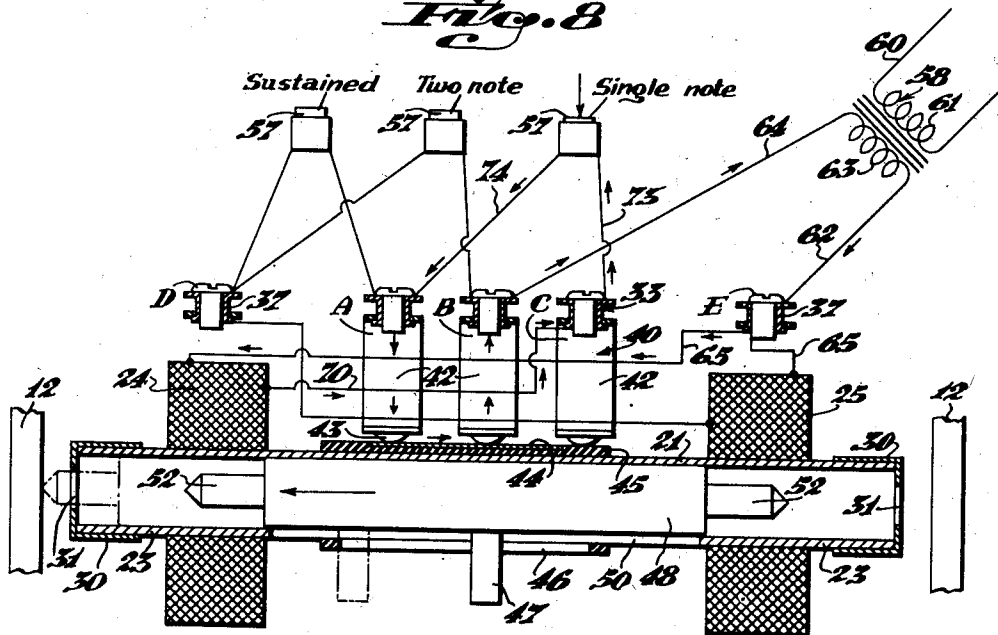


Fig. 9

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2,820,913

REPEATER MECHANISM FOR CHIMES

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Application September 2, 1954, Serial No. 453,736

8 Claims. (Cl. 310—35)

This invention relates to solenoid operated door chimes and is directed in particular to a repeater mechanism which is energized by three different push buttons to create three distinctive chime signals, utilizing a single chime unit. The single chime unit may serve three different doors, for instance the front, side and rear doors of a residence, each equipped with an individual push button, the several buttons electrically connected in common to the chime unit.

A chime signal producing two distinctive signals is disclosed in the prior patent of Lowell M. Alexander et al., No. 2,659,074, issued to the present assignee. The structure of the prior patent utilizes a pair of tone bars, related resonator tubes and a double acting solenoid plunger actuated by a pair of solenoid coils of different magnetic strength and biased by a pair of springs having different resistance to deflection. The stronger spring causes the plunger to strike both tone bars when the stronger solenoid coil is energized and deenergized, while the weaker spring causes it to strike one tone bar when the weaker coil is energized and deenergized.

The present structure also involves the use of two tone bars, related resonator tubes and a double acting solenoid plunger. A primary object of the present invention has been to provide a repeater mechanism operated by three individual push buttons, the mechanism creating a sustained or continuous chime signal upon operation of one button, creating a two-note signal upon operation of a second button and creating a single note signal upon operation of the third button.

Another object has been to provide more dependable operation and to produce stronger chime signals by impelling the solenoid under electrical energy for the several signals; also to provide a homing circuit whereby the repeater mechanism automatically assumes a homing position clearing all circuits when the buttons are released, thereby conditioning the mechanism to execute any one of the three cycles described above.

The repeater mechanism essentially comprises a double acting solenoid plunger energized by two opposed coils, a slidable two-position contact shuttle connected to the plunger for movement in response to plunger movement and a set of three stationary contacts engaging the contact shuttle. The stationary contacts are interconnected with the three push buttons and with the two solenoid coils and the shuttle normally resides in a homing position in which the circuits to the two solenoid coils are open. The plunger is biased to a centralized position between the two solenoid coils by a pair of compression springs engaged against its opposite ends.

When the sustained signal button is depressed, one of the solenoid coils is energized, causing the plunger to be impelled in that direction, thereby striking one of the tone bars. During this motion the plunger shifts the shuttle to its second position to energize the opposite solenoid coil and deenergize the first coil. Aided by the coil springs, the plunger is immediately impelled in the op-

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posite direction toward the second solenoid coil to strike the second tone bar, again shifting the shuttle back to its first or homing position. Assuming that the push button is still depressed, the circuit is again completed to the first solenoid coil, causing the plunger again to be impelled in that direction. This cycle is repeated so long as the button is depressed, thereby creating the sustained chime signal. When the button is released, the contact shuttle automatically returns to its homing position ready for the next signal.

When the two-note push button is depressed, the first coil is again energized to cause the plunger to strike the first tone bar and to shift the shuttle to its second position. The circuit is so arranged however, that the first coil remains energized while the button is depressed, even though the shuttle completes the circuit to the second coil. Therefore, the plunger remains under the influence of the first coil until the button is released to deenergize the first coil. Upon release of the button, the plunger is impelled toward the second energized coil to strike the second tone bar and in so doing shifts the contact shuttle back to its homing position, thus opening the circuit after the second tone bar is struck.

When the single note push button is depressed a circuit is established to the second coil to impel the plunger in that direction to strike the second tone bar. When the plunger moves in this direction, the contact shuttle is not shifted from its homing position; therefore, the circuits are not disturbed and the plunger simply returns to its centralized position under the influence of the coil springs upon release of the single note button.

By operation of the homing circuit, the sliding shuttle clears all circuits at the end of each signal and conditions the mechanism for the next signal. In other words, when the buttons are released, the homing circuit keeps the mechanism energized until the shuttle is shifted to its homing position. This also occurs automatically when the chime signal is initially installed in the event the shuttle is shifted from its homing position during shipment or handling.

Various features and advantages of the invention are disclosed in detail in the following description with reference to the drawings.

In the drawings:

Figure 1 is a front elevation of a door chime unit embodying the present invention, the cover being broken away to illustrate the general arrangement of the parts.

Figure 2 is an enlarged sectional view taken on line 2—2 of Figure 1, illustrating the repeater mechanism.

Figure 3 is a sectional view taken on line 3—3 of Figure 2, further detailing the repeater mechanism.

Figure 4 is a diagrammatic sectional view of the repeater mechanism taken on line 4—4 of Figure 2.

Figure 5 is a diagrammatic view similar to Figure 4 including the electrical circuit, the continuous chime button being shown depressed and the circuit set up to shift the solenoid plunger toward the right, the parts being shown in their normal homing position before the first stroke of sustained reciprocation.

Figure 6 is a view similar to Figure 5 showing the position of the parts after the first stroke toward the right, the parts being positioned for energizing the left hand solenoid coil.

Figure 7 is a view similar to Figure 5 showing the circuit which is established when the two-note chime button is depressed, the parts being shown in their normal homing position with the right hand coil energized for shifting the parts in that direction.

Figure 8 is similar to Figure 7 and shows the circuit set up to move the plunger and associated parts toward the left when the two-note button is released.

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Figure 9 is similar to Figure 8 showing the circuit set up for the single note operation.

Referring to Figure 1, the repeater mechanism, which is indicated generally at 10 is mounted upon the base plate 11 of a two-note chime unit having a pair of tone bars 12—12 associated with respective tuned resonator tubes 13—13. The tone bars and their resonator tubes preferably are pitched to provide two distinctive musical notes when sounded individually and to produce a harmonious two-tone chord effect when sounded in sequence. As shown, the resonator tubes are mounted upon lugs 14 which are struck up from the base plate, the tone bars being mounted adjacent the tubes upon turned studs 15 passing through the lugs and attaching the tone bars and resonator tubes in common to the lugs. The studs 15 preferably include grommets 16 formed of rubber or similar soft material to prevent metal-to-metal contact between the studs and tone bars. Each resonator tube includes an opening 17 facing its associated tone bar to provide the resonator effect.

The base plate includes a cover 18 which overlies the repeater mechanism and tone bars to conceal the parts from view and to protect the working parts against dust and dirt. The structure, so far described, represents a preferred embodiment of the invention and follows generally the structure shown in the aforesaid prior patent.

Referring to Figure 2, the solenoid mechanism comprises a sheet metal receptacle 20 attached to the base plate 11 and supporting a solenoid tube 21, the tube passing through apertures formed in the end walls 22 of the receptacle and having opposite end portions 23 projecting outwardly from opposite ends of the receptacle. The solenoid tube 21 is formed of brass or other non-magnetic material. Mounted upon the end portions 23 of the solenoid tube is a pair of solenoid windings or coils 24 and 25 formed of magnet wire, the opposite ends of the coils being confined between insulating washers 26—26 formed of fibrous or plastic material. Suitable insulating material is interposed between the coils and tube upon which they are mounted; the outside diameter of the coil is also covered with insulating material.

Each coil is enclosed by a coil housing 27 fitted over upon the respective end portions 23 of the solenoid tube and enclosing the coils and insulating washers. The coil housings preferably are formed of a single blank of sheet metal bent to form a box-like closure (Figure 3), the open end of the closure having a plurality of tangs 28 projecting into clearance openings 28a formed in the side walls of the receptacle, the tangs being bent over upon the edges of the end walls. The solenoid tube is locked against endwise movement by a pair of spring retainer caps 30—30 which are pressed upon the opposite ends of the tube and seat against the external surface of the coil housings (Figure 2). The end wall of each retainer cap is provided with a central opening 31 which allows the plunger tips to strike the tone bars.

As shown in Figure 1, a terminal panel 32 is mounted upon the open top of the receptacle 20 overlying the solenoid coils. The terminal panel is formed of insulating material and includes a series of electrical terminals 33 connected to the components of the repeater mechanism as described later. Electrical supply and control wires, indicated at 34 pass through an opening 29 formed in the base plate and are connected to the terminals 33 by means of terminal lugs 35 attached to the ends of the wires. The terminal panel is attached to the receptacle by means of the tangs 36 projecting from the upper edges of the receptacle 20 and passing through slots formed in the panel. The tangs are twisted or bent slightly to lock the panel to the receptacle.

Referring to Figure 3, the three intermediate terminals 33 are in the form of eyelet plates 37, each of which includes a pair of eyelets 38. Each pair of eyelets passes through the panel and their lower ends are curled over as at 39 upon respective flat leaf springs 40, thus eye-

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letting the leaf springs to the under surface of the panel. As best shown in Figure 2, there is provided a set of three leaf springs 40, each spring being attached to the panel by an individual eyelet plate 37, the electrical circuit being completed from the wires 34 through the self-tapping terminal screws 41 which are threaded into one of the eyelets of each pair. The two end terminals 33 also include eyelet plates 37 (Figure 5) but the contact springs are omitted; these terminals connect to the internal wiring of the repeater mechanism as indicated later.

Each contact spring has a downwardly depending portion 42, the lower end of which includes a contact boss 43 (Figure 4), preferably formed as an indent on the leaf spring. The leaf spring is bent to urge the contact boss under predetermined pressure against a metallic contact strip 44, formed of bronze or the like, which is mounted upon a slidable shuttle sleeve 45, formed of insulating material and loosely engaged upon the solenoid tube 21. Referring to Figure 2, shuttle sleeve 45 includes a longitudinal slot 46 which is transversely by a shuttle actuating pin 47 having an end threaded into the solenoid plunger 48. It will be noted in Figures 2 and 4, that the solenoid tube 21 is also provided with a longitudinal slot 50 extended between the two solenoid coils, permitting the shuttle actuating pin 47 to move freely from one side of the receptacle to the other.

The solenoid plunger 48 normally is maintained in a centralized position by a pair of compression springs 51—51, the springs having inner ends seated against the ends of the plunger and having outer ends seated against the spring retainer caps 30. The compression springs bias the plunger constantly toward a centralized position against the motion imparted to it magnetically by the two solenoid coils. The opposite ends of the plunger are provided with tips 52 of reduced diameter formed of a fibrous or plastic material. Upon actuation of the plunger, the tips project through the openings 31 of the sleeve caps and impinge against the tone bars as indicated in broken lines in Figures 5 to 9.

It will be understood at this point that the shuttle sleeve 45, being loosely mounted, is free to be shifted longitudinally upon the solenoid tube in response to the shifting of the solenoid plunger 48. The shifting motion is imparted to the shuttle by the pin 47 engaging the end of slot 46 as the plunger approaches the end of its stroke but before it impinges against the tone bar. The frictional resistance of the contact rivets 43, bearing against the contact strip 44, is sufficient to prevent overtravel of the sliding shuttle at the limits of its lineal motion.

It will be noted in Figure 3 that the shuttle actuating pin 47 passing through the slot 50 of solenoid tube 21, keys plunger 48 and shuttle sleeve 45 against rotation. This holds the contact strip 44 in alignment with the contact rivets 43 during reciprocation of the plunger and shuttle sleeve. The length of the slot 46 of the shuttle sleeve is related to the stroke of the plunger to cause the shuttle to be shifted endwise from its homing position (Figure 5) as the plunger approaches the end of its stroke in the right hand direction and to shift the shuttle back to its homing position as the plunger moves to the left (Figure 6). This endwise motion is utilized to establish a circuit through the contact strip 44 and contact springs 40 to energize the solenoid coils alternately to cause reciprocation of the plunger, as explained with reference to the electrical circuit.

It will be noted in Figure 4, that the repeater mechanism forms a self-contained unit, the base of the receptacle 20 being provided with lugs 53 which are attached by screws 54 to the base plate. The repeater mechanism is thus assembled as a separate unit and attached to the base plate, the wires 34 preferably being attached to the terminal screws after the repeater mechanism is installed on the base plate.

It will be noted in Figure 2 that the internal wiring 55 which sets up the circuits for the several operations,

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is confined within the receptacle 20. The internal wiring 55 and external wiring 34 is covered by insulated sleeving, as indicated at 56, to prevent short circuiting.

Electrical circuit and operation

The circuit disclosed diagrammatically in Figures 5 to 9 represents a typical home installation arranged to provide three distinct chime signals for three different entrances, the circuit including three push buttons of conventional design indicated generally at 57. The three buttons provide selectively a sustained or continuous chime, a two-note chime or a single note chime, as noted on the drawings, the different signals indicating which button is being pressed. The circuit is powered by a standard six to thirty volt bell transformer 58 which is energized by the A. C. service lines 60 connected to the primary winding 61.

It will be noted that the three intermediate terminals 33 and their contact springs 40 have been indicated at A, B and C and that the two end terminals 33 are indicated at D and E. Line 62 of the transformer secondary winding 63 is connected to the end terminal E and the second line 64 of the secondary is connected to the terminal of contact spring B. It will be noted that terminal E is connected on common to one end of both solenoid coils 24 and 25 by way of line 65, thus constantly energizing one end of each coil. The second line 64 of the secondary transformer winding energizes the opposite ends of the two coils 24 and 25 by way of the push buttons 57, contact springs 40 and contact strip 44 of the shuttle sleeve to provide the three operating cycles, as explained in detail below.

As will be more fully apparent from the following detailed description, the sliding shuttle sleeve has two positions and its contacts provide a homing circuit with the sleeve normally residing in the homing position shown in Figures 4 and 5. This normal position clears all circuits at the end of each cycle of operation, such that the mechanism is self-clearing whether the cycle is sustained, two-note, or single note. During the sustained or two-note cycles, the shuttle is shifted from its homing position during plunger movement toward the right, as indicated in broken lines in Figure 5, and is shifted back to its homing position during plunger movement toward the left as indicated in Figure 6 in broken lines.

When the sustained chime button is depressed as shown in Figure 5, the circuit is completed by the line 66 of the right hand solenoid coil 25 to terminal D, by way of line 67 to the sustained push button, and by way of line 68 to the contact spring A. The circuit is completed from spring A to spring B by way of contact strip 44 and from spring B by way of the line 64 to the transformer. Since the opposite end of the coil 25 is energized by lines 62 and 63 from the transformer, the solenoid plunger 43 will be shifted toward the right by the magnetic field of coil 25 as indicated by the arrow. As the plunger moves toward the right and enters coil 25, sleeve actuating pin 47 contacts the end of slot 46, shifting the shuttle 45 and contact strip 44 to its right hand position shown in broken lines, as plunger tip 52 strikes the tone bar. The sleeve thus assumes the position shown in Figure 6. The shuttle movement occurs as the tip approaches the tone bar and is completed as the tip actually contacts the bar. It will be noted that the tip impinges against the bar during overtravel of the end of the plunger beyond the end of the coil as indicated in broken lines; hence, the plunger immediately retracts upon striking the bar.

It will be seen in Figure 6 that the right hand movement of the shuttle shifts the contact strip 44 in a direction to establish a circuit from contact spring B to contact spring C. Contact spring B is in direct connection with the transformer by way of line 64, therefore a circuit is completed to the left hand coil 24 by way of

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line 70 of the left hand coil 24, spring C, through contact strip 44, spring B, line 64 to the transformer.

It will be seen therefore, that as soon as the plunger strikes the right hand tone bar, right hand coil 25 is deenergized and coil 24 is energized by way of springs B and C to draw the plunger to the left. It will also be observed at this point that the compression springs 51 function only to return the plunger toward its centralized position; as the plunger assumes that position it comes under the influence of the field of left hand coil 24. Thus in either direction of the motion, the actual tone bar impact is produced by electrical energy as distinguished from spring operation.

Upon approaching the left hand tone bar, pin 47 engages the left hand end of slot 46 and shifts the shuttle as indicated in broken lines in Figure 6 back to its homing position shown in full lines in Figure 5. Assuming that the sustained button is still in depressed position, the circuit will be reestablished to the right hand coil 25 by way of line 66, terminal D, line 67, sustained button, line 68, contact spring A to contact spring B and by way of line 64 to the transformer. The solenoid plunger will thus be maintained in sustained reciprocation between the two coils so long as the push button is depressed and will always stop at the homing position of Figure 5 when the button is released.

When the two-note button is depressed as shown in Figure 7, a circuit is established from the right hand coil 25 by way of line 66 to terminal D and by way of line 71 to the two-note push button. From the push button, the circuit is completed by way of line 72 to the terminal of spring B and to the transformer by way of line 64. A direct circuit is thus set up to the right hand coil 25, causing the plunger to be impelled toward the right as indicated in broken lines in Figure 7. Upon striking the tone bar, shuttle 45 is again shifted to the right, as indicated in broken lines in Figure 7, and in full lines in Figure 8.

When the shuttle is shifted to the right, a circuit is completed to the left hand coil 24, as shown in Figure 8 by way of line 70, to the terminal of contact spring C, through spring C to spring B by way of contact strip 44, the circuit being completed to the transformer by way of line 64. This is the same circuit shown in Figure 6. It will be noted at this point, that the left hand coil 24 is now energized by the shuttle circuit, while the right hand coil 25 remains energized through the push button circuit because the circuit from the button by way of lines 71 and 66 (Figure 7) is still complete. In other words both coils are energized but since the right hand portion of the plunger is within right hand coil 25, the magnetic flux of coil 24 is ineffective to move the plunger until coil 25 is deenergized. Therefore, when the two-note button is released, the right hand spring 51 returns the plunger to its centralized position, then the left hand coil 24 is effective to pull the plunger to the left, causing the second note to be struck. As soon as the plunger moves to its left hand position as indicated by the arrow (Figure 8), the shuttle is shifted back to its homing position as indicated in broken lines, deenergizing coil 24, with the springs 51 centralizing the plunger.

When the single note push button is depressed, as shown in Figure 9, a circuit is established to the left hand coil 24 by way of line 70 to the terminal of contact spring C and from said terminal to the push button by way of line 73. From the push button, a circuit is completed by way of line 74 to the terminal of contact spring A, through contact strip 44 to contact spring B and by way of line 64 to the transformer. This propels the plunger to the left as indicated in broken lines; however, the shuttle remains stationary in its homing position since the slot and pin provide the left hand stroke without contacting the end of the slot.

As indicated in broken lines in the several views, the

tone bars are struck during overtravel of the plunger beyond the ends of the coils; in other words the tip strikes the tone bar then retracts immediately to a position in which the end of the plunger is near the outer end of the coil. Thus, when the single note button is depressed, a single note is struck, then the plunger retracts within the energized coil until the button is released to de-energize the coil. When the coil is deenergized the spring 51 on the left shifts the plunger back to its centralized position.

From the foregoing, it will be seen that the ends of both solenoid coils are constantly energized by way of line 62 from the transformer, while the contact strip 44 of the shuttle is also constantly energized from the opposite side of the transformer circuit by way of contact spring B and line 64. Disregarding the push buttons and terminals, contact spring A, which is adjacent coil 24, is connected to coil 25 and spring C, which is adjacent coil 25 is connected to coil 24. Thus when the shuttle is moved toward a given coil, the contact strip and springs after a certain amount of movement complete the circuit to the opposite coil.

The circuit to coil 25 is completed through the sustained button while the circuit to coil 24 is directly from spring C by way of line 70. Therefore, when the sustained button is released, the homing circuit is always established by way of contact spring C to coil 24 to shift the shuttle to homing position. Contact strip 44 of the shuttle is shorter than the distance between springs A and C; hence the circuit to coil 24 is opened when the shuttle reaches homing position.

Since the two-note button is connected directly to coil 25, it completes the circuit upon being depressed and causes the plunger to shift the shuttle from homing position to its second position, energizing coil 24. The circuit to coil 24 remains closed through the shuttle circuit until the two-note button is released, deenergizing coil 25. At this time the plunger is attracted by coil 24 to strike the second note and restore the shuttle to homing position.

When the single note button is depressed, the circuit is completed from the constantly energized contact strip 44 of the shuttle from spring A to spring C to coil 24; causing the plunger to move to the left. Slot 46 of the shuttle allows pin 47 to move left without shifting the shuttle from its homing position. Therefore, the single note is struck without disturbing the shuttle or its circuits.

Having described my invention I claim:

1. A repeater mechanism for a chime signal comprising a solenoid tube, a first and second solenoid coil mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwise in opposite directions in response to the energization of said solenoid coils, spring means connected to the plunger normally maintaining the plunger in an intermediate position relative to said solenoid coils, a shuttle slidably mounted relative to the solenoid tube, the shuttle residing in a homing position when the plunger is in said intermediate position, an actuating element connected to the plunger and engageable with the shuttle, the actuating element shifting the shuttle from said homing position to a second position upon endwise movement of the plunger toward the first solenoid coil and shifting the shuttle back to said homing position upon movement of the plunger toward the second coil, a first and a second stationary contact means, respective conductors electrically connecting the first and second contact means to the first and second solenoid coils, an electrical element on the shuttle electrically energizing the contact means of the first coil when the shuttle is in homing position and energizing the contact means of the second coil when the shuttle is shifted to said second position, a normally open sustained reciprocation switch interposed in the conductor between the first contact means and first coil for energizing the same, said switch in closed position providing sustained reciprocation of the plunger

and shuttle, and a normally open two-note switch connected to the first coil for energizing the same independently of said shuttle, whereby closing of the two-note switch shifts the plunger toward the first coil and shifts the shuttle to said second position energizing the second coil for movement of the plunger toward the second coil upon opening of said switch.

2. A repeater mechanism for a chime signal comprising a solenoid tube, a first and second solenoid coil mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwise in opposite directions in response to the energization of said solenoid coils, spring means connected to the plunger normally maintaining the plunger in an intermediate position relative to said solenoid coils, a shuttle slidably mounted relative to the solenoid tube, the shuttle residing in a homing position when the plunger is in said intermediate position, an actuating element connected to the plunger and engageable with the shuttle, the actuating element shifting the shuttle from said homing position to a second position upon endwise movement of the plunger toward the first solenoid coil and shifting the shuttle back to said homing position upon movement of the plunger toward the second coil, a first and a second stationary contact means, respective conductors electrically connecting the first and second contact means to the first and second solenoid coils, an electrical element on the shuttle electrically energizing the contact means of the first coil when the shuttle is in homing position and energizing the contact means of the second coil when the shuttle is shifted to said second position, a normally open sustained reciprocation switch interposed in the conductor between the first contact means and first coil for energizing the same, said switch in closed position providing sustained reciprocation of the plunger and shuttle, and a single note switch connected to the second solenoid coil for energizing the same, whereby closing of the single note switch shifts the plunger toward the second coil without shifting the shuttle from said homing position.

3. A repeater mechanism for a chime signal comprising a solenoid tube, a first and second solenoid coil mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwise in opposite directions in response to the energization of said solenoid coils, spring means connected to the plunger normally maintaining the plunger in an intermediate position relative to said solenoid coils, a shuttle slidably mounted relative to the solenoid tube, the shuttle residing in a homing position when the plunger is in said intermediate position, an actuating element connected to the plunger and engageable with the shuttle, the actuating element shifting the shuttle from said homing position to a second position upon endwise movement of the plunger toward the first solenoid coil and shifting the shuttle back to said homing position upon movement of the plunger toward the second coil, a first and a second stationary contact means, respective conductors electrically connecting the first and second contact means to the first and second solenoid coils, an electrical element on the shuttle electrically energizing the contact means of the first coil when the shuttle is in homing position and energizing the contact means of the second coil when the shuttle is shifted to said second position, a normally open sustained reciprocation switch interposed in the conductor between first contact means and first coil for energizing the same, said switch in closed position providing sustained reciprocation of the plunger and shuttle, a normally open two-note switch connected to the first coil for energizing the same independently of said shuttle, whereby closing of the two-note switch shifts the plunger toward the first coil and shifts the shuttle to said second position energizing the second coil for movement of the plunger toward the second coil upon opening of said two-note switch, and a single note switch connected to the second coil for ener-

gizing the same, whereby closing of the single note switch shifts the plunger toward the second coil without shifting the shuttle from said homing position.

4. A repeater mechanism for a chime signal comprising, a solenoid tube, a first and second solenoid coil mounted upon the opposite end portions of said tube, a solenoid plunger slidably sustained in said tube and movable endwisely in opposite directions in response to the energization of the first and second coils, a shuttle slidably sustained relative to the solenoid tube, an actuating element mounted upon the plunger and engaging the shuttle, the actuating element shifting the shuttle respectively to a first and second position in response to the movements of the plunger in opposite directions, a stationary contact mounted adjacent the first coil and connected to the second coil, a second stationary contact mounted adjacent the second coil and connected to the first coil, contact means on the shuttle alternately energizing said stationary contacts in response to the movements of the plunger and shuttle to said first and second positions, a sustained signal switch interposed between the first coil and the stationary contact which energizes the same, said switch providing said sustained reciprocation upon closing thereof, a two-note switch connected directly to the first coil and energizing the same, closing of the two-note switch shifting the plunger toward said first coil to provide the first note and shifting the shuttle to said second position to energize the second coil, the solenoid plunger being shifted toward the second energized coil upon opening of the two-note switch to deenergize the first coil thereby providing the second note.

5. A repeater mechanism for a chime signal comprising, a solenoid tube, a first and second solenoid coil mounted upon the opposite end portions of said tube, a solenoid plunger slidably sustained in said tube and movable endwisely in opposite directions in response to the energization of the first and second coils, a shuttle slidably sustained relative to the solenoid tube, an actuating element mounted upon the plunger and engaging the shuttle, the actuating element shifting the shuttle respectively to a first and second position in response to the movements of the plunger in opposite directions, a stationary contact mounted adjacent the first coil and connected to the second coil, a second stationary contact mounted adjacent the second coil and connected to the first coil, contact means on the shuttle alternately energizing said stationary contacts in response to the movements of the plunger and shuttle to said first and second positions, a sustained signal switch interposed between the first coil and the stationary contact which energizes the same, said switch providing said sustained reciprocation upon closing thereof, and a single note switch interconnecting said stationary contacts and establishing a circuit from the contact means of the shuttle to the second coil for shifting the plunger toward the second coil without shifting the shuttle from said first position, thereby to provide a single note.

6. A repeater mechanism for a chime signal comprising a solenoid tube, a first and second solenoid coil mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwisely in opposite directions in response to the energization of said solenoid coils, spring means connected to the plunger normally maintaining the plunger in an intermediate position relative to said solenoid coils, a generally cylindrical shuttle slidably mounted upon the solenoid tube and residing in a homing position when the plunger is in said intermediate position, an actuating element connected to the plunger and engaging the shuttle, the actuating element shifting the shuttle from said homing position to a second position upon movement of the solenoid plunger toward the first solenoid coil and shifting the shuttle back to said homing position upon movement of the plunger toward the second coil, an elongated electrical contact element mounted on the shuttle and

movable therewith a set of three stationary contacts mounted adjacent the shuttle and spaced apart from one another along said elongated contact element, the intermediate of said contacts being in constant sliding electrical contact with the said elongated contact element, the two endwise contacts at opposite sides of the intermediate contact being spaced apart a distance greater than the length of the elongated contact element and electrically connected to said first and second solenoid coils in reverse order, one of said endwise contacts slidably contacting the elongated contact element when the shuttle is in said homing position, said elongated contact element slidably contacting the opposite endwise contact upon movement of the shuttle from said homing position to said second position, an electrical circuit having one side in common electrical connection with an end of both solenoid coils, the opposite side of said circuit connected to the said intermediate contact, the said two endwise contacts alternately completing the electrical circuit through the elongated contact element of the shuttle to the solenoid coil at one end of the tube upon reciprocation of the plunger and shuttle to an opposite end, providing sustained reciprocation of the shuttle and plunger.

7. A repeater mechanism for a chime signal comprising a solenoid tube, a pair of solenoid coils mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwisely in opposite directions in response to the alternate energization of said solenoid coils, a pair of coil springs disposed within said tube and engaged against respective opposite ends of said plunger, said springs normally maintaining the plunger in an intermediate position relative to said solenoid coils, a shuttle sleeve slidably mounted upon the solenoid tube between said coils, said solenoid tube having a longitudinal slot extending between said coils, the shuttle sleeve having a longitudinal slot in registry with the slot of the solenoid tube, an actuating member mounted on the solenoid plunger and projecting through said slots, said actuating member contacting the ends of the slot of the shuttle sleeve as the solenoid plunger approaches the respective opposite limits of movement toward said solenoid coils, thereby to shift the shuttle sleeve endwisely in opposite directions, a pair of stationary contacts cross connected to said pair of solenoid coils, contact means on said shuttle alternately energizing said contacts in response to the movements of the shuttle, said contacts alternately completing the circuit to a coil at one end of the solenoid tube upon reciprocation of the plunger and shuttle to an opposite end, thereby providing sustained reciprocation of the plunger and shuttle.

8. A repeater mechanism for a chime signal comprising a solenoid tube, a pair of solenoid coils mounted on opposite end portions of said tube, a solenoid plunger slidably sustained within said tube and movable endwisely in opposite directions in response to the alternate energization of said solenoid coils, a pair of coil springs disposed within said tube and engaged against respective opposite ends of said plunger, said springs normally maintaining the plunger in an intermediate position relative to said solenoid coils, a shuttle sleeve slidably mounted upon the solenoid tube between said coils, said solenoid tube having a longitudinal slot extending between said coils, the shuttle sleeve having a longitudinal slot in registry with the slot of the solenoid tube, an actuating member mounted on the solenoid plunger and projecting through said slots, said actuating member contacting the ends of the slot of the shuttle sleeve as the solenoid plunger approaches the respective opposite limits of movement toward said solenoid coils thereby to shift the shuttle sleeve endwisely in opposite directions, a contact strip on said shuttle, and a set of three stationary contact members mounted adjacent the shuttle and spaced apart from one another along said contact strip, the intermediate

of said contacts being in constant electrical connection with said contact strip and energizing the same, the contacts on opposite sides of the intermediate contact being spaced apart a distance greater than the length of the contact strip, said contacts being electrically connected to the solenoid coils at opposite ends of the solenoid tube in reverse order, said contacts on opposite sides of the intermediate contact alternately completing an electrical circuit to the solenoid coil at one end of the solenoid tube upon reciprocation of the plunger and shuttle to an op-

posite end, thereby providing sustained reciprocation of the plunger and shuttle.

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