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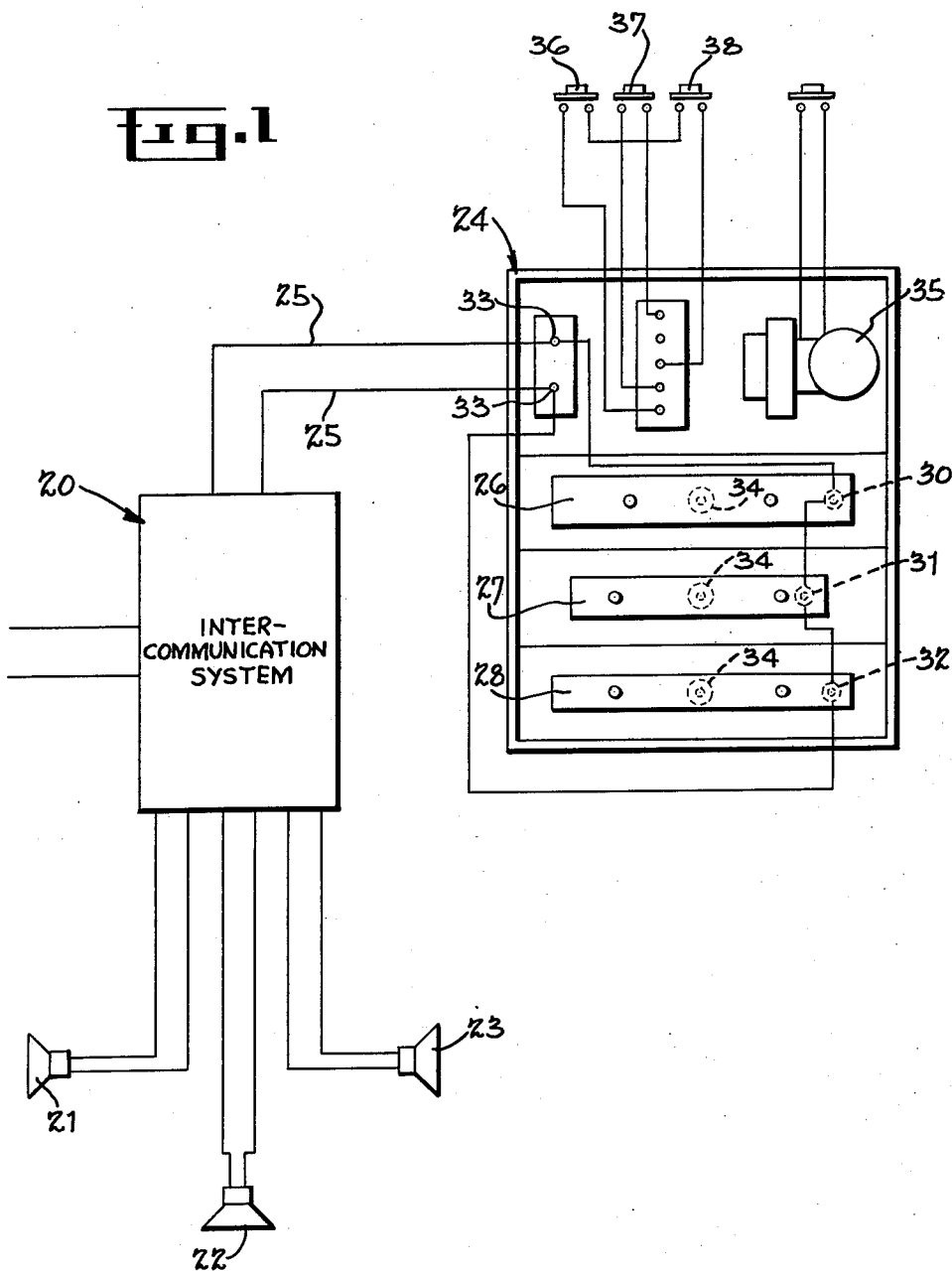
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3,002,187

DOOR CHIME

Filed Aug. 7, 1958

3 Sheets-Sheet 1



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Fig. 2

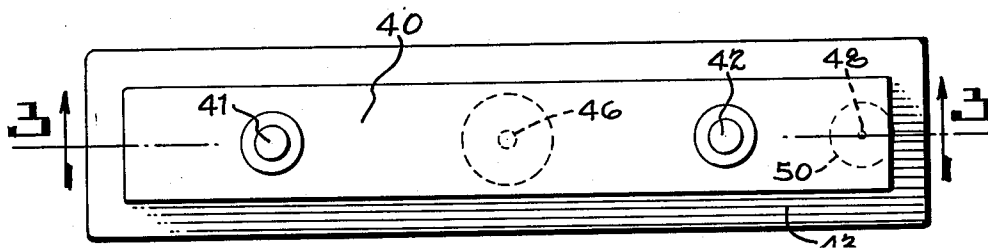


Fig. 3

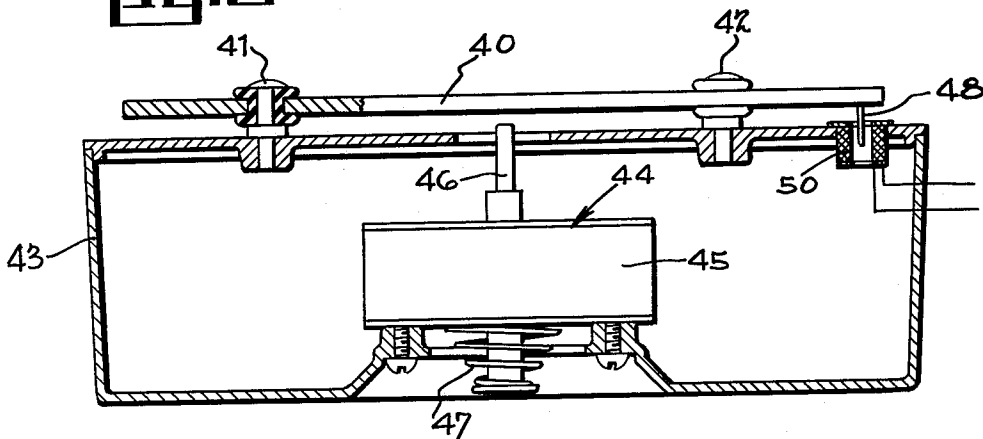
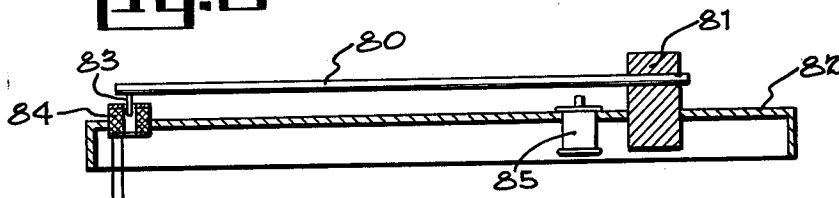


Fig. 4



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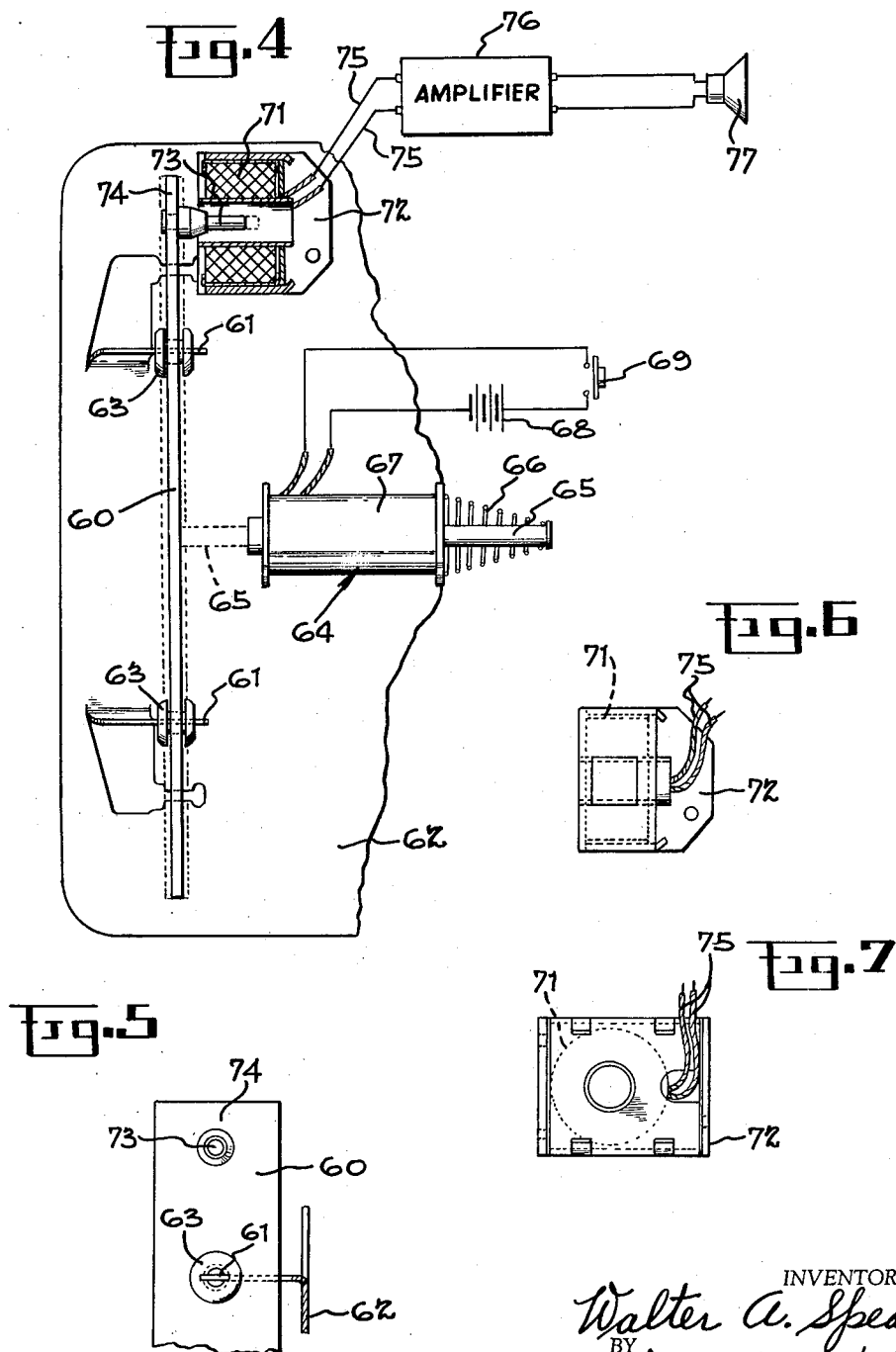
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3,002,187

DOOR CHIME

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1 Claim. (Cl. 340—328)

This invention relates to an electronic chime and more particularly, to a chime which is adapted for use in conjunction with an intercommunication system in residential homes and the like.

Doorbell chimes, until the present invention, have been mechanical devices insofar as the generation of the musical tone is concerned, even though they are generally electrically actuated. Electronic tone generators, on the other hand, have been known for some time but have not been incorporated into a door chime system partly because known electronic tone generators are unsuitable for door chime application.

The assignee of the present invention has developed a chime intercommunication system in which an amplifier and a plurality of speaker-microphones are installed in various locations throughout a home. At the option of the home builder or purchaser, such speakers may be installed in every room in the house. The installation of such an intercommunication system makes feasible for the first time the use of an electronic tone generator as a doorbell chime. It adds something fundamentally new to the door chime art and broad new vistas to the application and installation of doorbell chimes. For example, where the door chime signals are fed into a central intercommunication system, the home owner now can selectively operate his doorbell chimes in different locations of his home and can alter the volume of the chimes. Thus, if he wishes to sleep during the afternoon and does not wish to be disturbed, he may, by the twist of a dial, eliminate his room from the system. Alternatively, when entertaining a large crowd in his basement recreation room, he can turn up the volume on his basement chime. Then, through the use of the same speaker-microphone system, he can converse with the caller at the door.

Under certain circumstances the electronic intercommunication system will not be operating. The design of one embodiment of the present invention is such that the chime will nevertheless operate mechanically so that the door chime signal is always available regardless of the condition of operability of the intercommunication system.

It has been one objective of the invention to provide a door chime which generates an audible tone signal electronically and mechanically. This objective of the invention contemplates mounting a tone bar on a resonant chamber for the mechanical amplification of the tone, and fixing a magnet to a portion of the tone bar, the magnet cooperating with a coil mounted in the resonant chamber. The coil is connected to the amplifier in the home intercommunication system so that the impulses generated by the magnetic flux lines cutting the coil winding will be amplified at the frequency of the vibration of the tone bar to generate the electronic signal. When the electronic system is not operative, the resonant chamber will mechanically amplify the vibrations of the tone bar in a known manner.

It has been another objective of the invention to associate a plurality of signal generators of the type described above in a single installation and to provide a system for selectively operating the tone generators, whereby different tones may be associated with different doors of the residence and whereby a program switch can operate the tone generators in a predetermined sequence to play a tune.

It is another objective of the invention to provide a

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door chime installation in which the tone generators employ one or more coils cooperating with respective magnets, the total impedance of the coils matching the input impedance of the home intercommunication amplifier.

It has been another objective of the invention to provide a musical tone generator which is particularly suitable for installation in combination with known mechanical door chimes and which includes a bar mounted to permit the vibration thereof, a striker for vibrating the bar, a magnet at one end of the bar and projecting transversely therefrom, and a coil which can be embedded in a mechanical resonator, the coil having a central aperture into which the magnet projects.

It has been still another objective of the invention to provide a tone generator which produces a signal which is of unusually rich tonal quality. Electronic tone generators of known design have, because of their physical and mechanical limitations, individually produced a comparatively flat tone caused by the generation of only a fundamental frequency. Hence, a plurality of such generators have been required to produce the harmonics necessary for rich tonal quality. The present invention departs from prior practices by mounting an elongated tone rod at one end thereof and fixing a magnet to the other end thereof, the magnet being associated with a coil into which the magnet projects. A striker is mounted adjacent the base of the elongated rod, and, when it strikes the rod, it vibrates the rod in such a manner as to produce not only the fundamental frequency but also many harmonics which are picked up by the coil and amplified to produce unusual tonal effects.

These and other objectives of the invention will become more readily apparent from the following detailed description of the accompanying drawings in which:

FIG. 1 is a diagrammatic view showing one form of a door chime system in accordance with the invention.

FIG. 2 is a top plan view of a tone bar and resonator in accordance with the invention.

FIG. 3 is a cross sectional view taken along lines 3—3 of FIG. 2.

FIGURE 4 is a side elevational view of an alternative form of the invention.

FIG. 5 is a fragmentary top plan view thereof.

FIG. 6 is a side elevational view of a coil and mounting therefor.

FIG. 7 is a top plan view thereof.

FIG. 8 is a side elevational view of a tone generator. The form of the invention and its contemplated mode of use is diagrammatically illustrated in FIG. 1. It is to be understood that the diagram of FIG. 1 is illustrative only and is not intended to be limiting, for the invention may take many forms without departing from its essential aspects.

The system of FIG. 1 is for use in a house or other comparable structure having a plurality of doors, for example, a front door, a side door, and a rear door, and a plurality of rooms. Preferably, the system of FIG. 1 is installed in association with a home intercommunication system indicated diagrammatically at 20. The system, having an amplifier, is connected to several or all of the rooms of the house by means of a plurality of speakers indicated 21, 22 and 23. The intercommunication system 20 includes an amplifier and switches for selectively connecting the amplifier through one or more of the speakers 21—23.

A door chime generator unit 24 is connected by suitable conductors 25 to the amplifier of the intercommunication system. The chime generator unit includes three tone generators 26, 27 and 28 the details of which are to be described below. The tone generators 26—28 are electrical in nature and produce a signal at coils 30, 31 and 32 respectively, each tone generator having a fre-

quency differing from the frequency of the other tone generators. The coils 30-32 are connected in series, and the series connected coils are connected to the terminals 33 of conductors 25 so that the signals developed in the respective coils are transmitted to the amplifier of the intercommunication system 20. The impedance of the coils is designed to match the input impedance of the amplifier to provide maximum efficiency in signal transmission.

Each tone generator includes an electrically actuated striker 34 of known design. Alternative means are provided for energizing the strikers 34. The first of the energizing means comprises a program switch 35 driven by a synchronous clock type motor. The program switch 35 is of known design and will, when energized, actuate the strikers 34 in a predetermined sequence so that the door chimes play a simple tune. The program switch 35 may be connected to a main door button 36 of the house so that when the door chime button of the main door is depressed, the program switch will run its cycle causing a predetermined sequence of tones to be generated thereby indicating the caller is at the main door.

The remaining doors may have buttons 37 and 38 connected respectively to the tone generators 27 and 28. Thus, the depressing of the button 37 of one door, for example the rear door, will cause a signal to be generated only by the tone generator 27 thereby indicating that the caller is at the rear door. The system as above described has the advantage of selectivity insofar as the quality of the tone for the respective doors concerned, but has the further advantage that the house occupant can, by manipulation of the intercommunication system switches, select the rooms in which the door chime will or will not be heard.

Thus, for example, when a new baby is sleeping during the day in the master bedroom, the master bedroom can be eliminated from the system and then at night can be reinstalled in the system when the baby's parents retire for the night.

A preferred form of tone generator per se is illustrated in FIGURES 2 and 3. In this form of tone generator, a tone bar 40 is mounted by means of studs 41 and 42 to a resonator box 43. The tone bar or reed 40 may be metallic although for the purpose of the electrical signal generator, the only requirement of the reed is that it vibrate when struck by a suitable instrumentality. As best illustrated in FIG. 3, a striker 44 of suitable design is mounted in the resonator box. One type of striker, as illustrated, is in the form of a solenoid having a coil 45, a plunger 46 and a return spring 47. Energization of the coil 45 drives the plunger toward the reed 40. The reed 40, having been struck, will vibrate at a frequency determined by its physical characteristics. Attached to one end of the reed is a magnet 48 (preferably Alnico or other comparable material) which cooperates with a pick-up coil 50 embedded in resonator box. Due to the vibration of the reed 40, the magnet 48 oscillates generally axially with respect to the coil 50 causing the lines of magnetic flux to cut the windings of the coil at the frequency of vibration thereby inducing a voltage in the coil windings whose frequency is that of the vibrating reed. The coil is connected to an amplifier as described above where the coil voltage is amplified and transmitted to selected speakers.

It is preferred to mount a metallic reed on the resonator box even though the resonator box is not required for the electrical tone generation and transmission. The resonator box and associated metallic reed provide mechanical generation and amplification of the chime tone should it be necessary or advisable to de-energize the electrical intercommunication system.

Where mechanical chime generation is not necessary, the invention may take the form illustrated in FIGS. 4

to 7. In that form of the invention a reed or tone bar 60 is mounted on projections 61 struck from a base plate 62. The reed is connected to the projections 61 by means of grommets 63 so that the reed will be as free as possible for vibrating motion. A solenoid operated striker 64 having a plunger 65 mounted by return spring 66 to a solenoid coil 67 serves as a means to cause the reed 60 to vibrate. The solenoid is energized by a power supply indicated at 68 whose circuit to the solenoid is closed by the door chime button 69 mounted in association with a door.

As in the previous embodiment, signal generation is provided by a coil 71 mounted in a bracket 72 fixed to the base plate 62. An Alnico magnet or a magnet of comparable magnetic material 73 is press-fitted or otherwise secured to one end 74 of the reed. Vibration of the magnet 73 creates electrical emphasis in the coil 71 which are transmitted over conductor 75 to an amplifier 76. The amplified signal is transmitted to circuit speakers indicated at 77. While the invention has been described as having speakers distributed in a plurality of rooms, it should be understood that the invention embraces the combination of reeds, coils, amplifiers and speakers in a single casing.

Another application of the invention is illustrated in FIG. 8. In that form of the invention the reed takes the form of a rod 80 fixed at one end to a post 81 mounted on a base 82. An Alnico magnet or other comparable material 83 projects transversely from the other end of the rod 80 into a pick-up coil 84 mounted in the base 82. A suitable striker 85 is mounted on the base 82 for engagement with the rod 80 at a location near the mounting post 81.

It has been found that the combination of the elongated rod type reed with a magnet cooperating with a coil at one end thereof and a striker engaging the reed at the fixed other end thereof causes the generation of unusual and pleasing tonal effects consisting of the fundamental frequency of the vibrating rod as well as a number of harmonics thereof. Variations in the frequency as well as quality of the tone are provided by varying the physical characteristics of the rod 80, particularly including its length, and the relationship of the striker and magnet with respect thereto.

It should be understood that the positions of the magnet and coil may be reversed without departing from the scope of the invention, although for most contemplated uses of the invention such a disposition of the elements would be less practical because of the greater mass of the coil, and the requirement of attaching the coil leads to the vibratory reed.

I claim:

A door chime comprising a base, a reed, means mounting said reed for vibrations on said base, a striker transversely engageable with said reed to vibrate said reed transversely of its length, an elongated permanent magnet mounted substantially normal to said reed, a pick-up coil mounted on said base having a central axis substantially normal to the length of said reed and having a central opening along said axis receiving said elongated magnet, such that transverse vibrations in said reed causes said magnet to vibrate substantially along said central axis of said coil, an electrical signal amplifier connected to said coil, amplifying the current generated by the flux of said magnet cutting said coil during said vibrations, and at least one speaker connected to said amplifier.

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