April 12, 1949. A. R. EASTMAN 2,466,881

ACOUSTIC SWITCH

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Fig. 1

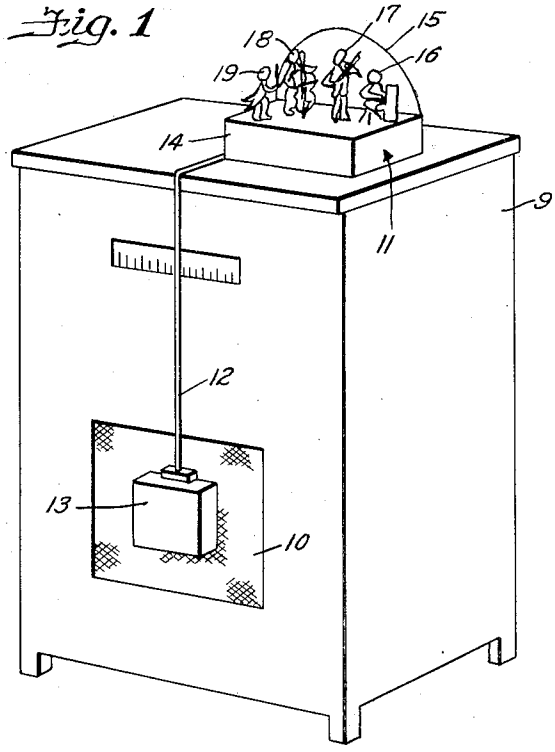


Fig. 4.

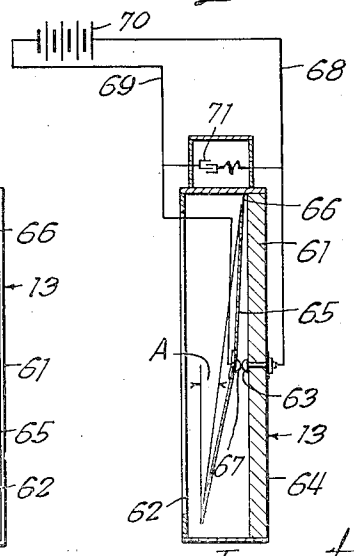


Fig. 3

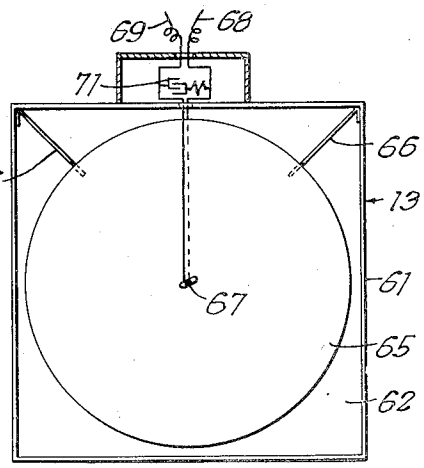
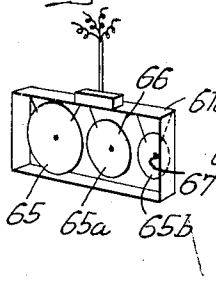


Fig. 2



Inventor
A. Reyner Eastman
Andrew F. Waterman
Atty.

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ACOUSTIC SWITCH

A. Reyner Eastman, Rockford, Ill.

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8 Claims. (Cl. 200—52)

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This invention relates to a new and improved acoustic switch especially designed and adapted for use with an electrically actuated amusement or advertising device.

The principal object of my invention is to provide an improved acoustic switch sensitive enough to respond easily to sound waves picked up by said switch from a radio, phonograph, player piano, orchestra, or individual performer, so that an electro-mechanically animated figure or figures controlled by said switch will be given movements in time with the music.

The acoustic switch made in accordance with my invention comprises a nearly flat paper or parchment cone suspended in a nearly vertical position, so that a contact on the apex portion of the cone has very light but steady pressure on its cooperating contact by gravity, the sound waves being directed against the concave side of the cone tending to flatten it so that the contacts are opened in the recoil action, as the cone after deflection springs back to normal shape causing momentary separation of the contacts. To obtain a greater range of response to different sound frequencies, a plurality of different diameter cones may be used in combination with a series of figures to be actuated, the smallest diameter cone responding to high frequencies only, and the largest diameter cone responding to all frequencies, the contacts for the various cones being connected in circuit to appropriate figures to produce separate actuation of these figures as desired, as, for example, in an orchestral group the piano player and violinist may be made to respond to one frequency and the bass viol player to another, but the conductor should respond to all frequencies.

The invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a perspective view of a radio cabinet on top of which has been placed an amusement or advertising device actuated in response to an acoustic switch made in accordance with my invention and suspended in front of the loud speaker;

Fig. 2 is a perspective view of a set of three acoustic switches having cones of different diameters, and

Figs. 3 and 4 are two views of an acoustic switch on a larger scale.

Similar reference numerals are applied to corresponding parts throughout the views.

Referring to Fig. 1, the cabinet 9 contains a radio or radio-phonograph combination, 10 being the conventional screen or grill in the opening in front of the loud speaker. The amusement

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or advertising device controlled by the acoustic switch of my invention is indicated generally by the reference numeral 11 and, in this case, is shown as placed on top of the cabinet, although of course it may be placed at some distance from the cabinet, assuming the extension cord 12, which interconnects my improved acoustic switch 13 with the device 11, is provided of sufficient length. For example, in a store window where the device 11 may be used for advertising purposes, it may be desired to place the device close to the window and to have the cabinet 9 with the switch 13 somewhere in the background. Also in the use of the acoustic switch of this invention in conjunction with an amusement device in the home, it is frequently desired to place the amusement device on the mantel-piece, or a table, or at any other convenient place for the entertainment of those present, whereas the cabinet 9 with the switch 13 may be at some distance from the device 11 and not necessarily in the same room.

The device 11, as illustrated in Fig. 1, comprises a stage or platform 14, with a suitable back 15, and an orchestral group consisting of a piano player 16, a violin player 17, base viol player 18, and conductor 19 in suitably spaced relation on the platform. However, the invention is by no means limited to this specific application, inasmuch as I may provide a single animated figure in combination with an acoustic switch 13, and, although the figures 16–19 happen to have movable arms, it will be obvious that I may provide figures having movable legs, movable bodies, movable heads, movable eyes, movable ears, movable noses, movable jaws, movable tails, movable trunks, movable horns, et cetera. In fact, the animated figure may be that of some machine or any mechanical contrivance, the movable element of which it is desired to have actuated in response to the energization of an acoustic switch.

Any other device such as a piano, or a sound reproducing device sounded in response to electrical or mechanical impulses furnished in a predetermined manner, as, for example, from a roll like that on a player piano or from a phonograph record, can be used to cause the actuation of the acoustic switch so as to produce movements of the actuated figure or figures, or other animated device employed.

The acoustic switch 13 with which my invention is particularly concerned is illustrated in Figs. 3 and 4 and comprises a generally rectangular frame or housing 61, which has an open front

62 and a stationary electrical contact 63 suitably mounted in a substantially central position in the back wall 64, and, of course, suitably insulated with respect to the frame 61 in the event the frame is made of conducting material. A nearly flat cone 65, made of fairly stiff paper or parchment, is suspended at two laterally spaced points near the top on strings 66 from the top of the housing in an inclined position, as indicated by the angle A in Fig. 4, so that the electrical contact 67, that is affixed to the apex of the cone and is arranged to engage the contact 63, will engage the contact 63 very lightly by gravity when the housing 61 is disposed in a substantially vertical position. The conical shape lends stiffness to the sheet material of the sound sensitive element 65, and the shallowness of the cone, on the other hand, accounts for its sensitiveness of response to sound waves impressed upon it. It is important to note that the concave side of the cone 65 is toward the open front 62 of the housing. When a sound wave strikes the cone, the cone flattens to a certain extent under the impact and in the spring-back to normal the cone bounces away from the contact 63, thereby causing a momentary "breaking" of contacts 63—67. In other words, the movement of the cone is due to the alternate compression and expansion of a sound wave, and to vibrations set up in the thin wall of the cone by the wave. The loose suspension of the cone is essential for sensitivity and accuracy of response. Now, the contacts 63 and 67 have wires 68 and 69 connected thereto, and these wires are connected in an electrical circuit with the coil of a solenoid and a storage battery 70, or any other suitable source of electric current, as, for example, an electric light socket, whereby in the make and break operation of the contacts intermittent current is supplied to the solenoid acting as the motor means for the operation of the movable elements of the mechanical figures 16–19 of the amusement or advertising device. A condenser 71 is connected between the wires 68 and 69 to absorb the sparking incident to the breaking of the contacts 63—67, so that there will be no electrical interference with the smooth performance of the radio set. The wires 68 and 69 may be in a single extension cord 12, like that shown in Fig. 1, thus permitting suspension of the acoustic switch by means of the cord, in the manner illustrated. Obviously, this extension cord may be of any suitable or preferred length, depending upon how far it is desired to place the device 11 away from the switch 13. Devices made in accordance with the present disclosure have been found to operate satisfactorily in close rhythm with the music from a phonograph or radio, giving a most amusing and entertaining performance.

In order to obtain a greater range of response to different sound frequencies, a series of various sized cones, like those indicated at 65, 65*a*, and 65*b* in Fig. 2, may be provided, the smallest 65*b* responding to high frequencies only, and the largest 65 responding to all frequencies. A circuit connecting the contacts 63—67 of each of these cones with appropriate figures, or other devices, will produce separate actuation of these figures in response to the different frequencies. Thus, for example, in an orchestral group, the conductor 19 would be operated by a solenoid energized in response to the movements of the cone 65 which responds to all frequencies, inasmuch as it is desired to have the conductor in continuous operation. On the other hand a certain figure or figures representing a member or members of the orchestra would have their solenoid or solenoids connected with the contacts 63—67 of the cone 65*b*, so as to be given movements in response only to high frequencies, and the rest of the orchestra would have their solenoid or solenoids connected in circuit with the contacts 63—67 of the cone 65*a* to have movements in response to certain other intermediate frequencies. The three cones are shown mounted in a housing or frame 61*a* that is open at the front, similarly as the housing 61, and, of course, the three cones are all suspended on strings 66 with the concave side toward the open front of the housing and in the same inclination from a vertical as the cone 65 in Figs. 3 and 4, so as to operate in the same way as that cone.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. A wave-actuated switch comprising, in combination, a support, a stationary contact thereon, a wave-actuated hollow cone element of resilient sheet material loosely suspended on said support by its one edge portion in an inclined position so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the wave source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact.

2. An acoustic switch comprising, in combination, a support, a stationary contact thereon, a hollow, nearly flat, cone of light weight, resilient sheet material loosely suspended on said support by its one edge portion in an inclined position so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the sound source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact.

3. An acoustic switch comprising, in combination, a support, a stationary contact thereon, a hollow, nearly flat, cone of light weight, resilient sheet material loosely suspended on said support by its one edge portion in an inclined position so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the sound source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact, the cone being of a diameter bearing a predetermined relationship to the frequency of the sounds that it is desired shall cause operation thereof.

4. A wave-actuated switch comprising, in combination, a support, a stationary contact thereon, a wave-actuated hollow cone element of resilient sheet material loosely suspended on said support by its one edge portion in an inclined position so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the wave source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact, said switch being devoid of adjustments but being variable in sensitivity of operation by inclination more or less of said support relative to a vertical.

5. An acoustic switch comprising, in combination, a support, a stationary contact thereon, a

hollow, nearly flat, cone of light weight, resilient sheet material loosely suspended on said support by its one edge portion in an inclined position so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the sound source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact, said switch being devoid of adjustments but being variable in sensitivity of operation by inclination more or less of said support relative to a vertical.

6. In an acoustic switch, a hollow cone of light weight, resilient, sheet material adapted to serve as a sound pick-up, said cone being of shallow depth in relation to diameter, and electrical contact means operable by the apex portion of said cone, said cone being supported so as to be free to move bodily relative to said contact means and being disposed so that it gravitates toward said contact means, said cone having its concave side toward a source of sound, so that the cone is more or less flattened toward said contact means by the impact thereon of sound waves from said source, whereby said cone upon recoil action thereof is adapted to spring away from said contact means to open an electrical circuit.

7. In an acoustic switch, a hollow cone of light weight, resilient, sheet material adapted to serve as a sound pick-up, said cone being of shallow depth in relation to diameter, electrical contact means operable by the apex portion of said cone, and means for suspending said cone by one edge portion so that it normally tends to gravitate to a position holding the contacts closed, said cone being disposed so that it is flattened more or less

by impact therein of sound waves, whereby it serves to open the contacts in the recoil action of the cone.

8. A wave-actuated switch comprising, in combination, a support, a stationary contact thereon, a wave-actuated hollow cone element of resilient sheet material loosely mounted so that its apex portion tends to gravitate toward said stationary contact, the concave side of the cone facing away from said contact toward the wave source, and a movable contact carried on the apex portion of said cone arranged to engage the first contact under gravitation of said cone toward said first contact, said cone being adapted to cause the movable contact to move into and out of engagement with the first contact in response to the resilient recoil action of said cone each time the cone is flattened more or less under impact of a wave on the concave side thereof.

A. REYNER EASTMAN.

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