Aug. 3, 1965 G. FINKENBEINER 3,198,872

TONE GENERATOR

Filed March 14, 1961

Fig.1.

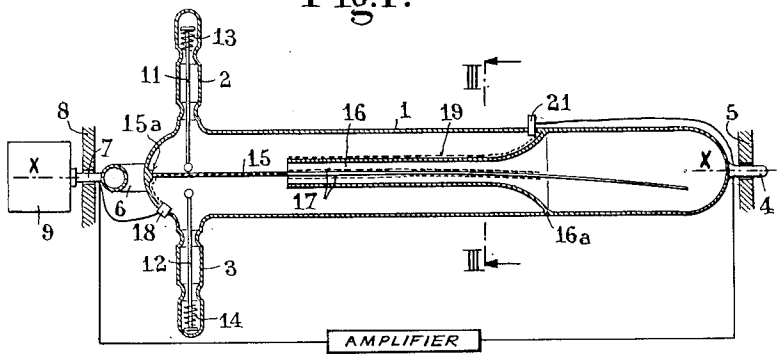


Fig.2.

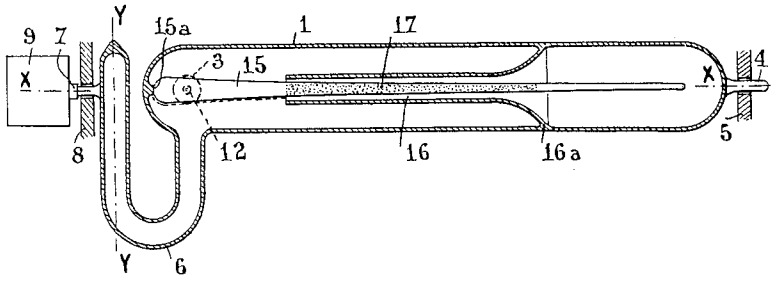
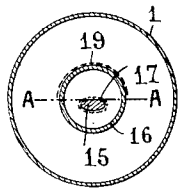


Fig.3.



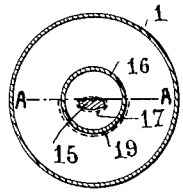
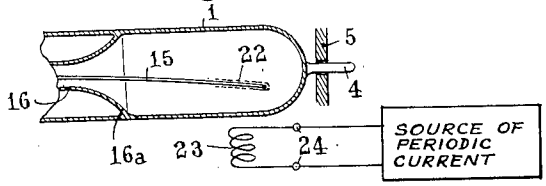


Fig.4.

Fig.5.



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TONE GENERATOR

Gerhard Finkenbeiner, Paris, France
(23 Alaska Ave., Bedford, Mass.)

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1 Claim. (Cl. 84—1.04)

This invention relates to improvements in tone or sound generators.

In a prior French Patent No. 1,184,575, there is described a tone generator utilizing mainly in combination a vibrating glass member struck by hammers, the vibration of the glass member being detected and amplified and subsequently transmitted to diffusers such as loud speakers for producing good-quality tones.

It is the essential object of this invention to provide various improvements in generators of this general type and also to provide means whereby the full peal effect characterizing the tone of conventional bells and other percussion operated instruments can be reproduced by means of the generator proper, without using any other artificial means.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawing in which:

FIGURE 1 is a longitudinal axial section showing a tone generator constructed according to the teachings of this invention, the tubes in which the striking hammers are slidably mounted normally in a vertical position;

FIGURE 2 is another longitudinal axial section but taken at right angles to that of FIG. 1;

FIGURE 3 is a cross section taken on a larger scale along the line III—III of FIG. 1;

FIGURE 4 is a similar cross section taken after rotating the apparatus through 180°; and

FIGURE 5 is a fragmentary longitudinal section illustrating a modified embodiment of the apparatus of this invention.

The sound or tone generator illustrated in FIGS. 1 and 2 of the drawing comprises essentially a cylindrical casing 1 formed at one end with diametrally opposite transverse tubular extensions 2, 3 which may extend either on or obliquely to a common diameter. The opposite end of casing 1 carries an axial trunnion 4 fitted in a bearing 5, and the other end of the casing 1 has a U-shaped tubular extension 6 carrying a trunnion or pin 7 in axial alignment with the casing 1 and trunnion 4, this pin 7 engaging a bearing formed in a support 8 and being rotatably driven from a motor 9.

Striking hammers 11, 12 slidably fitted in the tubular extensions 2, 3 as shown, are normally urged to their inoperative positions by elastic means 13, 14, as will be explained presently.

Disposed centrally of the casing 1 is the vibrating glass member 15 consisting for example of a glass rod, tube, blade or any otherwise shaped element secured on the wall of casing 1 by its end 15*a* constituting the transverse axis about which it vibrates. In the example illustrated the vibrating member 15 consists of a glass blade tapering toward its free end and adapted to be struck preferably in its thickest portion, in this case near its root end. The vibrating member 15 extends through a coaxial sleeve 16 connected at 16*a* to the outer casing 1, this sleeve extending along the whole or part of the vibrating member 15.

The vibrating glass member 15 is covered along its entire surface portion lying within the sleeve 16 by a coating 17 of conducting material, deposited for example according to the known metallizing process. This coating is shown in dotted lines notably in FIGS. 3 and 4. This conducting layer 17 is electrically connected to a lead 18 connected in turn by wire conductor to the pin 7 and bearing 8 to a first suitable input terminal of an amplifier (not shown).

On the other hand the coaxial sleeve 16 is covered by a layer 19 of conducting material on only one-half of its surface which is obtained by dividing this surface along the diametral plane A—A. This plane extends at right angles to the diametral plane containing the axes of the transverse tubular extensions 2 and 3. The conducting layer 19 is connected to a lead 21 electrically connected through the trunnion 4 and bearing 5 to another input terminal of the amplifier. These layers 17 and 19 constitute respectively the movable and fixed plates or disks or an adjustable condenser for detecting the vibrations.

In FIGS. 1 and 3 of the drawing it will be seen that when the casing 1 is in the position illustrated the vibrating member 15, which is somewhat curved downwards by gravity with respect to the axis of symmetry X—X, is in its remotest position with respect to the conducting layer 19 constituting the fixed plate of the variable measuring condenser. On the other hand, when the casing is rotated through 180° by the motor 9 to the position illustrated in FIG. 4, the vibrating member 15 and therefore the conducting layer 17 constituting the movable plate of the variable measuring condenser are in their nearest position in relation to the conducting layer 19 constituting the fixed plate.

Thus, by rotating the casing 1 at the rate of the to-and-fro movement of a given bronze bell, it is possible to superimpose a relative displacement of the mean position of this member 15 with respect to the fixed plate 19 of the variable measuring condenser to the inherent vibrating movement of the member 15 which results from the strokes applied to this member by the hammers 11 and 12. The change in nearness and in the angle of the movable plate 17 of the vibrating condenser in relation to the fixed plate 19, together with the inner stress, produce a complementary electrical effect adapted to be amplified. This complementary electrical effect, when diffused through adequate sound means, produces a full peal effect comparing with that of a conventional bell.

The mounting of the two striking hammers 11, 12 in the tubular extensions 2, 3 having their axes contained in a diametral plane perpendicular to the diametral plane A—A limiting the conducting layer 19 provides two different strokes, hits or blows from the point of view of acoustics. As a matter of fact, one kind of hammer stroke is obtained when the vibrating member 15 is in its remotest position with respect to the fixed plate 19 of the condenser, that is, when the capacity of this condenser has its lowest value (FIG. 3), and the other when this vibrating member 15 is nearest to the fixed plate 19, that is, when the highest condenser capacity is attained (FIG. 4). The striking hammers 11, 12 fall by gravity as they attain their upper position. They are urged to their inoperative position by the springs 13, 14 after the vibrating member 15 has been struck, in order to allow this member to vibrate freely.

In the modified embodiment illustrated in FIG. 5 the movable end of the vibrating member 15 is coated with a very fine layer 22 of a magnetic material. Registering with this metal layer 22 is a winding 23 connected across the terminals 24 of a suitable source of current. Thus, by energizing this winding 23 with a periodic current it is possible to generate a magnetic field having the same periodic characteristic which creates a corresponding dis-

placement of the free end 22 of the vibrating member 15, with the same effect as in the preceding case, the casing 1 remaining stationary. This solution is particularly advantageous when the striking hammers 11, 12 themselves are actuated by electromagnets.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claim.

What I claim is:

Tone generator for producing different percussion actuated instrument sounds such as bell sounds, piano sounds, etc., comprising a vibrating glass member mounted by an end and having a free end, means for striking this member and vibrating same, detector means for detecting the vibration thus produced and converting same into electrical signals, amplifier means for amplifying these signals and transforming them into sounds, and means for altering the mean position of said vibrating member relative to said vibration detecting means so as to superimpose an oscillating displacement of the vibrating member to the struck vibration of the vibrating member, thereby modulating said signals and sounds to include the full peal effect characteristic of percussion actuated instruments.

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ARTHUR GAUSS, *Primary Examiner.*

CARL W. ROBINSON, *Examiner.*