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2,269,576

CHIME

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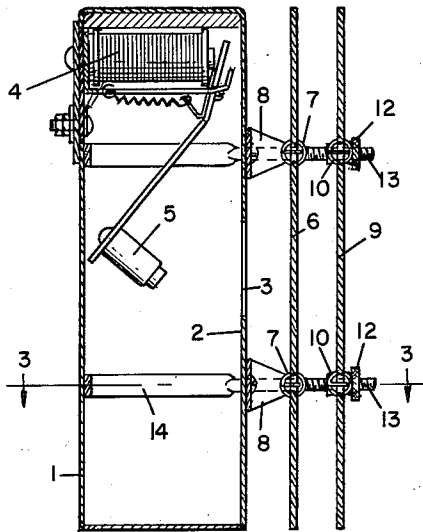


FIG. 1.

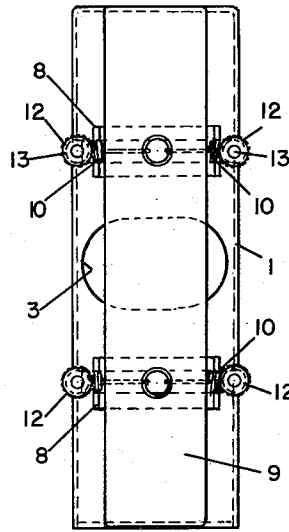


FIG. 2.

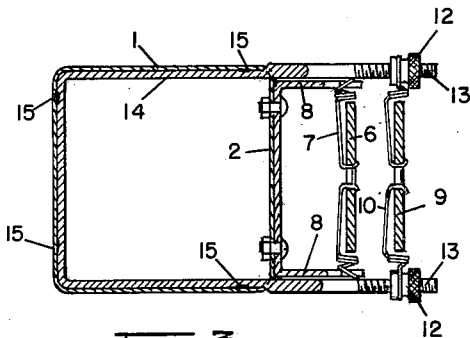


FIG. 3.

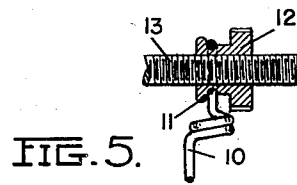


FIG. 5.

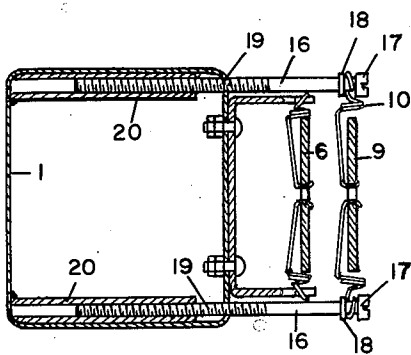


FIG. 4.

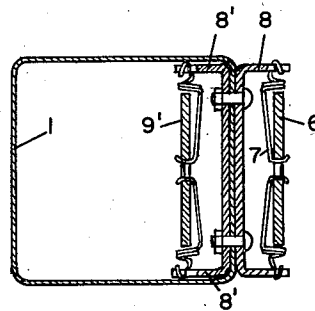


FIG. 6.

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CHIME

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Application November 22, 1939, Serial No. 305,667

5 Claims. (Cl. 177-7)

The present invention relates to a new and improved chime which is adapted for use in household or similar signalling systems, or for incorporation into musical instruments.

The general object and nature of my invention is to provide a chime wherein the tone or musical chime note emanating therefrom has a much more intense or stronger sound of tremolo characteristics and with greater carrying power. At the same time, the tone or sound is pleasing and not harsh, so that it is readily audible at substantial distances removed from the chime signal itself. I achieve this object, not by increasing the size of the signal or the force by which the vibratory element, chime bar or metallic reed is struck and caused to vibrate, but rather by the utilization of the principle of sympathetic sound vibration in combination with the phenomenon of beats. Thus, in the chime signal constructed according to the principle of my invention, I provide a plurality of reeds or chime bars, suitably two in number, which, although possessing almost the same frequency of sound vibration, are, nevertheless, slightly different, or out of tune. The chime bars are so mounted with respect to a resonance chamber that the body of air enclosed thereby is adapted to vibrate in unison, the result being that the chime bar or reed which is not initially struck or set in vibration, is caused to vibrate sympathetically but at slightly different frequency and thereby produce a resultant musical tone or chime signal of substantially augmented intensity and timbre, having a tremolo or beat effect, and which, as compared to the sound emitted by either one of the chime bars alone, is of such audibility, fullness, and duration as to command attention from the human ear, even at distances substantially remote from the sound source.

My invention also provides means for adjustably regulating the spaced distance between the chime bars and thereby regulating the purity, audibility and frequency of the beats of the sound produced by the chime.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the elements hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in structure embodying the invention, such disclosed elements constituting, however, but one of various structural forms in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is a sectional view of a device embodying

the principle of my invention; Fig. 2 is a top plan view of the device shown in Fig. 1; Fig. 3 is a transverse sectional view taken substantially along line 3-3 of Fig. 1; Fig. 4 is a sectional view similar to Fig. 3 but showing a modified form of construction; Fig. 5 is an enlarged, detailed sectional view of the chime bar supporting, spring-adjusting nut; and Fig. 6 is a transverse sectional view of another modified form of construction.

Now referring more particularly to the drawing, there is shown therein a resonance chamber 1, which is closed on all sides except the side 2 in which the opening 3 is located. A striking device, comprising essentially an electro-magnet 4 and a striking hammer 5, is mounted within the chamber 1 in such a manner that the hammer 5 is adapted to be expelled through the opening 3 to strike the metallic chime bar or reed 6.

The details of the foregoing construction are set forth at greater length in prior U. S. Patent No. 2,097,823, issued November 2, 1937, to William C. Roe.

The chime bar 6 is supported by means of spring-supporting arms 7 and brackets 8, as also explained in detail in the aforesaid patent.

A second chime bar or reed 9 is supported a spaced distance away from and parallel to the chime bar 6. Both the chime bars 6 and 9 are not of identical sound vibration frequency, but slightly out of tune. The supporting springs 10 for the chime bar 9 engage a groove 11 on the knurled adjusting nuts 12. The nuts 12 threadably engage the threaded ends 13 of the U-shaped supporting bracket 14, which extends into the interior of the chamber 1 and may be suitably affixed thereto, such as by the spot welds 15.

In operation, as the hammer 5 strikes the chime bar 6, the latter is caused to vibrate, giving off sound waves which are reinforced by the body of air enclosed in the resonance chamber 1, such body of air being of such proportions as to vibrate in unison with the chime bar 6. The sound waves thus produced impinge against the sympathetic chime bar 9, whereby the latter is also caused to vibrate and at a slightly different frequency, thus producing the sound or amplified tone hereinabove described. By adjusting the nuts 12, the distance of the chime bar 9 from the chime bar 6 may be varied, thus changing the tempo of the beats and the intensity, amplitude and tone quality of the resultant sound produced by the chime.

I have discovered that the distance between the chime bars 6 and 9 is a critical one with respect to producing the maximum amplitude and duration of sound and of the beat effect. Thus, for example, where the chime bar 6 is tuned to "A" in the musical scale, or 440 vibrations per second, and the chime bar 9 is slightly out of tune therewith, or of $439\frac{1}{2}$ vibrations per second, the optimum distance between them should be one-half inch to produce the resultant sound of maximum amplitude, intensity, duration and beat effect.

In Fig. 4, a modified form of construction is shown for mounting the outermost, or sympathetically vibrating chime bar 9. In this form of construction, the supporting springs 10 engage the adjusting screws 16 between the slotted heads 17 and the collars 18. The threaded shanks 19 of the adjusting screws 16 engage within the internally threaded tubes 20 mounted within the resonance chamber 1.

In the alternative form of construction shown in Figure 6, the chime bar 6 is mounted externally of the resonance chamber 1 by means of the brackets 8, as hereinabove described. The sympathetic chime bar 9', however, is mounted internally of the resonance chamber 1 by means of the bracket 8'. The operation of the construction, as shown in Fig. 6 is, of course, analogous to that of the previously described construction, suitable actuating means (not shown) being provided for starting operation of the reeds by imparting vibratory movement to one of the reeds.

The above described constructions can, of course, be incorporated into a musical instrument by providing a plural number or series of units, each embodying the principle of the invention. In such a musical instrument adaptation as a xylophone or vibraphone, for example, the chime bars or vibratory elements of each unit are of such sound frequency groups as to correspond to the scale and number of musical notes desired. Such a musical instrument adaptation of the invention, would, of course, be operated or played by a manual striking means, such as a striking hammer, rather than the mechanical or electro-magnetic means shown in the accompanying drawing.

I am unable to ascribe any scientific theory or reason for the operation of my invention. According to previously accepted principles of the physics of sound, there is no accountability for the presently achieved result, wherein variation in the frequency of beats or tempo of the tremolo effect should be changed by adjustment in the spaced positions of the chime bars.

In order to preserve the characteristics of the sound produced by the device of my invention, and slightly out of tune characteristics of the sympathetic chime bars, or difference in their frequencies, should be maintained within the limit of 1.005 to 1.

Other forms may be employed embodying the features of my invention instead of the one here

explained, change being made in the form or construction, provided the elements stated by any of the following claims or the equivalent of such stated elements be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. A device of the character described, comprising a plurality of chime bars having slightly different sound frequency vibrations, a resonance chamber enclosing a volume of air adapted to vibrate in unison with said chime bars and means for adjustably regulating the spaced distance between said chime bars, to change the beat frequency.

2. A device of the character described, comprising a plurality of chime bars having slightly different sound frequency vibrations, a resonance chamber enclosing a volume of air adapted to vibrate in unison with one of said chime bars, means for causing vibration of one of said chime bars, said other of said vibratory elements being adapted to be placed in sympathetic, audible vibration by impingement of sound waves emanating from the first of said chime bars and from said resonance chamber, and means for adjustably regulating the spaced distance between said chime bars, to change the beat frequency.

3. In a device of the character described, the combination of a pair of chime bars having slightly different sound frequency vibrations, a resonance chamber enclosing a volume of air adapted to vibrate in unison with one of said chime bars, means for supporting said chime bars in spaced relationship with each other and with respect to said resonance chamber, electromagnetic means for causing vibration of one of said chime bars and means for adjustably regulating the space distance between said chime bars, to change the beat frequency.

4. In a device of the character described, the combination of a pair of chime bars having slightly different sound frequency vibrations, a resonance chamber enclosing a volume of air adapted to vibrate in unison with one of said chime bars, means for supporting one of said chime bars within said resonance chamber, means for supporting the other of said chime bars in a position parallel to and on the exterior of said resonance chamber, and means for adjustably regulating the spaced distance between said chime bars to change the beat frequency.

5. In a device of the character described, the combination of a pair of chime bars having different sound frequency vibrations, the ratio of the frequencies of one to the other being not greater than 1.005 to 1, a resonance chamber enclosing a volume of air adapted to vibrate in unison with one of said chime bars, means for supporting said chime bars adjacent said chamber, and means for adjustably regulating the spaced distance between said chime bars, to change the beat frequency.

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