

Feb. 28, 1950

P. H. ROWE

2,499,113

SUSPENSION FOR MUSICAL RESONANT BARS

Filed July 8, 1948

2 Sheets-Sheet 1

Fig. 1.

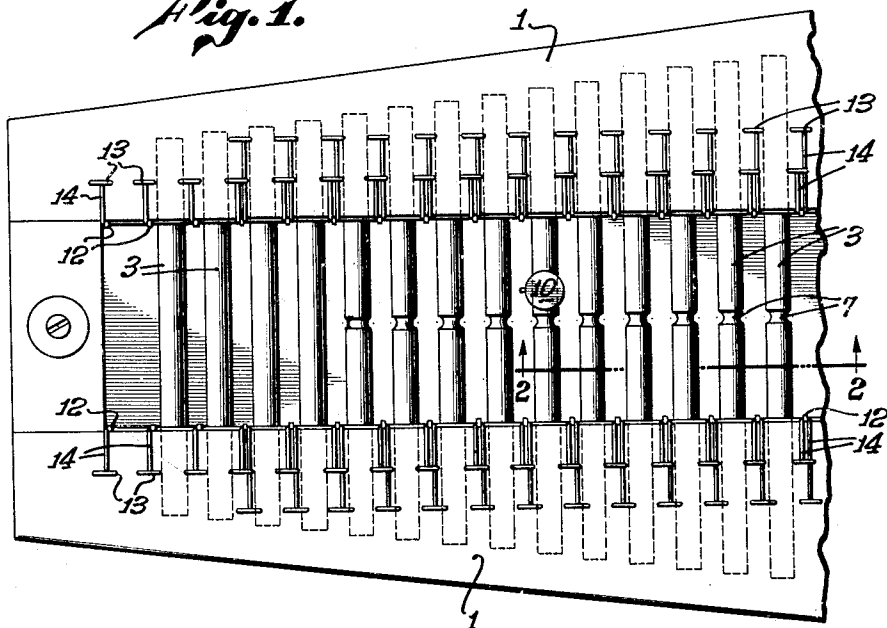
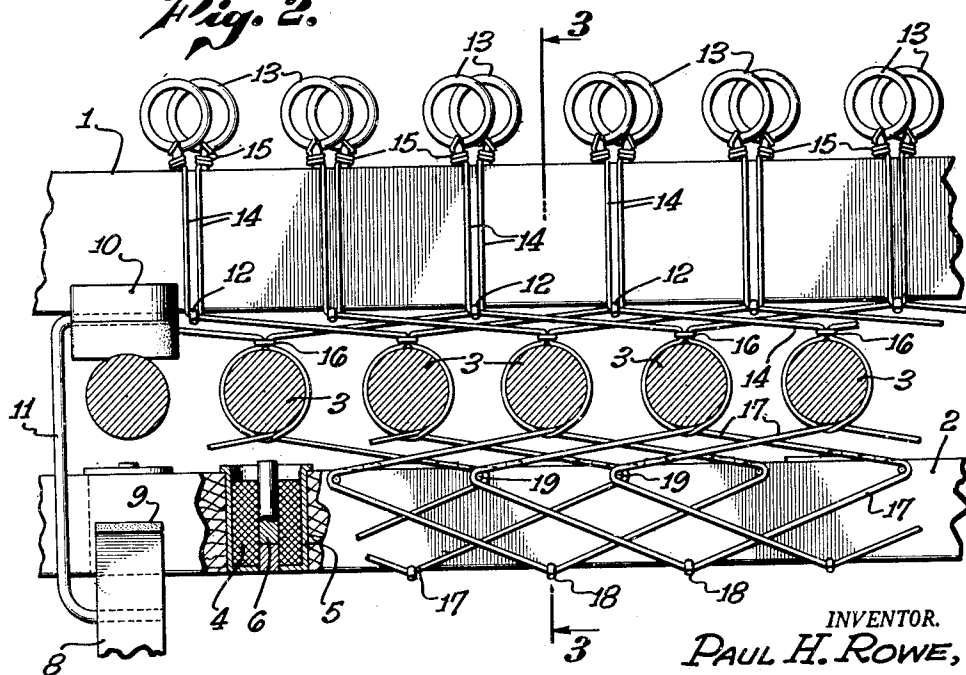


Fig. 2.



INVENTOR.
PAUL H. ROWE,
BY
John Flann
ATTORNEY.

Feb. 28, 1950

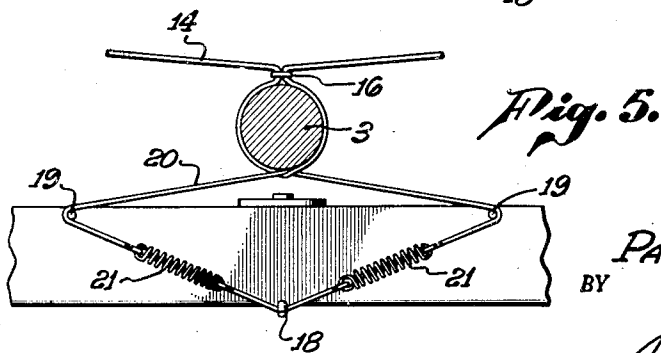
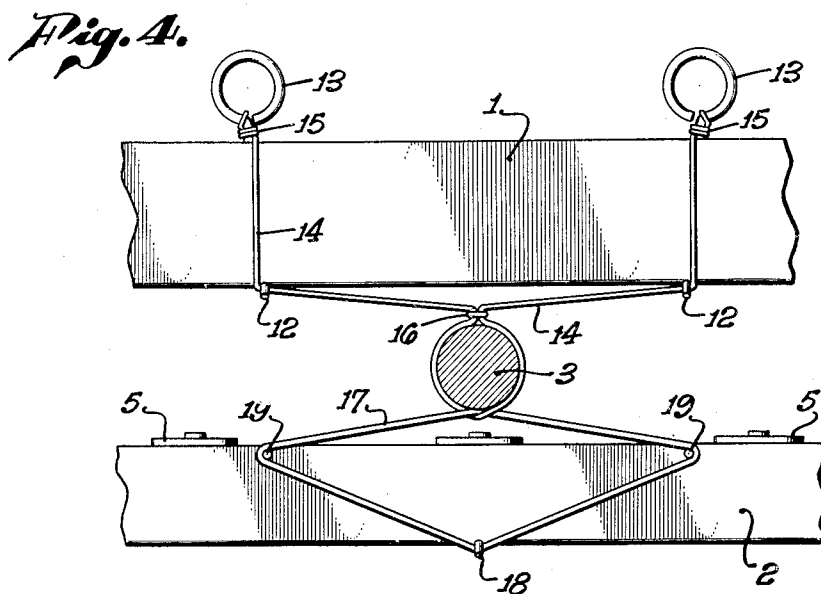
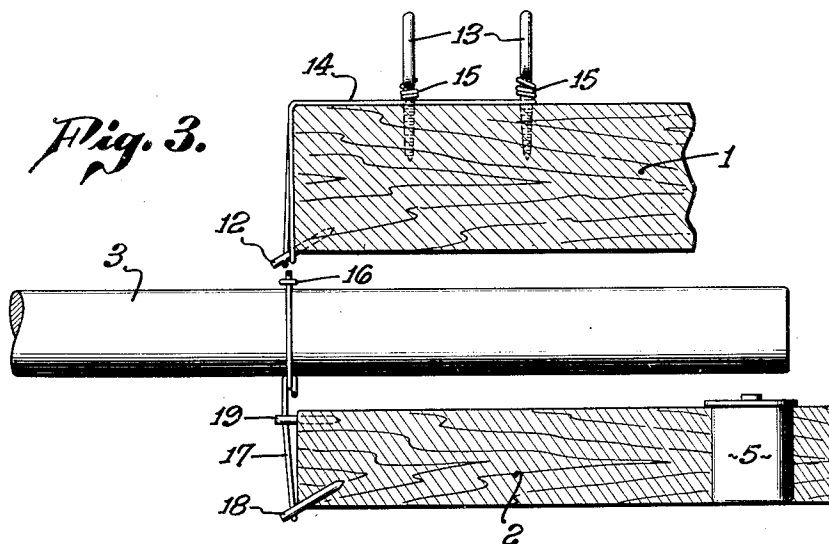
P. H. ROWE

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2 Sheets-Sheet 2



INVENTOR.
PAUL H. ROWE,
BY
John Ham
ATTORNEY.

UNITED STATES PATENT OFFICE

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SUSPENSION FOR MUSICAL RESONANT BARS

Paul Henry Rowe, Los Angeles, Calif., assignor
to Maas-Rowe Electromusic Corporation, Los
Angeles, Calif., a corporation of California

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6 Claims. (Cl. 84-403)

1

This invention relates to musical instruments of the percussion type in which rigid bars are struck to produce characteristic musical tones. The strikers are often electromagnetically operated. More particularly, the invention relates to the suspension of these bars.

This application is a continuation in part of application, Serial No. 744,875, filed April 30, 1947 in the name of Paul Henry Rowe, and entitled: Resonant bar suspension apparatus.

An object of this invention is the provision of string supports for resonant bars, and which permit the bars to vibrate freely with resulting clear and vibrant tones.

Still another object of this invention is to provide a supporting structure for a resonant bar that efficiently supports the bar and yet permits free vibration thereof.

In order to transmit the sound waves produced by the vibrations, the vibrations of each bar are caused to affect an electric circuit in which a pick-up coil is included. This coil includes a magnetic core, and the bar is suspended over the core so that the vibrations cause corresponding variations in the magnetic flux through the coil. The resultant current fluctuations in the coil can be used to affect amplifiers and a loud speaker.

It is, accordingly, another object of this invention to provide a suspension that can readily be adjusted for positioning the bar as desired with relation to the coil. Furthermore, by appropriate adjustment of the suspension, the distance of the bar from the core can be adjusted to obtain the desired amplitude of the amplified sound. Since a pick-up circuit is associated with each bar, it is thus possible independently to adjust the intensity of the sound caused by each vibrating bar.

It is still another object of this invention to provide a suspension that resiliently maintains the bars in a desired adjusted position with respect to the pick-up coil.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of several embodiments of the invention. For this purpose, there are shown a few forms in the drawings accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

2

Figure 1 is a fragmentary plan view of an instrument incorporating the invention, all of the strikers except one being omitted, as well as other parts; for the sake of clearness;

Fig. 2 is an enlarged sectional view, taken on the plane 2-2 of Fig. 1;

Fig. 3 is an enlarged sectional view, taken along plane 3-3 of Fig. 2;

Fig. 4 is a fragmentary enlarged view, similar to Fig. 2, showing the string suspension system for one string only; and

Fig. 5 is a view similar to Fig. 4, of a modified form of the invention.

In the drawings, supporting frame is provided, which may be made of wood, and having the horizontal upper and lower supports 1 and 2. Support 1 has two horizontally spaced supporting members. Suspended transversely below support 1 are the spaced resonant bars 3 of conventional design. These bars are made from magnetic material. Near the end of each bar 3, as shown most clearly in Figs. 2, 3, and 4, there is a pick-up coil 4 that has a thin metal shell 5 supported in an appropriate recess in frame member 2. This coil has a core 6 which may be a permanent magnet; or, a part of core 6 may be a permanent magnet, and another part soft iron. The top of the core is spaced slightly below the corresponding bar to pick up the vibrations therefrom, so as to vary the flux through the coil 4 in accordance with the bar vibrations.

These bars 3 are shown as of graduated lengths to correspond to the desired tones to be produced by striking them. Furthermore, to provide the desired tonal qualities, some of them may have reduced intermediate portions 7 (Fig. 1). A hammer or striker 8 (Fig. 2), having the felt cap 9 thereon and overhead damper 10 connected thereto by a looped wire 11, is interposed between the spaced resonant bars in the complete musical instrument. Only one striker is shown for the sake of clarity, but it is to be understood that similar strikers are provided for each bar 3, all being appropriately supported beneath member 2 and electromagnetically operated.

Now, directing the description specifically to the string suspension of resonant bars, a series of string guides 12 (Figs. 2, 3, and 4) are secured to each member of the support 1 adjacent its lower edge, said string guides being interposed between the spaced resonant bars 3. These guides are in the form of pins slanted downwardly toward the space between the two longitudinal frame members of support 1.

Manually operated string anchoring and tight-

ener members 13 provide the attachment and adjustment means for the long string sustaining the bar. These anchors may be in the form of eyes screwed into the top of support 1, immediately above guides 12. As shown most clearly in Figs. 1 and 3, there is a double row of these anchors on each of the frame members to provide sufficient spacing between the anchors. Although these screw eyes are all shown with their eye loops parallel to each other, this is only for the sake of simplifying the drawing. In actual use, the angular positions of the eyes are haphazard.

Inasmuch as each string suspension means for an individual resonant bar is the same, it is believed necessary merely to describe a single resonant bar support, as shown most clearly in Fig. 4.

A long string 14 is secured, as by a knot 15, to one of its anchors 13. This string is preferably made from fibreglass cord, covered with nylon, and resists stretching. The string 14 passes downwardly along a vertical face of support 1 (see Fig. 3), and thence underneath guide 12 and above one resonant bar 3 (Fig. 2), thence around a resonant bar 3 at a nodal point thereon. The looped string may be held in looped form by a string loop 16. The string 14 is then passed above another adjacent bar 3, underneath another guide 12, and finally attached as by a knot 15, to another anchor 13. As shown most clearly in Fig. 2, each string 14 passes above the bars 3 that are adjacent the suspended bar, so that the length of the suspension between guides 12 is about three times the center-to-center spacing of the bars.

In order to provide a further restraint on the bar, there is provided a resilient string 17. This string loops over the guide 13, similar to guides 12, and located at the lower edge of support 2. Pin guides 19, spaced apart adjacent the upper edge of support 2, serve to provide a looped form for string 17. The upper loop passes beneath the loop of string 14 where string 14 embraces rod 3. The string 17 is preferably made of twisted nylon cord, that is highly resilient. However, a non-resilient string 20 may be used (Fig. 5), in conjunction with light tension springs 21 located somewhere in the loop cord.

The outer ends of the suspending string 14, previously described as attached to anchors 13, may be readily adjusted by manual means, either to tighten the string or to loosen same. In other words, a wide degree of adjustment relative to the core 6 of the pick-up coil 4 may be given to the resonant bar 3 by merely adjusting the lengths of the strings at these anchors 13 as conditions may require. This adjustment is effected by turning the eye 13 so as to wind or unwind the string on the shank of the eye.

As shown most clearly in Figs. 2 and 4, the series of strings 14 for the bars overlap and cross above the bars 3. Each bar is provided with similar string suspensions adjacent each end of the bar to form a double suspension.

Each of the guides 12 serves effectively for two strings 14, one passing toward the right thereof, and the other to the left, as indicated in Fig. 2. Similarly, guides 19 serve for two of the strings 17.

The resonant bar is afforded not only a considerable degree of vertical adjustment with respect to core 6, but the bar may be moved horizontally in either direction by the proper adjustment of the long string, so as to bring the bar into the desired relation to its respective core. The resilient anchor formed by string 17, or

string 20 and spring 21 maintains the bar 3 in proper position. The strings 14 are kept stretched by this means, so that the bars are kept effectively in the desired relation to the pick-up coils.

Although in the forms illustrated, a tie 16 is shown for maintaining the loop in the cord 14, this may be obviated by simply making a turn around the bar with the cord 14.

I claim:

1. In an apparatus of the class described: a series of closely spaced resonant bars; substantially horizontal suspension cords for each bar, extending at right angles to the axis of the bar and tangentially to the upper surface thereof; and means for anchoring these suspension cords on each side at a point horizontally spaced beyond the adjacent bar, thereby providing a free suspension string having a total free length of substantially three times the center-to-center spacing of the tone bars; said anchor points for the suspension string being located in a plane somewhat above the top surface of the tone bar so as to provide clearance between the supporting string of any bar and the adjacent tone bar; another cord attached to the bar near the bottom surface of the bar and supported in a similar manner to the first mentioned cords, but with the anchor points placed below the bar so as to provide necessary clearance with adjacent bars, said lower cord providing a downward tension on the bar.

2. In an apparatus of the class described: a supporting frame; a horizontal tone bar; main supporting cords for transversely supporting said bar, engaging the bar and fixed at points on the supporting frame; and auxiliary supporting cords, constructed at least partly of resilient material, said auxiliary cords being located on the opposite side of the bar from the main supporting cords, and exerting a pull on the bar against the main supporting cords; means for adjusting the spacing of the tone bar relative to the supporting frame; said means consisting of a device for varying the free lengths of the main supporting cords between their fixed supports and the tone bar.

3. In a suspension system for musical resonant bars: a frame having a pair of vertically spaced supports; a horizontal tone bar adapted to be supported between said supports; and means for transversely and adjustably supporting said bar with respect to said supports for mounting said bar at a particular spacing between the said supports, comprising: a suspending cord, a pair of string guides on the upper of said supports, a pair of anchor pins on said support, the suspending cord extending between the guides and guided thereby and being secured to said bar at a point intermediate said guides, the guides being located at points laterally displaced from said bar, the suspending cord being anchored to said anchor pins, the anchor pins being adjustable to vary the length of said suspending cord between the guides and thereby varying the spacing of said bar from said supports; and resilient means cooperating with the bar and mounted on the lower support and tensioning said main supporting cord.

4. In a suspension system for musical resonant bars: a frame having a pair of vertically spaced supports; a horizontal tone bar adapted to be supported between said supports; and means for transversely and adjustably supporting said bar with respect to said supports for mounting said bar at a particular spacing between the said supports, comprising: a suspending cord, a pair of

5

string guides on the upper of said supports, a pair of anchor pins on said support, the suspending cord extending between the guides and guided thereby and being secured to said bar at a point intermediate said guides, the guides being located at points laterally displaced from said bar, the suspending cord being anchored to said anchor pins, the anchor pins being adjustable to vary the length of said suspending cord between the guides and thereby varying the spacing of said bar from said supports; and means cooperating with the bar and tensioning said suspending cord, including an auxiliary resilient cord means cooperating with said bar, string guides laterally displaced from said bar and located on the lower support, said auxiliary cord means being guided thereby, and means insuring cooperation of said auxiliary cord with said guides.

5. In a suspension system for musical resonant bars: a frame having a pair of vertically spaced supports; a horizontal tone bar adapted to be supported between said supports; and means for transversely and adjustably supporting said bar with respect to said supports for mounting said bar at a particular spacing between the said supports, comprising: a suspending cord, a pair of string guides on the upper of said supports, a pair of anchor pins on said support, the suspending cord extending between the guides and guided thereby and being secured to said bar at a point intermediate said guides, the guides being located at points laterally displaced from said bar, the suspending cord being anchored to said anchor pins, the anchor pins being adjustable to vary the length of said suspending cord between the guides and thereby varying the spacing of said bar from said supports; and means cooperating with the bar and tensioning said suspending cord, including an auxiliary resilient cord means

6

cooperating with said bar, comprising a non-resilient cord and a tension spring, string guides laterally displaced from said bar and located on the lower support, said auxiliary cord means being guided thereby, and means insuring cooperation of said auxiliary cord with said guides.

6. In an apparatus of the class described: a supporting frame; a horizontal tone bar; main suspending cords for transversely supporting said bar and engaging the bar, said cords being fixed at points on the supporting frame; guides for the cord on the frame guiding the main supporting cord to extend substantially tangentially and transversely of said bar from the point of engagement therewith; and auxiliary supporting cords, constructed at least partly of resilient material, said auxiliary cords being located on the opposite side of the bar from the main supporting cords, and exerting a pull on the bar against the main suspending cords; and means for adjusting the spacing of the tone bar relative to the supporting frame; said means consisting of a device for varying the free lengths of the main supporting cords between their fixed supports and the tone bar.

PAUL HENRY ROWE.

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