Sept. 2, 1941. G. W. DEMUTH 2,254,840

ELECTRIC MUSICAL INSTRUMENT

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Fig. 1.

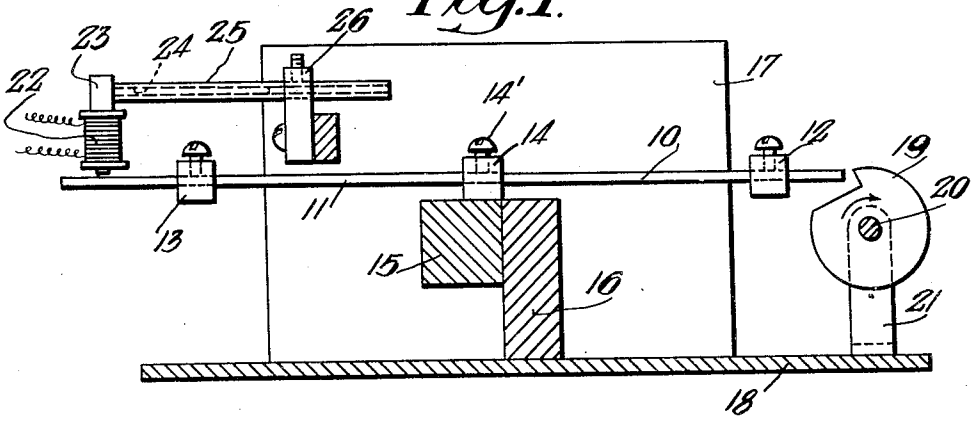
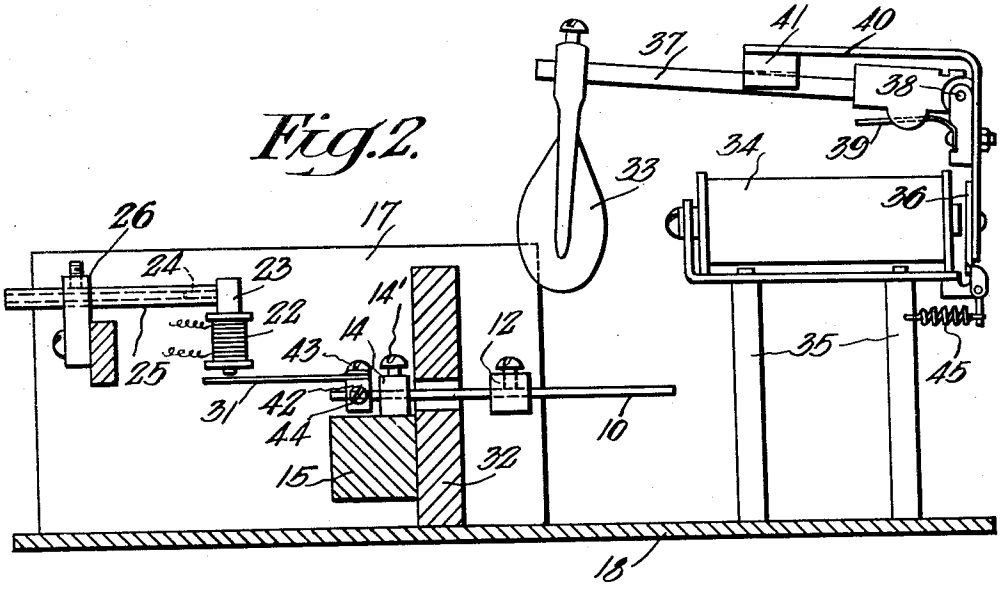


Fig. 2.



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ELECTRIC MUSICAL INSTRUMENT

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6 Claims. (Cl. 84—1.15)

This invention relates to an electric musical instrument and more particularly to an instrument of the general type of a vibraharp or chime in which a vibrating bar is used as a source of the tone.

In the present apparatus, a novel form of vibrating element is used and a novel method of striking or sounding the vibrating element is provided.

In prior art apparatus of the type described, vibrating members have been provided from which the vibrations could be picked up electrically and the vibrations were produced either mechanically or electrically. The form of pickups used were either electromagnetic or electrostatic. The sounding of the vibrating member was accomplished by striking it with a hammer or plucking it with an appropriate pick or, in some instances, by means of an electric driver which caused regenerative oscillations. In the latter form of the device, the tone builds up gradually and no sharp attack can be secured. In the striking or plucking forms of sounding mechanism, the sharp attack can be secured, but, when used in conjunction with an electrical pickup and an amplifier, the note sounded at the time of striking is usually quite harsh and contains many dissonant harmonics.

In the present apparatus, I provide two mechanically coupled vibrating members, one of which is struck or plucked and the other of which is adapted to operate the electrical pickup. The mechanical coupling between the elements is so constructed, preferably by providing considerable rigidity and mass, that the sharp strike note and the dissonant harmonics are not transmitted to the element which provides the pickup and these objectionable notes are therefore not heard through the amplifier and loudspeaker.

One object of the invention is to provide an improved form of vibrating element for a musical instrument.

Another object of the invention is to provide an improved method of actuating the vibrating element in an instrument of the class described.

Another object of the invention is to provide a double vibrating element the segments of which may be tuned to different closely adjacent frequencies so that beats may be secured.

Another object of the invention is to provide an improved striking mechanism for electrically striking the vibratable member with a predetermined force.

Other and incidental objects of the invention will be apparent to those skilled in the art upon a reading of the specification and an inspection of the accompanying drawing in which

Figure 1 is a side view partly in section of one form of the invention with a mechanical plucking mechanism; and

Figure 2 is a similar view of a second form of the invention with an electrical striking mechanism.

Referring first to the form of the invention shown in Fig. 1:

The vibrating member is composed of two segments of a bar 10 and 11, which are respectively tuned by the adjustable weights 12 and 13 adapted to be secured in appropriate locations on the bars by the screws in the weights. The bar, composed of segments 10 and 11, is secured in the block 14 by the screw 14' or, if desired, the bar may be soldered into the block 14 after being located in the proper position. The block 14 is in turn secured to the relatively heavy members 15 and 16 which are rigidly secured to the side plates 17 and the base 18.

When the member 10 is vibrated transversely, a sufficient quantity of the vibration is transmitted through the block 14 to the segment 11 to cause the segment 11 to vibrate. If the members 10 and 11 are exactly in tune with each other, the member 10 may be plucked or struck quite sharply and the member 11, in vibrating in sympathy therewith, will produce a uniform vibration without the sharply struck note or the dissonant harmonics of the plucked member 10 being produced thereby. If, however, the members 10 and 11 are slightly out of tune with each other, the same effect is produced as far as the strike note is concerned, but the continued vibrations produce the well-known effect of beating, and the pickup coil 22 will pick up the vibrations of the segment 11 as modified by these beats. The tone in this case is similar to that of a vibraharp or vibraphone. In either case, the objectionable effects of the strike note are avoided.

In order to cause vibration of the segment 10, I have provided a cam 19 which deflects and then suddenly releases the end of the segment 10. This cam 19 may be mounted on an appropriate shaft 20 and carried in brackets 21 and, if desired, a plurality of vibratable elements may be mounted side by side with appropriate cams 19 mounted in such angular relation on the shaft 20 as to produce the tones in any sequence desired.

The magnetic pickup mechanism is quite similar to that shown and described in my applica-

tion Serial No. 248,542, filed December 30, 1938 (RCV D-6515). In this pickup arrangement, the pickup coil 22 is mounted on a soft iron member 23, which is magnetically connected with and mounted on a small bar magnet 24, preferably of an appropriate magnetizable alloy. This magnet 24 is carried in a supporting tube 25, which is adjustable in the bracket 26 carried on the side plate 17. The magnet 24 provides a certain amount of magnetic flux through the pole piece 23 and the vibratable member 11 and, when the member 11 is vibrated, this causes a current to be produced in the coil 22 corresponding with the vibrations of the member 11.

Referring now to the form of the invention shown in Fig. 2:

In this form of the invention, the driving segment 10 of the vibratable member may be substantially the same as shown in Fig. 1 and tuned in the same way by the weight 12. Likewise, the supporting block 14, the clamp screw 14', and the massive supporting block 15 are substantially the same. In order to secure more adequate mechanical and electrical shielding, however, I provide a more massive partition 32 carried by the side wall 17 and the base 18. The magnetic pickup elements 22 to 26 inclusive are likewise similar to those illustrated in Fig. 1 and require no further description.

The vibrating element 31 is substituted for the vibrating element 11. This element 31 is made from an appropriate springy magnetic material, such as piano wire, and is secured to the end of the segment 10 by means of the block 42 and the screws 43 and 44. This member 31 is made very thin in relation to the member 10 in order that vibrations of a considerably greater amplitude may be caused therein. Likewise, the mounting of the block 42 at a slight distance from the rigid block 14 tends to increase the amplitude of the vibrations of the member 31. This member 31, being very light, is not tuned in the same manner as the segment 11 in Fig. 1, but is preferably tuned by grinding off the end until the frequency of vibration is sufficiently sharpened. If a little too much should happen to be ground from the end of the member 31, the pitch may be slightly flattened by, for example, affixing a small drop of solder which may then be scraped until it has lowered the pitch only the required amount. The entire connection including the block 42, the screw 44 and the screw 43 should, after assembly, be covered with a layer of wax fused into place in order to prevent any buzzes or other undesired noises due to the relative vibration of any of these parts.

The striking mechanism for this form of the invention includes a heavy magnet 34 supported on appropriate posts 35 and adapted to attract an armature 36. This magnet and armature may be of the type commercially used in relays. The armature 36 carries a bent arm 40 which in turn supports the hammer 33 and the hammer arm 37 by the pivot 38. The hammer arm 37 is held up against the felt block 41 by an appropriate spring 39. When the circuit is closed, passing current through the magnet 34, the armature 36 is drawn forcibly toward the magnet, throwing the hammer 33 downwardly. When the armature 36 strikes the face of the magnet, the hammer 33, due to its momentum, continues to move downwardly against the pressure of the spring 39 until it hits the striking member 10. When the hammer 33 strikes the member 10, it bounces and is immediately withdrawn, preventing striking the member 10 a second time, by the springs 39, carried by the member 40, and the spring 45, which lifts the member 40 when the current through the magnet 34 is turned off.

The hammer 33 and the arm 37 may be of the type usually used in pianos, the bar 37 being of wood and the hammer 33 being covered with felt in the customary manner.

The vibrating members in Fig. 2, like those in Fig. 1, may be arranged in a group of the proper tones side by side on a single block 15 between two side members 17.

I claim as my invention:

1. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member in substantial alignment with and coupled to said tone-producing member, massive means rigidly coupled to said members adjacent their junction point, and means for vibrating said second member transversely.

2. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member coupled to said tone-producing member, and means for vibrating said second member transversely, said members being substantially in alignment coupled at their adjacent ends and having their outer ends free to vibrate transversely.

3. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member coupled to said tone-producing manner, and means for vibrating said second member transversely, the member in cooperative relation with said pickup being thinner than the other member.

4. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member coupled to said tone-producing member, and means for vibrating said second member transversely, said members being substantially in alignment coupled at their adjacent ends and having their outer ends free to vibrate transversely, the member in cooperative relation with said pickup being thinner than the other member.

5. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member coupled to said tone-producing member, means for vibrating said second member transversely, the member in cooperative relation with said pickup being thinner than the other member, and massive means rigidly coupled to said members adjacent their junction point.

6. Apparatus of the class described including a vibratable tone-producing member, an electric pickup in cooperative relation with said member, a second vibratable member coupled to said tone-producing member, means for vibrating said second member transversely, said members being substantially in alignment coupled at their adjacent ends and having their outer ends free to vibrate, the member in cooperative relation with said pickup being thinner than the other member, and massive means rigidly coupled to said members adjacent their junction point.

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