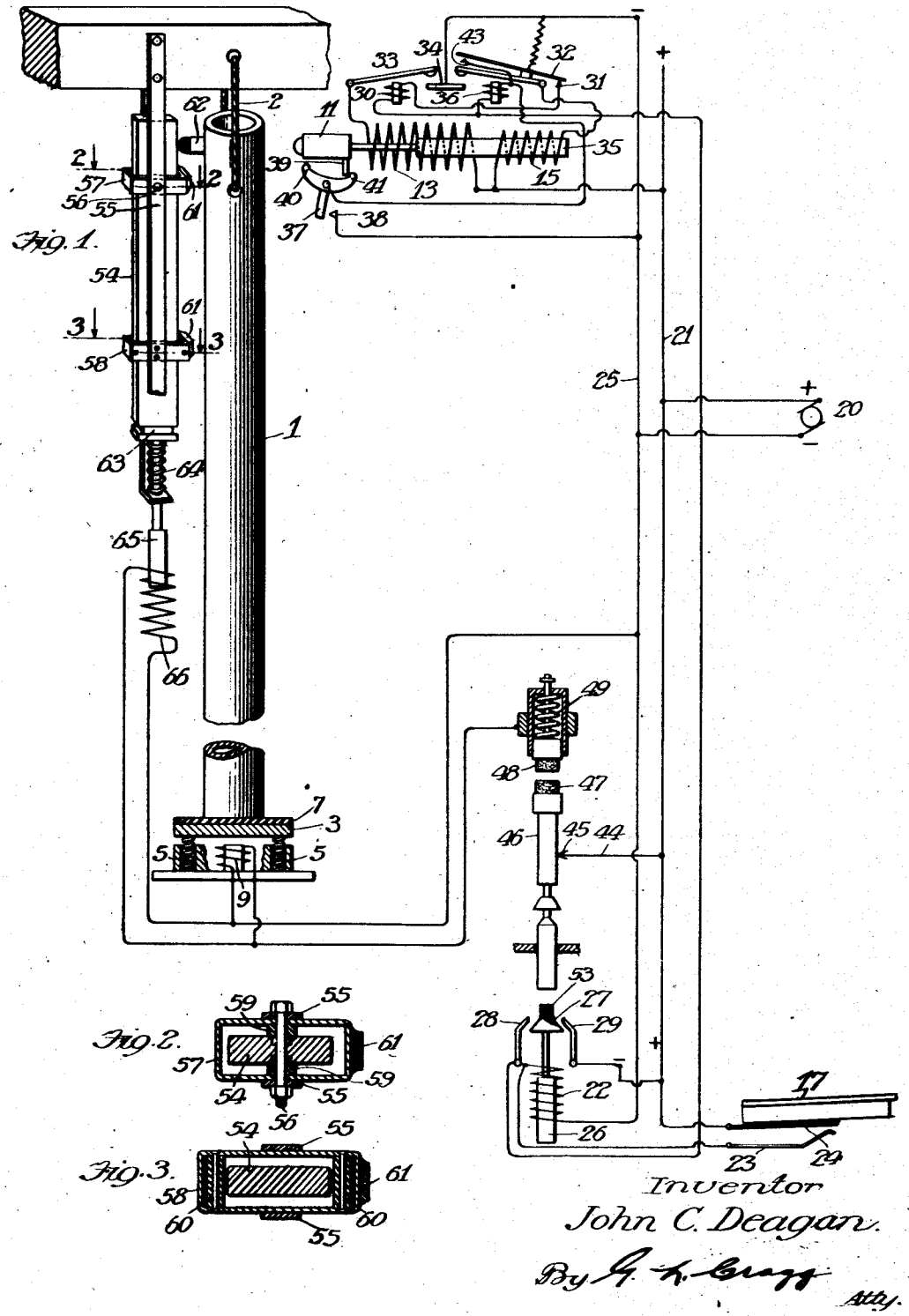
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J. C. DEAGAN

SOUND PRODUCING INSTRUMENT

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SOUND-PRODUCING INSTRUMENT.

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My invention relates to sound producing or musical instruments which employ sound producing bars. An instrument of the kind to which my invention is adaptable is described in U. S. Letters Patent 1,562,103 dated November 17, 1925, though the invention is not to be thus limited. In the instrument disclosed in this patent, suspended bars are arranged to be struck by hammers to set them into vibration. In applying my invention to the instrument of said patent, I provide the sound producing bars, or some of them, with supplemental bars which are also set into vibration to furnish tonal qualities lacking in the main bars. The supplemental bars are desirably set into vibration by the impacting action of the main bars as the main bars are set into vibration. A main bar and its supplement are desirably so arranged and interrelated that the supplemental bar is not only set into vibration by the percussive action of the main bar thereon, but will act as a damper to reduce the swing of the main bar and limit its striking engagement with the supplemental bar to preferably one stroke. The two bars, when vibrating together, will produce a sound synthetically composed of the sounds produced by both bars, and having tonal qualities which either bar alone is incapable of producing. For example, the sound thus jointly produced by the main and supplemental bars may have the tonal qualities of sounds produced by a flaring bell with a metallic ring or overtone. That is the tones produced by the two bars are complementary harmonic tones that tend to clarify the sound and make it louder and more bell-like in tone.

The invention will be more fully explained by reference to the accompanying drawing in which Fig. 1 is a somewhat diagrammatic view illustrating the preferred embodiment of the invention; Fig. 2 is a sectional view on line 2—2 of Fig. 1; and Fig. 3 is a sectional view on line 3—3 of Fig. 1.

The main sound producing bar and the mechanism associated therewith will first be described. The main sounding bar 1 is indicated as being tubular. It is suspended by a cord 2 from a suitable support. The bar 1 is provided with a sound damper 3 which floats upon upright coiled springs 5, these springs normally pressing the sound damper against the bottom of the bar. The sound damper 3 is desirably an iron armature carrying a sound damping cushion 7 preferably of felt, directly engaging the bottom end of the bar. This armature is included in an electromagnet having an energizing coil 9. The bar 1 is set in vibration in any preferred way. I have illustrated the bar as being provided with a hammer 11 which is applied to the bar by means of the striking solenoid or electromagnet 13 and which is retracted from the bar it has struck by means of the withdrawing solenoid or magnet 15.

The manually operated key 17 serves, through instrumentalities to be described, to operate the hammer 11, other keys for controlling the hammers of other sounding bars, not illustrated, being included in the same bank with key 17.

The apparatus whereby the key 17 has control over the hammer 11 will be described. When the key 17 is depressed a circuit is established which may be traced from the positive pole of the generator 20 through the positive bus wire 21, the magnet or solenoid winding 22, the key contacts 23, 24, of key 17, the negative bus wire 25 to the negative pole of the generator 20. The solenoid 22, when energized, lifts its core 26 to bring the metallic switch block 27 into engagement with the two spring contacts 28 and 29. When these spring contacts 28 and 29 are electrically connected by the switch block 27, another circuit is established which includes the generator 20, spring contacts 28, 29, switch block 27, relay 30, and the switch contacts 31 and 32. When the relay 30 is energized circuit is established which may be traced from the positive pole of the generator 20 through the bus wire 21, the striking winding 13, contacts 33 and 34 of the armature switch of relay 30, the negative bus wire 25 to the negative pole of the generator. The energized solenoid winding 13 draws the solenoid core 35 forcibly toward the bar 1 to strike the hammer 11 against this bar. As the hammer nears the bar the circuit of the striking solenoid 13 is opened, the hammer moving the rest of its striking distance by momentum. The opening of the circuit of the striking solenoid is directly occasioned by the separation of the contacts 31 and 32 by the separation of the contacts 31 and 32 that are included in series with the relay 30, the relay 30, when deenergized, opening the circuit of the striking solenoid 13 at the switch 33, 34.

These contacts 31 and 32 are separated as a consequence of the energization of the relay 36 occurring when the hammer nears the bar, these contacts being included in the armature switching mechanism belonging to this particular relay. The circuit of the relay 36 includes the generator 20, the switch elements 28, 27, 29, the winding of the relay and the switch contacts 37 and 38, which are closed by the pin 39 upon the hammer 11 when this pin engages the horn 40 upon contact 37 as the hammer nears the bar 1 and which are separated when the hammer is retracted, by the engagement of the pin 39 with the horn 41 upon the contact 37. When the relay 36 is thus energized the contacts 31 and 32 are separated with the results described.

To prevent repeated operation of the hammer while the key corresponding thereto is depressed, a supplemental contact 43 is employed, this contact being in multiple with the contact 37, which, with the contact 32 that is in multiple with the contact 38, are substituted for the contacts 37 and 38 and performing the same function, the contact 43 being engaged by the contact 32 when the relay 36 is energized whereby the striking solenoid 13 is maintained in open circuit and the retracting solenoid 15 is maintained in closed circuit, as long as the corresponding key 17 is closed. When this key 17 is released the corresponding solenoid 22 is deenergized to interrupt all hammer controlling circuits.

The sound damper is normally applied to the bottom end of the bar 1. Whenever the hamber 11 is applied to its bar the corresponding sound damper is withdrawn to permit the bar to vibrate. When a key 17 is depressed, circuit is established through the damper withdrawing magnet 9, which may be traced from the positive pole of the generator 20 through the bus wire 21, the conductor 44, switch contact 45, the upright metallic plunger rod 46, contact 47, contact 48 engaged by contact 47 when the plunger rod 46 is lifted by the insulating block 53 upon the solenoid core 26, the winding of the damper releasing magnet 9, the negative bus wire 25 to the negative pole of the generator. The contact 48 is pressed to a limited extent toward the contact 47 by means of a coiled spring 49.

The auxiliary sounding bar 54 is suspended by the strap 55 to be substantially parallel with an abreast of bar 1. A bolt 56 is carried by the strap and directly supports bar 54. Said strap also carries an upper frame 57 and a lower frame 58. Rubber rings 59 position the bar 54 midway between the long sides of said frames. Rubber tubes 60 limit the extent to which the bar 54 may swing after being set into vibration by being struck. Cushions 61 upon frames 57, 58 prevent bar 1 from engaging the frames.

The main bar 1 carries a striker or hammer near its upper end when the bar is set into vibration said hammer strikes the bar 54, this bar being preferably oblong in cross section and the hammer 62 preferably being arranged to strike the narrow side of the bar to produce a superior tone. A damper 63 is preferably normally applied to the bottom of bar 54 by a spring 64 which is bottomed upon the lower end of strap 55. This damper is carried upon the upper end of a solenoid core 65, the winding 66 that pertains to core 65 being in multiple with winding 9, whereby the dampers are simultaneously removed from both bars.

The bar 54 is supplemental to bar 1 and furnishes desired tonal quality to the sound produced by both bars and which is not furnished by bar 1 alone, as hitherto set forth. The body of hammer 62 is desirably metallic with its striking end made of rawhide. When the bar 1 is struck it is swung sufficiently to strike the bar 54 through the intermediation of said hammer. Bar 54 serves as a damper to reduce the swinging movement of bar 1 to such an extent that the latter bar strikes the first preferably only once, each being thus permitted to continue its own vibration without interference from the other. The supplemental bar not only contributes to the tone produced by both bars, but modifies the tone produced by bar 1 by checking its swinging movement.

A sound producing instrument made as herein set forth is capable of producing sounds of desired tonal quality which either bar acting alone would not produce. The sound of a flaring bell, may, for example, be well simulated by the device of my invention.

In the preferred embodiment of the invention, the tone produced by striking the supplemental bar upon the narrow side thereof produces a complementary upper partial to the fundamental tone of the main bar. By striking a flat side of the supplemental bar, a second tone complementary to the tones produced by both bars is produced, the various tones of the bars coalescing to produce the sound of a flaring musical bell. The invention is not limited, in all of its embodiments, to sound producing bars as other sound producing members may be employed in accordance with some characteristics of the invention.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:

1. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar being mounted to swing when struck and carrying a portion that is within striking range of the supplemental bar.

2. In a sound producing instrument, the combination with a main and a supplemental

sound producing bar, the main bar having a portion engageable with the supplemental bar when the main bar is set into sound producing vibration to set the supplemental bar into sound producing vibration.

3. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar being mounted to swing when struck and carrying a portion that is within striking range of the supplemental bar; and dampers applicable to both bars and coupled to be simultaneously removed from engagement with said bars.

4. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar having a portion engageable with the supplemental bar when the main bar is set into sound producing vibration to set the supplemental bar into sound producing vibration; and dampers applicable to both bars and coupled to be simultaneously removed from engagement with said bars.

5. In a sound producing instrument, the combination with a bar that is oblong in cross section; of a hammer mounted to strike the narrower side of said bar.

6. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar being mounted to swing when struck and carrying a portion that is within striking range of the supplemental bar; dampers normally applied to both bars; and mechanism operable upon the main bar for setting it into vibration and in controlling relation to said dampers and, when operated, operating upon said dampers to remove them from engagement with said bars.

7. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar having a portion engageable with the supplemental bar when the main bar is set into sound producing vibration to set the supplemental bar into sound producing vibration; dampers normally applied to both bars; and mechanism operable upon the main bar for setting it into vibration and in controlling relation to said dampers and, when operated, operating upon said dampers to remove them from engagement with said bars.

8. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar being mounted to swing when struck and carrying a portion that is within striking range of the supplemental bar; dampers normally applied to both bars; and mechanism operable upon the main bar and including a hammer for striking the main bar to set it into vibration and in controlling relation to said dampers to remove them from engagement with said bars.

9. In a sound producing instrument, the combination with a main and a supplemental sound producing bar, the main bar having a portion engageable with the supplemental bar when the main bar is set into sound producing vibration to set the supplemental bar into sound producing vibration; dampers normally applied to both bars; and mechanism operable upon the main bar and including a hammer for striking the main bar to set it into vibration and in controlling relation to said dampers and, when operated, operating upon said dampers to remove them from engagement with said bars.

10. In a sound producing instrument, the combination with a main and supplemental sound producing member; dampers normally applied to both members; and mechanism operable upon said members for setting them into vibration and in controlling relation to said dampers and, when operated, operating upon said dampers to remove them from engagement with said members.

11. In a sound producing instrument, the combination with a main and supplemental sound producing member; dampers normally applied to both members; and mechanism operable upon said members and including a hammer for striking the main member to set it into vibration and in controlling relation to said dampers and, when operated, operating upon said dampers to remove them from engagement with said members.

In witness whereof, I hereunto subscribe my name.

JOHN C. DEAGAN.