June 30, 1942. C. L. HOWARD 2,288,455

MEANS FOR PRODUCING MUSICAL SOUNDS

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Fig. 1

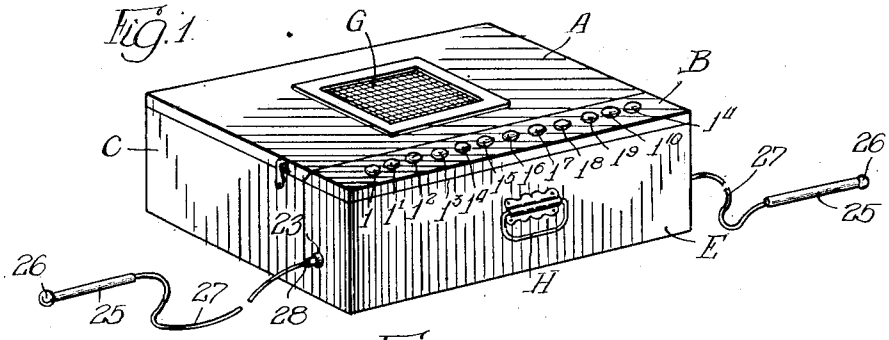


Fig. 2

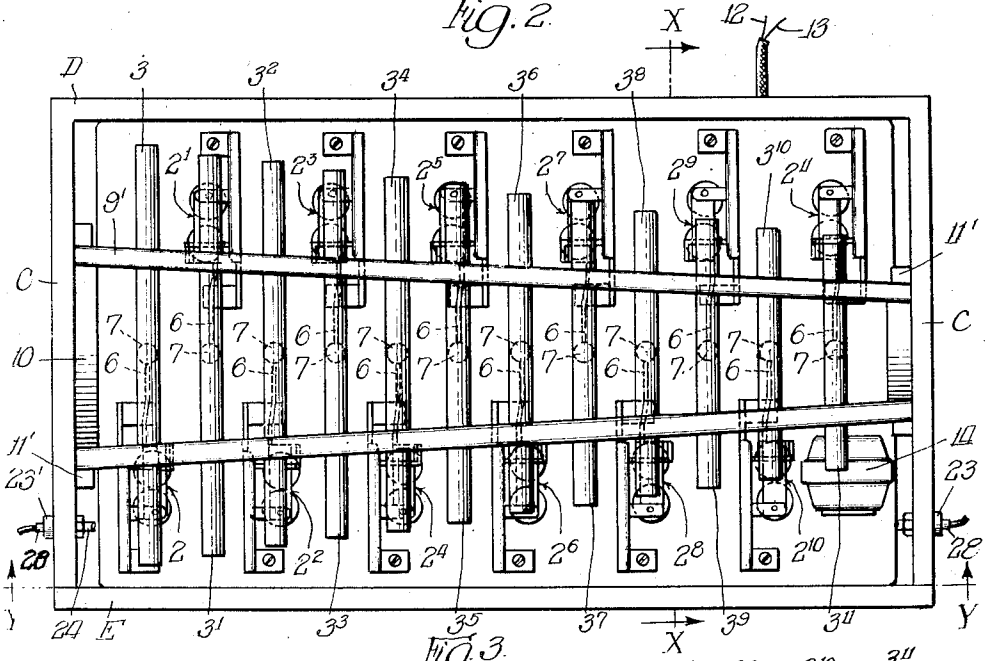
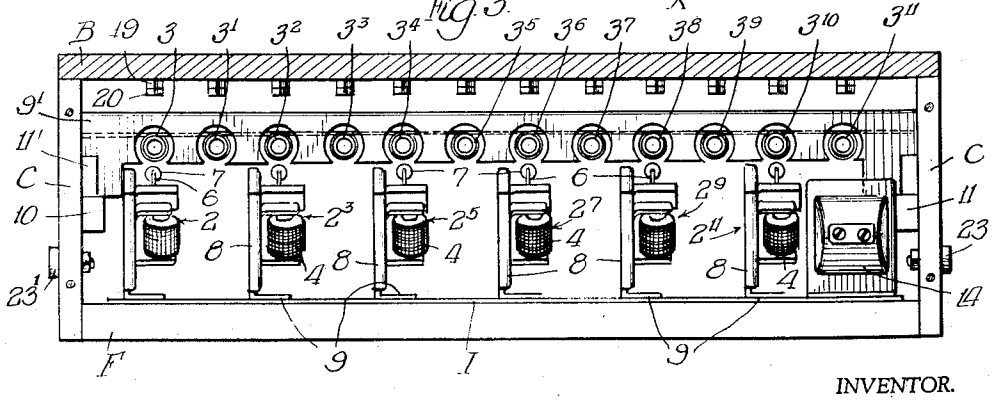


Fig. 3



INVENTOR.

Charles L. Howard

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Fig. 5

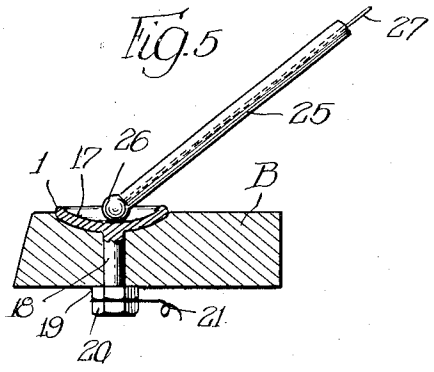


Fig. 4

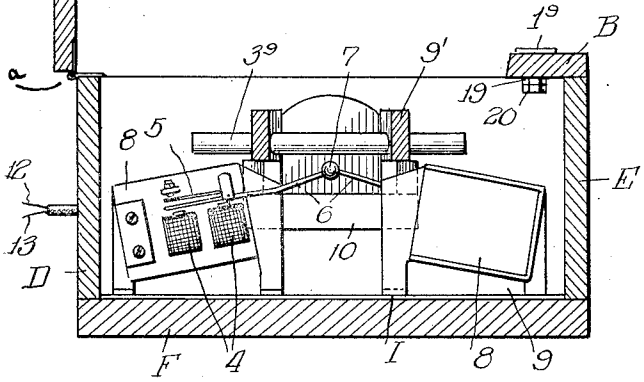
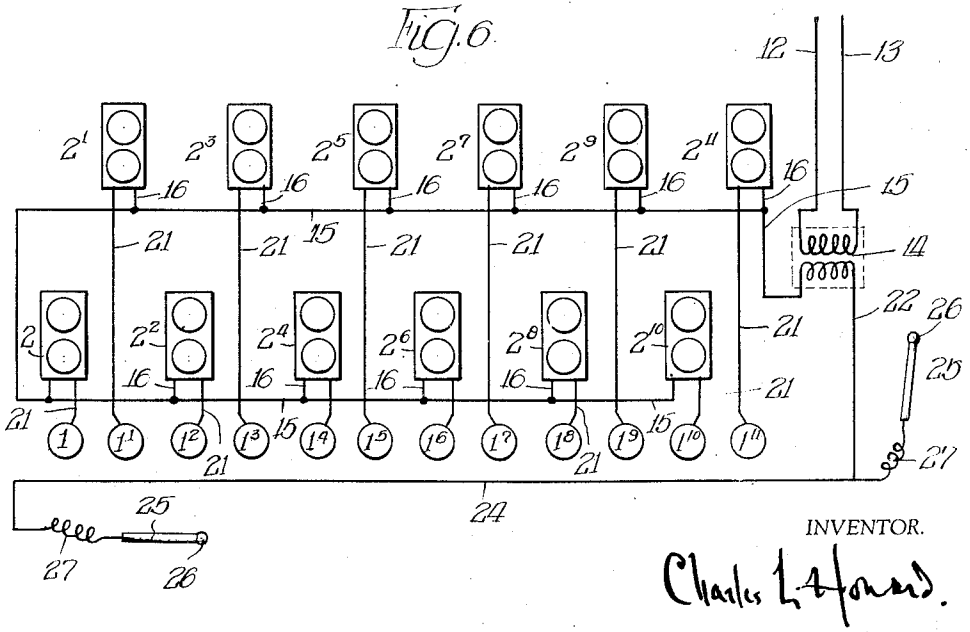


Fig. 6



INVENTOR.

Charles L. Howard.

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MEANS FOR PRODUCING MUSICAL SOUNDS

Charles L. Howard, Wilmette, Ill., assignor to Helen M. Howard, Wilmette, Ill.

Application January 8, 1941, Serial No. 373,550

13 Claims. (Cl. 84—405)

My invention relates to means for creating musical sounds through the instrumentality of electrically operated apparatus employing resonating sound producing elements and electro-magnetically operated units for striking and vibrating said elements.

One of the objects of my invention is to provide means for producing musical sounds by energizing electric circuits in a novel manner for the purpose of setting in motion electro-magnetically operated units and which energizing means is of simple, durable, inexpensive and portable construction and which may be easily and safely manipulated even by a child of tender years.

Another object of my invention is the provision of an instrument having a novel arrangement of resonating elements with respect to electro-magnetically operated knocker means whereby the instrument as a whole requires a small amount of space in a casing even though a large number of resonating elements be employed and which may be easily carried from place to place.

A further object of my invention is to provide an instrument with novel means whereby resonating elements upon being vibrated by knockers of electro-magnetically operated units produce musical sounds of superior quality even though the instrument be operated by one unskilled in music.

And a further object of my invention is an arrangement of parts which permits of a simple, safe and well protected system of electrical wiring for the instrument.

With the above and other objects in view, I will explain my invention more fully by reference to the accompanying drawings which, for illustrative purposes, show the invention as employing twelve resonators of the xylophone type to create the musical notes.

Figure 1 is a perspective view of the casing supporting and housing the musical instrument;

Fig. 2 is a top plan view of the instrument with the cover of the casing removed;

Fig. 3 is a front view of the instrument looking in the direction of arrows X—X of Figure 2, the cover for the casing being in place;

Fig. 4 is a cross sectional view taken in the direction of arrows Y—Y of Fig. 2, with the cover of the casing, however, added;

Fig. 5 is a detailed view, partly in section, of one of the contact buttons located upon the cover-strip with the portable contact closer or "electric-wand" associated therewith, and

Fig. 6 is a diagrammatic view of the electrical circuit.

The musical instrument of my invention may be enclosed in a box-like casing comprising a cover consisting of two sections, one section A being hinged as at *a* and the other section B consisting of a comparatively narrow strip firmly fixed in position; sides C, back D, front E and bottom F. The casing, of course, may be of any suitable material and of any dimension depending upon the size of the instrument to be associated therewith. The top section A may have an opening therein of any required size for the emission of sound when the instrument is being operated, the opening having a perforated cover G of any approved material. H is a handle by which the instrument as a whole may be carried from place to place and I is an insulating mat which, however, is not essential.

Located upon the top of the casing, preferably in the strip B, Figs. 1, 3, 4 and 5, are buttons 1, 1^1, 1^2, 1^3, 1^4, 1^5, 1^6, 1^7, 1^8, 1^9, 1^{10} and 1^{11}, the purpose and detailed description of which will be described in full later on in this specification.

Secured to the bottom of the casing are a series of electro-magnetically operated units of any approved type, such as shown by 2, 2^1, 2^2, 2^3, 2^4, 2^5, 2^6, 2^7, 2^8, 2^9, 2^{10} and 2^{11}. These units are each identical in construction and comprise two coils 4, a vibrating armature 5 which operates an arm 6 at the end of which is a knocker 7. Upon closing electrical circuits, the knockers are set in motion for the purpose to be explained in detail in the following paragraphs of this specification.

It will be noted from Figure 2 that the twelve electro-magnetically operated units are staggered, that is, units Nos. 2, 2^2, 2^4, 2^6, 2^8, and 2^{10}, are located on one side of a longitudinal line running through the center of the casing, and units Nos. 2^1, 2^3, 2^5, 2^7, 2^9, and 2^{11}, are located on the opposite side of said line. However, although the units are staggered in the casing as just described, the twelve knockers extend towards the center of the casing and are in alignment side by side. Each electro-magnetic unit is supported by a suitable frame 8 which is secured in the bottom of the casing by appropriate means, such as a bracket 9.

Superimposed above the electro-magnetic units 1 to 1^{11} inclusive, is a frame 9', in which are loosely suspended, in any approved manner, twelve resonating elements, such as hollow bars, adapted to be vibrated when contacted by the closely associated knockers of the electro-mag-

netic units. The frame 9' is held in suspended position by cleats 10 and 11 secured to the sides C of the casing and is prevented from lateral movement by additional cleats 11'.

The loosely suspended resonating elements are identified as 3, 3^1, 3^2, 3^3, 3^4, 3^5, 3^6, 3^7, 3^8, 3^9, 3^{10}, and 3^{11}. These elements are of the xylophone type and each produces a different musical note when vibrated, and thus when certain elements are struck in turn by the knockers, tunes are played.

It is to be noted that the knocker of electro-magnetic unit 2, for example, is directly beneath and slightly out of contact of resonating element 3 and approximately midway the ends of said element and that knocker of unit 2^1 is also directly beneath element 3^1 and midway its ends and so on. From this it will be seen that each of the twelve knockers is directly beneath a resonating element and positioned substantially midway the ends of the element. Due to this arrangement it will be observed that the combined length of two magnetic units with their arms and knockers is less than the length of the longest resonating element and hence the depth of the instrument need be only slightly greater than the length of the longest resonating element. Moreover, in arranging the resonating elements above the knockers of the electro-magnetic units, superior sound qualities are obtained.

The electrical circuits for operating the magnetic units to set the knockers in motion to vibrate the resonating elements are shown by Fig. 6, it being understood, of course, that any suitable source of current may be used. Lead and ground wires are shown by 12 and 13 respectively, the wires to be connected to a transformer 14 within the casing to reduce as desired the voltage from the source of power to the instrument. Leading from the transformer 14 is a wire 15 from which are lead-in wires 16 to each magnetic unit.

To complete the circuits, I provide buttons 1 to 1^{11} inclusive, Fig. 1, previously referred to, each button having preferably a concave face as shown by 17, Fig. 5. These buttons are solid and free of movable parts and each has a neck portion 18 passing through the cover strip B and the neck portion at the end is screw-threaded for the reception of nuts 19 and 20 between which nuts is secured a wire 21. Wires 21 run from the neck 18 and connect each button to a magnetic unit. See Figs. 5 and 6. It may be found more convenient, under certain conditions, to simply solder the wire 21 to the end of the neck 18 to make the electrical connection. Locating the buttons in the strip B places them in a convenient position for the operator of the instrument and at the same time the hinged cover piece B provides convenient means for inspection of the instrument.

From the transformer 14 is a wire 22 leading to socket 23, Fig. 2, in one side C of the casing and leading from this wire is a wire 25 running to a socket 23' in the other side of the casing. Adapted to be plugged in either socket 23 or 23', or both sockets 23 and 23' simultaneously, is a portable contact closing device or "electric-wand," this device including an insulated handle portion 25 having at one end a contact point 26, preferably round as shown, and at the other end a wire 27 with a plug 28 which plug is adapted to be inserted in either socket 23 or 23'.

From the above description it will be seen that I have provided a source of current feeding a plurality of circuits in which the magnetic units and the portable contact closing device are included and, consequently, when the contact closer or "electric wand" 25 is utilized and its point 26 is engaged with button 1, for instance, a circuit is energized and the knocker of magnetic unit 2 is set in motion to strike and vibrate resonating element 3 to create a musical note. And, likewise, when the point 26 of the "electric wand" contacts button 1^1 the knocker of magnetic unit 2^1 is set in motion to vibrate resonating element 3^1 and so on. By thus touching the buttons in suitable order one after the other with the "electric wand" circuits are closed and appropriate resonating elements are vibrated and tunes are played easily and by one not necessarily familiar with music. From this it will be seen that the portable circuit closing device or "electric-wand" is connected to all of the buttons through the electro-magnetically operated units. The concavity 17 in each button permits the point 25 of the "electric wand," when contacted with the button, to slide towards the center of the button and, consequently, there is no danger of the point accidently becoming dislodged from the button.

By arranging the electro-magnetic units 2, etc., in staggered relationship and locating the buttons 1, etc., in the cover-strip B, the amount of wiring from the transformer 14 to the magnetic units and the wiring from the buttons to the magnetic units is reduced to a minimum and the wiring is conveniently positioned so as not to interfere in any way with the operative parts of the instrument.

It will be seen from the foregoing description that due to my novel combination of parts, resonating elements are vibrated through the action of electro-magnetic units set in motion by a portable circuit closing device or "electric wand" and solid button combination to produce musical sounds of superior quality.

It has been found in actual practice that only one "electric wand" is necessary to produce simple tunes from the instrument of my invention but two wands, as shown by the drawings, may be used by a single player. Or four "wands" may be utilized with larger instruments, two wands each for two players, without departing from the spirit of my invention.

It is to be understood, of course, I do not limit myself to any particular type or number of resonating elements, nor to the exact arrangement of electro-magnetically operated units with respect to the resonators, nor to the location of buttons as described and illustrated by the drawings. And while I have described my invention as employing magnetic units of the vibratory type, it is to be understood that it comes within the scope of my invention to employ magnetic means whereby a single magnetization is effected with each closure of a circuit by the use of a "wand" to permit a knocker to give only a single strike against a resonating element. While throughout the specification and claims applicant has referred to "knockers" for the electro-magnetically operated units and "buttons" to be contacted by the portable circuit closing device, it is, of course, understood that these words are meant to include any mechanical equivalents therefor.

When not in use the "electric wand" with its wire 27 and plug 28 and the wire leading to the source of current may be placed within the casing. With the wand thus stored there are no

exposed movable parts of the instrument, such as a key-board or the like, to be accidently damaged and thus the instrument as a whole may be safely carried from place to place by means of the handle H.

From the above description of one embodiment of my invention, it will be apparent that the invention comprises a combination of parts providing a highly efficient and compact musical instrument characterized as having an exceptionally durable, practical and convenient means for energizing electro-magnetically operated units to create musical sounds. While only one type of "portable circuit closing device" or "portable wand-like device" is shown by the drawings and described, it is to be understood that any means adapted to be carried by the hand of the operator of the instrument for energizing the units to create musical sounds may be employed.

I claim as my invention:

1. In an electrical musical instrument of the type having a plurality of resonating sound producing elements employing a plurality of corresponding electro-magnetically operated units each having a knocker which is adapted to vibrate one of said resonating sound producing elements, the combination of a series of solid buttons each connected to one of said magnetic units and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact any one of said buttons to energize said electric magnetic units to create a musical sound.

2. In an electrical musical instrument of the type having a plurality of resonating sound producing elements employing a plurality of corresponding electro-magnetically operated units each having a knocker which is adapted to vibrate one of said resonating sound producing elements, the combination of a series of solid buttons each connected to one of said magnetic units and each having a concave face and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact any one of said faces to energize said electric magnetic unit to create a musical sound.

3. In an electrical musical instrument, comprising, in combination, a set of electro-magnetically operated units each provided with a knocker, a resonating sound producing element adjacent each knocker, electric circuits in which each magnetic unit is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact said buttons to create musical sounds.

4. In an electrical musical instrument comprising, in combination, a set of electro-magnetically operated units each provided with a knocker, a resonating sound producing element adjacent each knocker, electric circuits in which each magnetic unit is included, and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units and each having a concave face and each of which is adapted to be contacted by a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units to create a musical sound.

5. In an electrical musical instrument comprising, in combination, a set of electro-magnetically operated units each provided with a knocker, a resonating sound producing element superimposed and adjacent each knocker, electric circuits in which each magnetic unit is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units and a portable circuit closing device connected to all of said buttons through said electro-emagnetically operated units and adapted to contact said buttons to create musical sounds.

6. In an electrical musical instrument comprising, in combination, a casing including a cover, a set of electro-magnetically operated units located within said casing each provided with a knocker, a resonating sound producing element adjacent each knocker, electric circuits in which each of said magnetic units is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magetic units and spaced upon the top of said casing and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact said buttons to create musical sounds.

7. In an electrical musical instrument comprising, in combination, a casing including a cover, a set of electro-magnetically operated units located within said casing each provided with a knocker, a resonating sound producing element adjacent each knocker, electric circuits in which each of said magnetic units is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units and each having a concave face spaced upon the top of said casing and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact said faces to create musical sounds.

8. In an electrical musical instrument comprising, in combination, a casing including a cover, a set of electro-magnetically operated units located within said casing in staggered relationship each unit provided with a knocker, a resonating sound producing element adjacent each knocker, electric circuits in which each of said magnetic units is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units spaced upon the top of said casing and a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units and adapted to contact said buttons to create musical sounds.

9. In an electrical musical instrument comprising, in combination, a casing including a cover having a hinged section and a fixed section, a set of electro-magnetically operated units located within said casing each unit being provided with a knocker, a resonating sound producing element in proximity to each knocker, electric circuits in which each of said magnetic units is included and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units spaced upon said fixed section of said cover, each button being adapted to be contacted by a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units to create a musical sound.

10. In an electrical musical instrument comprising, in combination, a casing including a cover having a hinged section and a fixed section, a set of electro-magnetically operated units

located within said casing each unit being provided with a knocker, a resonating sound producing element associated with each knocker, electric circuits in which each of said magnetic units is included, and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units and each having a concave face spaced upon said fixed section of said cover, each of which faces is adapted to be contacted by a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units to create a musical sound.

11. In an electrical musical instrument comprising, in combination, a casing including a cover having a hinged section and a fixed section, a set of electro-magnetically operated units located within said casing each unit being provided with a knocker, a resonating sound producing element superimposed and associated with each knocker, electric circuits in which each of said magnetic units is included, and means for energizing said circuits consisting of a series of solid buttons each connected to one of said magnetic units spaced upon said fixed section of said cover, each of which is adapted to be contacted by a portable circuit closing device connected to all of said buttons through said electro-magnetically operated units to create a musical sound.

12. In an electrical musical instrument of the type having a plurality of resonating sound producing elements, electro-magnetically operated means adapted to vibrate said elements, contact members connected to said electro-magnetically operated means and a portable circuit closing device connected to said members through said electro-magnetically operated means and adapted to engage said members to energize said electro-magnetically operated means to create musical sounds.

13. In an electrical musical instrument of the type having a plurality of resonating sound producing elements, an electro-magnetically operated unit adjacent each element and said units each having a portion adapted to vibrate its adjacent sound producing element, a plurality of contact members each connected to one of said electro-magnetically operated units and a portable circuit closing device connected to all of said members through said electro-magnetically operated units and adapted to engage said members one at a time to energize said electro-magnetically operated units to create musical sounds.

CHARLES L. HOWARD.