July 10, 1951 F. W. JACKSON ET AL 2,560,444

ALARM BELL AND VIBRATOR ELEMENT THEREFOR

Filed Jan. 24, 1949

Fig. 1.

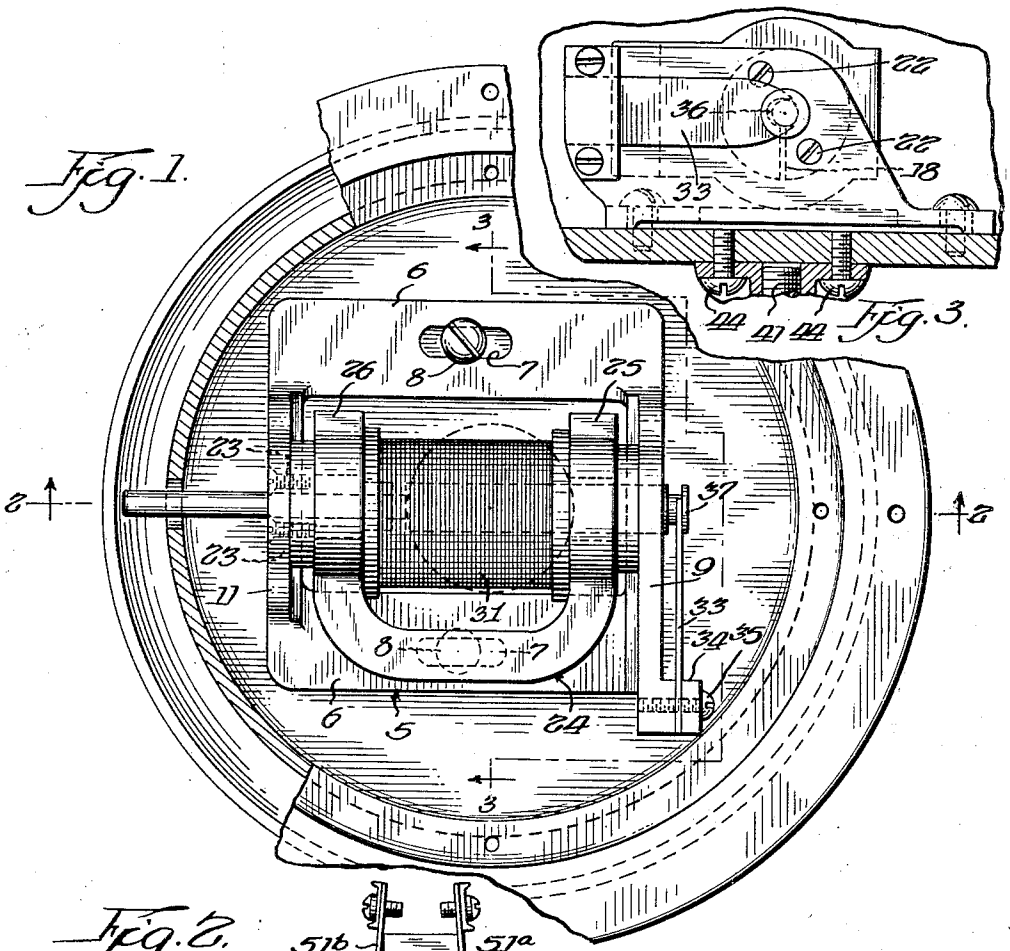
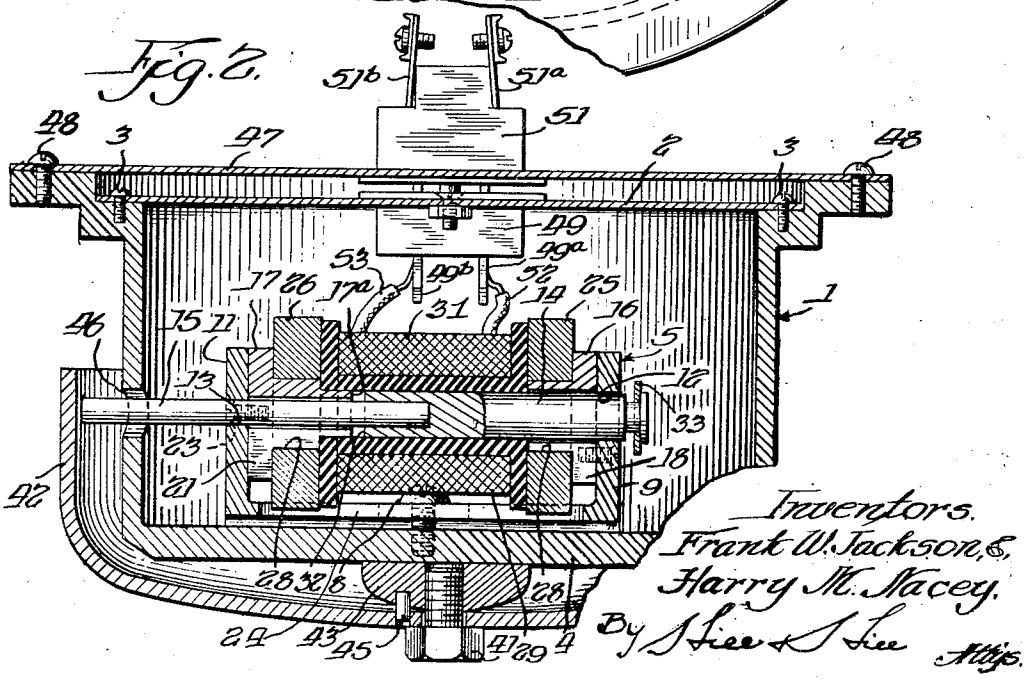


Fig. 3.

Fig. 2.



Inventors.
Frank W. Jackson &
Harry M. Nacey.
By Lee & Lee Attys.

Patented July 10, 1951

2,560,444

UNITED STATES PATENT OFFICE

2,560,444

ALARM BELL AND VIBRATOR ELEMENT THEREFOR

Frank W. Jackson and Harry M. Nacey,
Chicago, Ill.

Application January 24, 1949, Serial No. 72,402

9 Claims. (Cl. 177—7)

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The invention relates generally to an alarm bell, and more particularly to a bell and vibrator structure therefor adapted to be operated on alternating current.

The invention has among its objects the production of a vibrator structure and bell assembly which is very simple in construction, relatively inexpensive to manufacture, and very efficient in operation, whereby a very loud alarm will be produced with relatively low voltages on the actuating winding and an attendant low current consumption.

Another object of the invention is the production of such a vibrator structure which employs only one moving part and which is so constructed that the alternating current winding may be readily removed and replaced, whereby the same structure may be readily employed on different alternating current voltages by the substitution of a suitable winding.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

In the drawing, wherein like reference characters indicate like or corresponding parts;

Fig. 1 is a top plan view of a bell embodying the present invention, the covers being removed therefrom and part of the housing being broken away to show the details of construction;

Fig. 2 is a sectional view taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is a sectional view taken approximately on the line 3—3 of Fig. 1.

Referring to the drawing, 1 indicates a hollow, generally cylindrical housing open at one end with the latter closed by a cover member 2 secured to the housing 1 by screws 3 or the like.

Mounted on the bottom 4 of the housing 1 is a base member of non-magnetic material, such as bronze or other suitable material, indicated generally by the numeral 5, the latter having a pair of horizontally extending portions 6 each of which is provided with an elongated slot 7 through which extend mounting screws 8 threaded into the bottom 4 of the housing. The base member 5 is also provided with a pair of spaced transversely extending upright portions 9 and 11, respectively. The upright 9 is formed with a bore 12 therein axially aligned with a bore 13 in the upright 11, in which is slidably carried an armature 14 of a ferro-magnetic material, the diameter of the latter being slightly less than the diameter of the bore 12. Rigidly carried by and axially aligned with the armature 14 is a

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striker 15, of non-magnetic material, which extends through the bore 13 and is of slightly less diameter than that of the bore 13.

Mounted on the respective uprights 9 and 11 are a pair of sleeves 16 and 17, respectively, through which the armature 14 and striker 15 extend, the bores of the respective sleeves being of slightly larger diameter than the diameter of the armature and striker to provide clearance between the respective parts, and, as illustrated in Figs. 2 and 3, the sleeves are each provided with a radially extending slot, the sleeve 16 being provided with the slot 18, and the sleeve 17 being provided with the slot 21. The sleeves 16 and 17 are illustrated in the present instance as secured to their respective uprights by screws 22 and 23.

Positioned between the uprights 9 and 11 is a U-shaped permanent magnet indicated generally by the numeral 24, the legs 25 and 26 of which are provided with bores 27 and 28, respectively, through which the respective sleeves 16 and 17 extend, the diameter of the bores 27 and 28 being of approximately the same size as the adjacent portions of the respective sleeves. Positioned between the legs of the magnet 24 and encircling the armature 14 is winding 29, the latter being wound on a suitable spool 31 of non-magnetic material.

The inner end 32 of the armature 14 is spaced from the adjacent end 17a of the sleeve 17 to form an air gap therebetween, the armature being maintained in its normal position by a leaf spring 33 secured at one end to the upright 9 by the block 34 and screws 35, the free end of the spring being slotted as indicated at 36, whereby the spring may bear against the head 37 formed on the adjacent end of the armature 14.

Positioned adjacent the closed end of the housing 1 and secured thereto by a bolt 41 is a bell member 42, the bolt 41 passing through a hole in the bell 42 and threaded into a block 43 mounted on the bottom 4 of the housing by screws 44. Rotation of the bell 42 relative to the housing 1 is prevented by pin 45 engaging both the bell and the block 43. The striker 15 extends through a hole 46 in the side wall of the housing 1 and is of a length to strike the bell 42 when the device is actuated.

In the construction illustrated, the housing 1 is provided with a second cover member 47, also secured to the housing by screws 48. The cover 2 carries a suitable socket 49 co-operable with a plug 51 mounted on the cover 47 with the ends 52 and 53 of the winding 29 being connected to

terminals 49a and 49b of the socket 49, and makes connection with the corresponding terminals 51a and 51b of the plug 51. Thus by removing the screws 48, the bell structure, including the socket 49, may be readily separated from the member 47 and plug 51, thereby facilitating removal or replacement of the bell structure.

The device is adapted to be actuated by the application of an alternating current to the winding 29. Prior to the application of alternating current to the winding, the elements of the device will be in the position illustrated in Figs. 1 and 2 with the spring 33 maintaining the armature 14 and striker 15 in the position illustrated. It will be apparent that, as the adjacent end 32 of the armature 14 and sleeve and end 17a of the sleeve 17 are of opposite polarity as a result of the magnetic forces existing in the legs 25 and 27 of the permanent magnet 24, the armature 14 will be attracted to the end 17a of the sleeve, which action is resisted by the spring 33. Upon the energization of the winding 29 by an alternating current, as for example from a sixty cycle power line, the winding will create a magnetic field which is alternating in polarity, which field will thus alternatively oppose and supplement the permanent field set up by the magnet 24. Such action will result in axial vibration or reciprocation of the armature 14 and striker 15, with the striker hitting the bell 42 at the end of each outward stroke, thereby ringing the same. The action of the striker 15 is, of course, very rapid and results in a large volume of sound being produced by the bell 42. The efficiency of a bell constructed in accordance with the present invention is readily illustrated by the fact that such a bell may be actuated under normal operation on approximately 20% less current than alarm bells heretofore employed. Likewise, a bell employing a winding intended for use on a twelve volt circuit will provide an audible alarm when operated down as low as four volts, and similarly a bell constructed for normal use on one hundred and fifteen volts will provide an audible alarm with only forty volts applied to the winding. The present invention is particularly intended for use as an alarm in fire alarm circuits, and it is, of course, particularly desirable that the operation of the device not be dependent on critical operating voltages, so that the length, and thus the resistance of the circuit wire, will have relatively little effect on the satisfactory operation of the bell within wide limits.

It will also be noted that the device may be readily operated on different voltages merely by substituting a different winding 29, the remaining elements of the device being employed in either case.

The slots 18 and 21 in the sleeves 16 and 17 are provided merely to eliminate the building up of large induced currents in the structure, which would tend to heat up the same.

It might be mentioned that tests of bells constructed in accordance with the present invention indicate that a six inch bell, constructed as herein shown and described, is comparable in audible volume with eight inch bells presently employed in alarm circuits, and an eight inch bell is comparable in volume to previous ten inch bells when operated on normal working voltages.

While the vibrator structure is particularly adapted for use in a bell structure, as herein shown and described, it will be apparent that the vibrator structure may be of particular use in other applications where a simple and inexpensive, but very efficient vibrator structure is required.

Having thus described our invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of our invention; hence, we do not wish to be understood as limiting ourselves to the exact form, construction, arrangement, and combination of parts herein shown and described, or uses mentioned.

What we claim as new and desire to secure by Letters Patent is:

1. In a bell structure, the combination of a housing, a base member of non-magnetic material positioned in said housing, a pair of spaced sleeve elements of ferro-magnetic material carried by said base member, said sleeves each having a bore therein axially aligned with one another, a U-shaped, permanent type magnet, each of the respective poles of the latter having a bore therein through which said sleeves respectively extend, an armature of ferro-magnetic material slidably carried in the bore of one of said sleeves with the inner end thereof positioned adjacent to but spaced from the other of said sleeves, said armature having an axially aligned extension of non-magnetic material at the inner end thereof positioned in the bore of the other sleeve, a field winding positioned between the poles of said magnet and encircling said armature, said winding being adapted to be connected to a source of alternating current, a leaf spring mounted on said base member and engageable with said armature for restricting axial movement of the latter, and a bell member carried by said housing, a portion of which is positioned in the path of an adapted to be struck by the extension of said armature.

2. In a vibrator structure, the combination of a base member of non-magnetic material, a pair of spaced sleeve elements of ferro-magnetic material carried by said base member, said sleeves each having a bore therein axially aligned with one another, a U-shaped, permanent type magnet, each of the respective poles of the latter having a bore therein through which said sleeves respectively extend, an armature of ferro-magnetic material slidably carried in the bore of one of said sleeves with the inner end thereof positioned adjacent to but spaced from the other of said sleeves, said armature having an axially aligned extension of non-magnetic material at the inner end thereof positioned in the bore of the other sleeve, a field winding positioned between the poles of said magnet and encircling said armature, said winding being adapted to be connected to a source of alternating current, and a leaf spring mounted on said base member and engageable with said armature for restricting axial movement of the latter.

3. In a vibrator structure, the combination of a base member of non-magnetic material, a pair of spaced sleeve elements of ferro-magnetic material carried by said base member, said sleeves each having a bore therein axially aligned with one another and a radially extending slot therein extending from the periphery of the respective sleeve to the bore therein, a U-shaped, permanent type magnet, each of the respective poles of the latter having a bore therein through which said sleeves respectively extend, an armature of ferro-magnetic material slidably carried in the bore of one of said sleeves with the inner end thereof positioned adjacent to but spaced from the other of said sleeves, said arma-

ture having an axially aligned extension of non-magnetic material at the inner end thereof positioned in the bore of the other sleeve, a field winding positioned between the poles of said magnet and encircling said armature, said winding being adapted to be connected to a source of alternating current, and a leaf spring mounted on said base member and engageable with said armature for restricting axial movement of the latter.

4. In a bell structure, the combination of a housing, a base member positioned in said housing, a pair of spaced sleeve elements carried by said base member, said sleeves each having a bore therein axially aligned with one another, a U-shaped permanent type magnet, each of the respective poles of the latter having a bore therein through which said sleeves respectively extend, an armature slidably carried in the bore of one of said sleeves, said armature having an extension of non-magnetic material at one end thereof positioned in the bore of the other sleeve, a winding inductively related to said armature, said winding being adapted to be connected to a source of alternating current, spring means related to said armature for restricting axial movement of the latter, and a bell member carried by said housing, a portion of which is positioned in the path of and adapted to be struck by the extension of said armature.

5. In a bell structure, the combination of a housing, a base member positioned in said housing, a pair of spaced sleeve elements carried by said base member, said sleeves each having a bore therein axially aligned with one another, permanent magnet means related to the respective sleeves whereby the latter are of opposite polarity, an armature slidably carried in the bore of one of said sleeves, said armature having an extension of non-magnetic material at one end thereof positioned in the bore of the other sleeve, a winding inductively related to said armature, said winding being adapted to be connected to a source of alternating current, spring means related to said armature for restricting axial movement of the latter, and a bell member carried by said housing, a portion of which is positioned in the path of and adapted to be struck by the extension of said armature.

6. In a vibrator structure, the combination of a base member, a pair of spaced sleeve elements carried by said base member, said sleeves each having a bore therein axially aligned with one another, a U-shaped permanent type magnet each of the respective poles of the latter having a bore therein through which said sleeves respectively extend, an armature slidably carried in the bore of one of said sleeves, said armature having an extension of non-magnetic material at one end thereof positioned in the bore of the other sleeve, a winding inductively related to said armature, said winding being adapted to be connected to a source of alternating current, and spring means related to said armature for restricting axial movement of the latter.

7. In a vibrator structure, the combination of a base member, a pair of spaced sleeve elements carried by said base member, said sleeves each having a bore therein axially aligned with one another, permanent magnet means related to the respective sleeves whereby the latter are of opposite polarity, an armature slidably carried in the bore of one of said sleeves, said armature having an extension of non-magnetic material at one end thereof positioned in the bore of the other sleeve, a winding inductively related to said armature, said winding being adapted to be connected to a source of alternating current, and spring means related to said armature for restricting axial movement of the latter.

8. In a vibrator structure comprising a permanent magnet formed by a pair of spaced, relatively fixed, magnetically polarized members, said members being of opposite polarity, an elongated armature of permeable material operatively mounted with respect to one of said members and adapted to be inductively polarized thereby, said armature extending between said members, with one end positioned adjacent to, but spaced from the other member, means for supporting said armature for axial movement toward and away from said other member, a winding inductively coupled to said armature whereby the armature is adapted to be inductively polarized, said winding being adapted to be connected to a source of alternating current, and spring means related to said armature for restricting axial movement thereof.

9. In a vibrator structure comprising a permanent magnet, an elongated armature of permeable material, means for supporting said armature for axial movement, said permanent magnet including a pair of spaced, relatively fixed, magnetically polarized members aligned on the axis of said armature, the latter extending between said members, with one end of said armatures positioned adjacent to, but spaced from one of said pole members and movable toward and away from the same, a winding inductively coupled to said armature, said winding being adapted to be connected to a source of alternating current, and spring means operatively connected to said armature for restricting axial movement thereof.

FRANK W. JACKSON.
HARRY M. NACEY.

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