March 31, 1964 J. E. RUSSO ETAL 3,127,602

AUDIBLE SIGNAL DEVICE

Filed Nov. 3, 1960

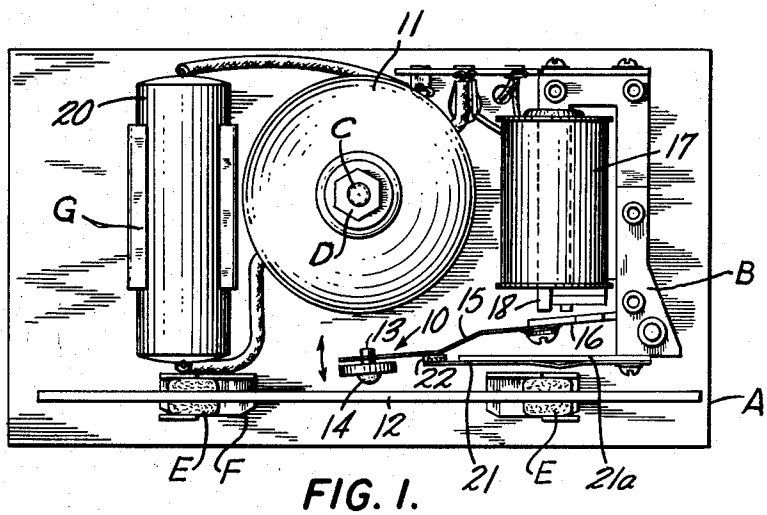


FIG. 1.

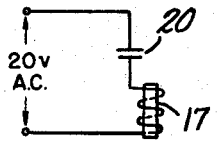


FIG. 3.

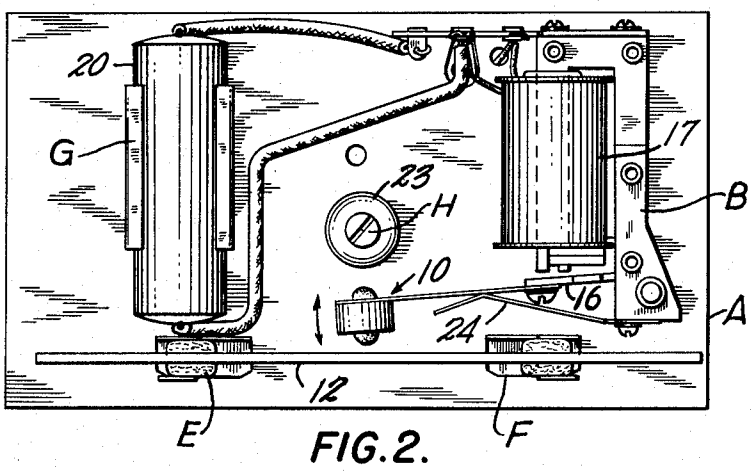


FIG. 2.

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United States Patent Office 3,127,602 Patented Mar. 31, 1964

3,127,602

AUDIBLE SIGNAL DEVICE

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Filed Nov. 3, 1960, Ser. No. 67,105
6 Claims. (Cl. 340—392)

This invention relates to improvements in audible signal devices, and more particularly, to a novel bell having a distinctive and pleasant sound which can be actuated by a relatively low power supply.

The bell of the present invention embodies a sound-producing element, a clapper actuated by an electromagnet and a yieldable positioning element for the clapper which normally maintains the clapper out of engagement with the sound-producing element. The sound is produced on the stroke of the clapper which results from the deenergization of the electromagnet. That is to say, upon energization of the electromagnet, the clapper is raised away from its yieldable positioning element, and upon release, the clapper falls into engagement with the yieldable positioning element, deflecting it and permitting the clapper to strike the sound-producing element lightly and but momentarily. The positioning element thereafter immediately restores the clapper to a raised position out of contact with the sound-producing element, whereupon the cycle is repeated.

In a preferred embodiment of the present invention, a two-tone signal is produced by employing an arrangement in which the clapper strikes a gong when actuated in one direction by the energization of the electromagnet and a chime or tone bar upon deenergization of the electromagnet. The present invention is particularly applicable to this type of bell because the actuation of the clapper can be effectively controlled to strike the gong sharply and the chime lightly.

A sharp single sound effect is produced by employing a permanent magnet in the bell which offers resistance to the movement of the clapper in the direction of the gong until a sufficiently high force is exerted on the clapper by the electromagnet to release the clapper from the permanent magnet. Upon release, the clapper will move against the gong at high velocity and cause the clapper to strike the gong with a sharp blow. This feature of the present invention is applicable not only to the novel bell of the present invention, but also to other types of bells.

The bell of the present invention has a wide variety of applications, but it is particularly adapted for use in or with telephone circuits.

For a complete understanding of the present invention, reference may be made to the detailed description which follows and to the accompanying drawing, in which:

FIGURE 1 is an elevational view of a two-tone bell of the present invention;

FIGURE 2 is an elevational view of an alternative embodiment of the present invention in which the sound is produced by a chime bar; and

FIGURE 3 is a circuit diagram for the bells shown in FIGURES 1 and 2.

The two-tone bell shown in FIGURE 1 comprises a clapper **10** interposed between a gong **11** and a chime or tone bar **12**. The clapper includes a loosely mounted hammer having striker tips **13** and **14** on opposite sides thereof and a supporting flexible arm **15**. The hammer is loosely mounted to the arm so that it will have limited freedom of movement relative to the arm. This permits the arm a slight amount of motion without encountering the inertia of the hammer and helps provide a better

signal. The flexible arm **15**, in turn, is connected to a pivotal armature **16** of an electromagnet **17**.

The above components are all suitably mounted on a backboard panel A. More specifically, the electromagnet **17** and the pivotal armature **16** thereof are mounted in a frame B which is affixed to the backboard panel A. The gong **11** is mounted on a post C which projects forwardly from the backboard panel A, and the gong is held thereon by a nut D threaded onto the end of the post. The tone bar **12** is supported by non-damping elements E and mounted to the backboard panel A by clips F.

Upon energization of the electromagnet **17**, the armature **16** is raised toward the pole face **18**, bringing the striker tip **13** into contact with the gong **11**, and upon deenergization of the electromagnet the armature is released causing the striker tip **14** to strike the chime bar **12**.

The electromagnet **17** can be energized with an A.C. or D.C. power supply. In one operative embodiment it is energized by a 20-cycle alternating current power supply, and a capacitor **20** is connected in series with the electromagnet (see the circuit diagram of FIGURE 3) to block any D.C. current transmitted by the power supply. Obviously, the capacitor is not required for D.C. operation. The capacitor, incidentally, is held to the backboard panel A by a clip G.

The bell clapper is normally supported in its position intermediate the gong **11** and chime bar **12** by a yieldable positioning element **21**. The yieldable positioning element **21** is anchored at one end, and in the embodiment shown in FIGURE 1, it carries a permanent magnet **22** at its free end, the permanent magnet being disposed directly beneath the flexible arm **15**. A relatively rigid suppressor bar **21***a* is positioned above the element **21** to limit upward deflection of the element **21**. The bar **21***a*, however, does not interfere with the downward deflection of the element **21**.

The flexible arm **15** is made of magnetic material, and its action is, therefore, influenced by the magnet. More specifically, upon energization of the electromagnet **17**, the permanent magnet holds the arm **15**, causing it to deflect, until a sufficient force is exerted upon the arm to release it from the permanent magnet. As a result of the force exerted on the flexible arm by the electromagnet and the energy stored in the arm by the deflection thereof, a high velocity is imparted to the clapper on its upstroke, causing it to strike the gong **11** with a sharp blow to produce a clear and distinctive sound.

Upon deenergization of the electromagnet **17**, the clapper falls of its own weight toward the chime bar **12**. However, before striking the chime bar on the downstroke of the clapper, the arm **15** comes into engagement with the permanent magnet, deflecting the yieldable element **21** so that the clapper strikes the chime bar lightly and but momentarily. Upon striking the chime bar, the yieldable element **21** immediately lifts the clapper away from the chime bar, permitting the chime bar to reverberate without interference from the clapper. The combined effects of the gong and the chime bar produce a distinctive and pleasant sound.

An alternative embodiment of the bell of the present invention is shown in FIGURE 2 in which the gong **11** is replaced by a snubber **23** mounted on a post H of the backboard panel. On the upstroke of the clapper **10** the snubber post produces no audible signal. Upon deenergization of the electromagnet, the clapper falls onto a resilient positioning element **24**, which functions in the same manner as the corresponding element **21** described above in connection with the embodiment shown in FIGURE 1, thereby controlling the striking action of the clapper against the chime bar.

The invention has been shown and described in preferred forms only and by way of example, and many

variations and modifications may be made therein within the spirit of the invention. Therefore, the invention is not to be limited to any specified form or embodiment except insofar as such limitations are set forth in the appended claims.

We claim:

1. An audible signal device comprising two spaced-apart sound-producing elements, one to be struck by a sharp blow and the other to be struck by a light, momentary blow, an oscillatory clapper interposed between the two sound-producing elements and engaging the sound-producing element to be struck sharply when moving against the force of gravity on one stroke and the sound-producing element to be struck lightly when moving with the force of gravity on the opposite stroke, a resilient positioning element engaging and resisting the movement of the clapper during its stroke toward the sound-producing element which is to be engaged lightly and but momentarily, said resilient positioning element normally maintaining the clapper in an intermediate position between the sound-producing elements when it is not being actuated, and an electromagnet operatively associated with the clapper and moving the clapper to strike the one sound-producing element to be struck sharply upon energization, the momentum of the clapper toward the sound-producing element to be struck lightly overcoming the resistance of the resilient positioning element upon deenergization of the electromagnet so that the clapper strikes the other sound-producing element lightly and but momentarily, whereby the resilient positioning element imparts a force to the clapper causing it to strike one sound-producing element sharply and resists the movement of the clapper toward the other sound-producing element causing it to strike said other sound-producing element lightly and but momentarily.

2. A two-tone bell comprising a gong and chime bar spaced apart from each other, an oscillatory clapper which engages the gong sharply on one stroke and the chime bar lightly on the opposite stroke, a resilient positioning element engaging the clapper and resisting its stroke toward the chime bar and supporting the clapper in a position intermediate the gong and the chime bar when the clapper is at rest, and an electromagnet operatively connected with the clapper and moving the clapper against the gong upon energization of the electromagnet, and releasing the clapper to fall toward the chime bar upon deenergization of the electromagnet, the momentum of the falling clapper overcoming the resistance of the resilient positioning element so that the clapper strikes the chime bar lightly and but momentarily.

3. An audible signal device comprising a clapper, means imparting oscillatory motion to the clapper, a pair of sound-producing devices on opposite sides of the clapper, one to be struck sharply by the clapper and the other to be struck lightly and but momentarily, a resilient element engageable by the clapper in moving toward the sound-producing device to be struck lightly and but momentarily, said resilient element resisting the movement of the clapper toward the sound-producing device to be struck lightly and but momentarily and immediately moving it out of contact therewith, and a magnet carried by said resilient element which attracts and holds the clapper until sufficient force is built up by the oscillatory motion-imparting means to release the clapper from the magnet and move it in the direction of the sound-producing device to be struck sharply.

4. An audible signal device as set forth in claim 3 in which the sound-producing device to be struck sharply is a gong and in which the sound-producing device to be struck lightly and but momentarily is a tone bar.

5. An audible signal device as set forth in claim 3 including means engageable with the resilient element to offer additional resistance to its movement toward the sound-producing device to be struck sharply.

6. A two-tone bell comprising a gong and chime bar spaced apart from each other, an oscillatory clapper which engages the gong sharply on one stroke and the chime bar lightly on the opposite stroke, a resilient positioning element engageable with the clapper during its stroke toward the chime bar and supporting the clapper in a position intermediate the gong and the chime bar when the clapper is at rest, an electromagnet which upon energization moves the clapper against the gong and upon deenergization thereof permits the clapper to fall against the resilient positioning element, causing the clapper to strike the chime bar lightly and but momentarily, and a rigid bar adjacent the supported end of the leaf spring but shorter in length than the leaf spring so that the free end of the leaf spring extends beyond the end of the rigid bar, the rigid bar limiting the deflection of the leaf spring in the direction of the gong but not in the direction of the chime bar.

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