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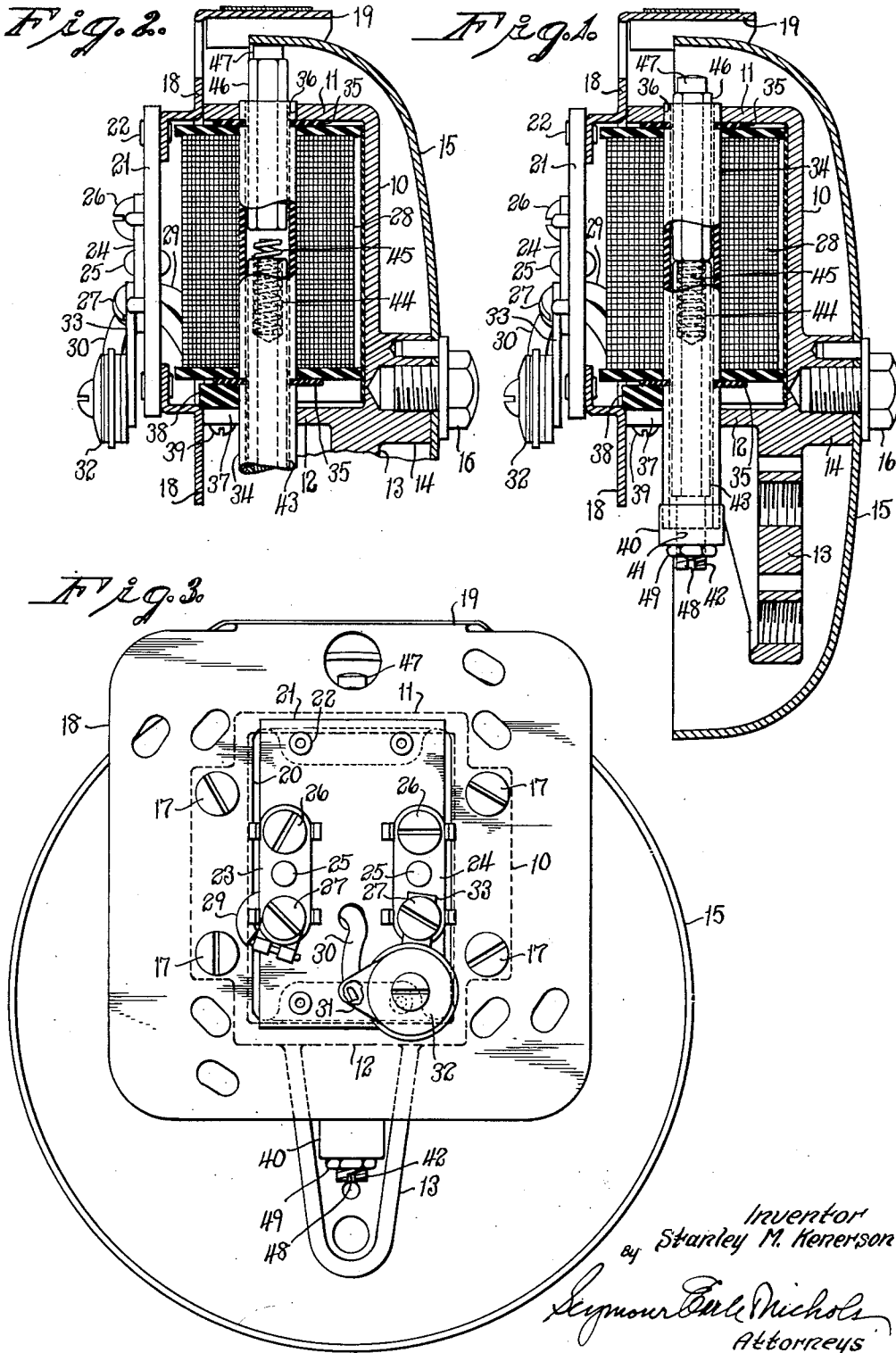
S. M. KENERSON

2,357,743

ELECTROMAGNETIC AUDIBLE SIGNAL

Filed April 2, 1941

2 Sheets-Sheet 1



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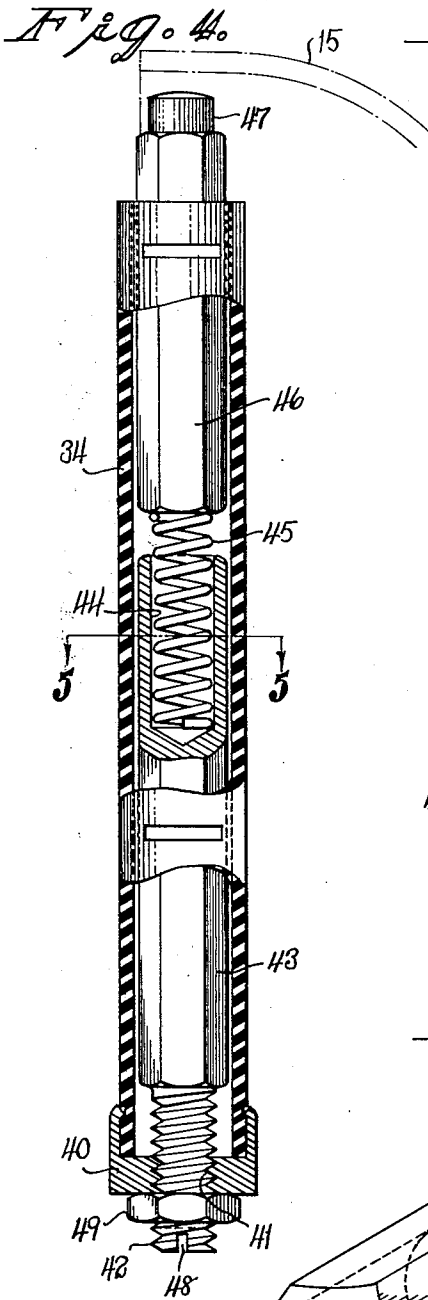
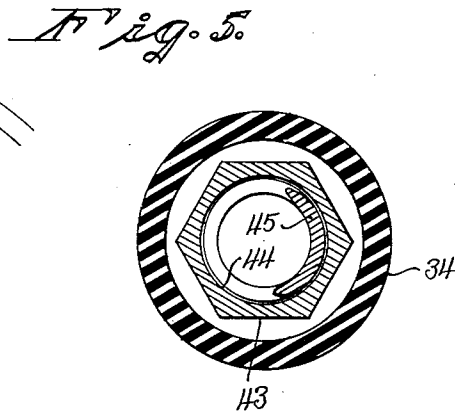
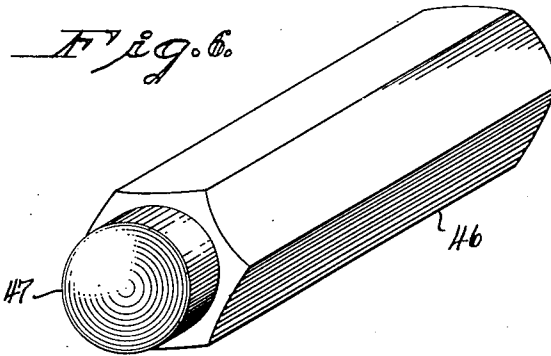
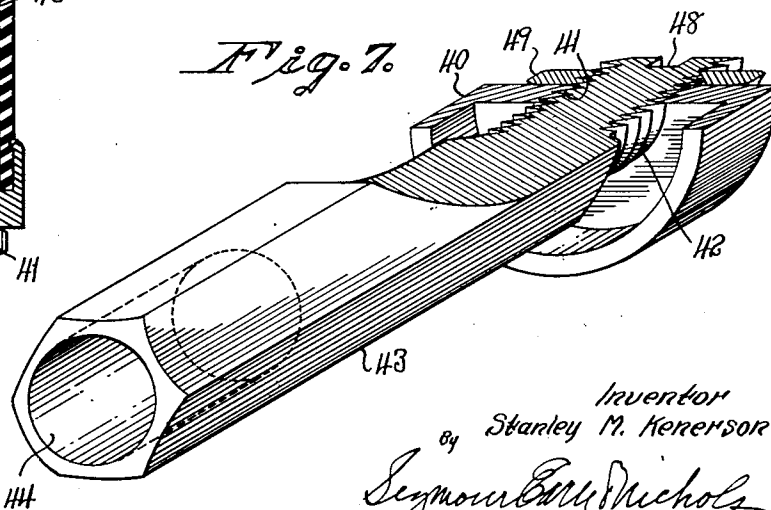
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ELECTROMAGNETIC AUDIBLE SIGNAL

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4 Claims. (Cl. 172-126)

The present invention relates to improvements in electromagnetic audible signals which may take the form of bells, gongs or buzzers. More particularly, the present invention relates to improvements in electromagnetic audible signals which are actuated by alternating or other pulsating currents such, for instance, as rectified alternating current.

One of the objects of the present invention is to provide a superior audible signal of the character referred to which may be produced at a low cost for manufacture and which may be relied upon to effectively perform over long periods of use.

Another object of the present invention is to provide a superior audible signal of the character referred to in which a construction and arrangement of parts is employed which guards against the undue wear of the guide-means for a reciprocating armature and affords ready adjustment.

A still further object of the present invention is to provide a superior audible signal for operation by a pulsating electric current in which is employed a striker responding with high force to the action of relatively-weak magnetism.

Still another object of the present invention is to provide a device of the character referred to wherein a movable magnetic core-piece is substantially axially aligned with a fixed magnetic core-piece and in which also the two said core-pieces may approach each other closely when the audible signal is energized without requiring excessive length, to thereby minimize the dimensions of the device for a given degree of power.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a view in central transverse-vertical section of an electromagnetic audible signal constructed in accordance with the present invention and showing the reciprocating core-piece or striker in the position which it assumes when the energizing-coil is supplied with current;

Fig. 2 is a similar but less comprehensive view showing the striker core-piece in the position which it assumes immediately following the cessation of current-flow in the energizing-coil;

Fig. 3 is a view in rear elevation of the electromagnetic audible signal of the preceding figures;

Fig. 4 is a view partly in side elevation and partly in central-longitudinal section of the core-unit detached;

Fig. 5 is a transverse sectional view taken on the line 5-5 of Fig. 4 but on a larger scale;

Fig. 6 is a perspective view of the reciprocating core-piece or striker detached; and

Fig. 7 is a perspective view of the stationary core-piece, together with the adjacent cap and lock-nut, parts of the unit being shown in central-longitudinal section.

The particular electromagnetic audible signal herein chosen for purposes of illustrating the present invention includes a frame 10 which may be conveniently formed of cast iron and includes a horizontal rearwardly-projecting upper arm 11 and a complementary horizontal rearwardly-projecting lower arm 12. The said frame also includes a perforated depending mounting-arm 13 to which bells of various diameters may be secured to the said frame 10.

The frame 10 above referred to also includes a forwardly-projecting centrally-threaded boss 14 against the forward face of which (in the instance shown) is clamped a cup-shaped bell 15 by means of a clamping-screw 16.

Secured to the rear face of the frame 10 by means of screws 17 or the like is a metallic assembly-plate 18 which is of substantially-rectangular form in elevation and which has its upper end bent forwardly to provide a guard-flange 19. The assembly-plate 18 is also formed with a substantially-rectangular central aperture 20 which is spanned by an insulating-plate 21 of fibre or the like. As shown, the said insulating-plate may be secured to the assembly-plate 18 by four (more or less) tubular rivets 22.

Mounted against the rear face of the insulating-plate 21 above referred to are two vertically-extending and laterally-spaced-apart terminal-plates 23 and 24, each of which may be secured in place in the location referred to by means of a rivet such as 25, as is shown particularly well in Fig. 3. Each of the terminal-plates 23 and 24 may be conveniently made of brass or other electro-conductive material and as shown, each thereof is provided adjacent its upper end with a binding-screw 26 and adjacent its lower end with a second binding-screw 27 for purposes as will hereinafter appear.

Mounted between the rearwardly-extending horizontal arms 11 and 12 of the frame 10 is an energizing-coil 28 having one of its terminal-

leads 29 extending to the lower binding-screw 27 of the terminal-plate 23. The other or complementary terminal-lead 30 of the energizing-coil 28 leads to one terminal 31 of a copper-oxide or dry-plate rectifier generally designated by the reference character 32, and requiring no detailed description herein, inasmuch as it is a well-known device for blocking out one-half of the wave of an alternating current. The complementary terminal 33 of the rectifier 32 is clamped to the lower binding-screw 27 of the terminal-plate 24.

When suitable leads from a source of alternating current are respectively connected to the upper binding-posts 25—26 of the terminal-plates 23 and 24, the energizing-coil 28 will receive current through the connections previously described.

Extending axially through the energizing-coil 28 is a core-tube 34 formed of non-magnetic insulating material such, for instance, as fabric impregnated with phenolic resins. The said core-tube 34 is held against axial displacement with respect to the energizing-coil 28 by means of two retaining-keys 35—35 respectively located against the upper and lower end faces of the energizing-coil 28 and fitting into suitable notches formed in the outer surface of the said core-tube.

The core-tube 34 above referred to, in addition to extending axially through the energizing-coil 28, extends also upwardly through an aligned aperture 36 in the upper horizontal arm 11 of the frame 10. The lower portion of the said core-tube extends downwardly through a rearwardly-opening notch 37 formed in the lower horizontal arm 12 of the frame 10. The lower end of the energizing-coil 28 and the adjacent retaining-key 35 are normally spaced upwardly from the upper surface of the horizontal arm 12 of the frame 10 to thus crowd the upper surface of the upper key 35 against the under face of the horizontal arm 11. This spacing permits the unit comprising the energizing-coil 28, the core-tube 34 and the parts to be hereinafter described which are carried by the said core-tube, to be maneuvered into and out of installed positions between the two said arms 11 and 12. After the installation of the unit just referred to, the said unit may be maintained in place by a spacer-block 38 preferably formed of insulating material and secured by means of one or more screws such as 39 to the upper face of the horizontal arm 12 at a point to the rear of the core-tube 34 and in position to span the rear portion of the notch 37 in the said arm 12.

At its lower end, the core-tube 34 has rigidly secured to it a cup-shaped cap 40 which may be conveniently made of aluminum and which, as is particularly well shown in Figs. 4 and 7, is formed with an axial threaded passage 41 through which extends the externally-threaded depending stem 42 of a stationary core-piece 43 formed of soft iron or other suitable magnetic material. The said stationary core-piece 43 is housed within the lower end of the core-tube 34 and has its inner or upper end terminating about midway the axial length of the energizing-coil 28. In its upper or inner portion, the stationary core-piece 43 is formed with an upwardly-opening axial recess 44 receiving the lower end of a helical striker-spring 45.

The upper end of the striker-spring 45 above referred to impinges against the lower or inner end of a reciprocating core-piece or striker 46 housed

mainly within the upper portion of the core-tube 34 with capacity for vertical reciprocation therein. Like the stationary core-piece 43, the reciprocating core-piece or striker 46 is formed of iron or other suitable magnetic material. The said striker normally projects upwardly beyond the upper end of the core-tube 34, as is especially well shown in Fig. 4, and is preferably provided with a striker-head 47 which is preferably formed of chrome-nickel steel or other suitable hard and relatively non-magnetic material. It is preferred to have the striker-head 47 of non-magnetic material to avoid the possibility of having the reciprocating core-piece or striker 46 stick to the bell 15 when the latter is formed of magnetic material, as is most economical.

Normally, when there is no current supplied to the energizing-coil 28, the reciprocating core-piece or armature 46 will occupy substantially the position in which it is shown in Fig. 4, in which figure it will be noted, the striker-head 47 is below the inner surface of the bell 15 with which it is adapted to engage. Now when, for instance, a supply of 60-cycle alternating current is supplied to the terminal-plates 23 and 24, the rectifier 32 will "block out," so to speak, one-half of the wave, with the result that the energizing-coil 28 will receive but 60 unidirectional energizations per second.

Each energization of the energizing-coil 28 will result in the magnetization of both the stationary core-piece 43 and the reciprocating core-piece or striker 46. This magnetization will cause the striker 46 to move downwardly against the tension of the striker-spring 45 into substantially the position shown in Fig. 1 and into engagement or substantial engagement with the upper end of the stationary core-piece 43. The instant that the current through the energizing-coil ceases, the striker-spring 45 will assert itself and will upwardly propel the striker 46 to thus engage the striker-head 47 with the bell 15 as shown in Fig. 2. Immediately following each engagement of the striker-head 47 with the bell 15, the entire reciprocating core-piece or striker 46 will rebound downwardly, away from the said bell, and thus permit the latter to freely resonate.

If desired, the rectifier 32 may be omitted, and a pulsating or sinuous full-wave current fed to the energizing-coil 28, though it has been found that the best results are achieved with a low frequency which may be conveniently accomplished by the simple expedient of employing alternating current of commercial frequency and "blanketing out," so to speak, part of the waves thereof.

The projecting lower end of the stem 42 of the stationary core-piece 43 is provided with a kerf or slot 48 for the reception of a screw driver or other suitable tool. Normally threaded upon the projecting lower end of the said stem 42 and in tight engagement with the under face of the cap 40 of the core-tube 34, is a lock-nut 49 which serves to hold or lock the stationary core-piece 43 in any given position of axial adjustment.

The normal or "at rest" position of the reciprocating core-piece 46 and consequently both the retired and projected positions of the said core-piece, may be conveniently altered or adjusted by first loosening the lock-nut 49 and turning the stationary core-piece 43 by means of its kerf 48 to axially upwardly advance or downwardly retire the said core-piece 43 and hence, also, the core-piece 46. When the proper position of adjustment is accomplished for the core-piece 43, so that the bell 15 or other sounding device res-

onates properly, the core-piece 43 may be locked in this position against displacement by the vibration of the parts, by turning the lock-nut 49 into firm engagement with the under face of the cap 40 of the core-piece 43.

It is to be noted that the parts illustrated in full lines in assembled relationship in Fig. 4 may be handled as a unit and installed in and removed from the energizing-coil 28 as such a unit.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. An electromagnetic vibrator-device including: an impact-abutment; a solenoid energizing-coil; a movable striker core-piece of magnetic material extending in said coil and having a striker-head adapted to strike said impact-abutment, and a thrust-abutment; a stationary core-piece of magnetic material extending in said coil and having a thrust-abutment; a spring in said coil between and adapted to engage said thrust-abutments; said striker core-piece being constructed and arranged to be vibrated only in a direction away from said impact-abutment and to stress said spring, by a pulsating electric current flowing through said coil, and said spring being constructed and arranged to vibrate said striker core-piece only toward said impact-abutment and in consequence to vibrate said striker-head against said impact-abutment; and a current-rectifier in series with said coil and constructed and arranged to block out one-half of each wave of an alternating pulsating electric current to convert it into a unidirectional pulsating electric current.

2. An electromagnetic vibrator-device including: an impact-abutment; a solenoid energizing-coil; a movable striker core-piece of magnetic material extending in said coil and having a striker-head adapted to strike said impact-abutment, and a thrust-abutment; a stationary core-piece of magnetic material extending in said coil and having a thrust-abutment; a spring in said coil between and adapted to engage said thrust-abutments; said striker-head being spaced a substantial distance from said impact-abutment when said spring is in contact with said thrust-abutments and said spring being constructed and arranged not to thrust said striker-head against said impact-abutment, when no electric current is flowing through said coil; said striker core-piece being constructed and arranged to be vibrated only in a direction away from said impact-abutment and to stress said spring, by a pulsating electric current flowing through said coil, and said spring being constructed and arranged to vibrate said striker core-piece only toward said impact-abutment and in consequence to vibrate said

striker-head against said impact-abutment; and a current-rectifier in series with said coil and constructed and arranged to block out one-half of each wave of an alternating pulsating electric current to convert it into a unidirectional pulsating electric current.

3. An electromagnetic vibrator-device including: an impact-abutment; a solenoid energizing-coil; a movable striker-core-piece of magnetic material extending in said coil and having a striker-head adapted to strike said impact-abutment, and a thrust-abutment; a stationary core-piece of magnetic material extending in said coil and having a thrust-abutment; a spring in said coil between and adapted to engage said thrust-abutments; said striker core-piece being constructed and arranged to be vibrated only in a direction away from said impact-abutment and to stress said spring, by a pulsating electric current flowing through said coil, and said spring being constructed and arranged to vibrate said striker core-piece only toward said impact-abutment and in consequence to vibrate said striker-head into engagement with said impact-abutment; and one of said core-pieces having a substantially-axial spring-receiving recess of a depth at least equal to a major portion of the length of said spring and of a diameter sufficient to permit the spring to freely slide therein; and a current-rectifier in series with said coil and constructed and arranged to block out one-half of each wave of an alternating pulsating electric current to convert it into a unidirectional pulsating electric current.

4. An electromagnetic vibrator-device including: an impact-abutment; a solenoid energizing-coil; a movable striker core-piece of magnetic material extending in said coil and having a striker-head adapted to strike said impact-abutment, and a thrust-abutment; a stationary core-piece of magnetic material extending in said coil and having a thrust-abutment; a spring in said coil between and adapted to engage said thrust-abutments; said striker-head being spaced a substantial distance from said impact-abutment when said spring is in contact with said thrust-abutments and said spring being constructed and arranged not to thrust said striker-head against said impact-abutment, when no electric current is flowing through said coil; said striker core-piece being constructed and arranged to be vibrated in a direction away from said impact-abutment and to stress said spring, by a pulsating electric current flowing through said coil, and said spring being constructed and arranged to vibrate said striker core-piece toward said impact-abutment and in consequence to vibrate said striker-head into engagement with said impact-abutment; and one of said core-pieces having a substantially-axial spring-receiving recess of a depth at least equal to a major portion of the length of said spring and of a diameter sufficient to permit the spring to freely slide therein.

STANLEY M. KENERSON.