United States Patent [19]

Youhanaian

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[45] Sept. 18, 1973

[54] AUDIO SIGNALLING DEVICE

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[73] Assignee: Littelfuse, Inc., Des Plaines, Ill.

[22] Filed: Sept. 10, 1971

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[52] U.S. Cl. 340/388, 340/402

[51] Int. Cl. G10k 9/12

[58] Field of Search ..... 340/388, 402, 403, 340/384 R

[56] References Cited

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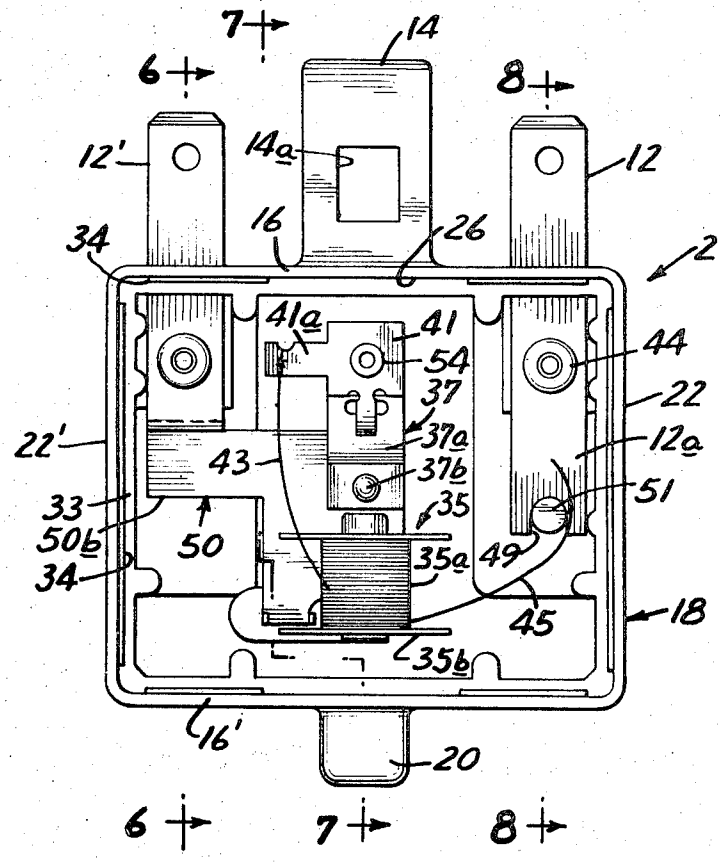
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Primary Examiner—John W. Caldwell
Assistant Examiner—William M. Wannisky
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[57] ABSTRACT

An audio signalling unit including a housing body made of molded synthetic plastic material and having an end wall and transversely extending side walls defining an opening into the housing body. This housing body has various positioning shoulders and locator means molded integrally therewith for supporting and positioning a vibratable reed, contact carrying plates and a coil all forming a buzzer which vibrates the reed. The opening into said housing body is closed by a vibratable metal buzzer-forming diaphragm bridging the side walls of the housing body and coated on the outside thereof with an insulating material so that no electrical contact can be made with the metal body of the diaphragm from the outside of the housing and the outer surface thereof is insulated from the electrical conponents inside the housing.

14 Claims, 10 Drawing Figures



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SHEET 1 OF 2

FIG. 1

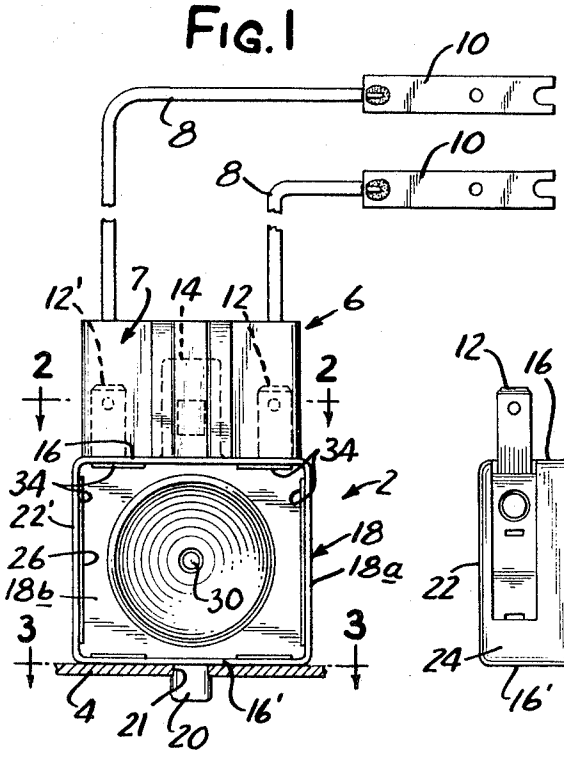


FIG. 3

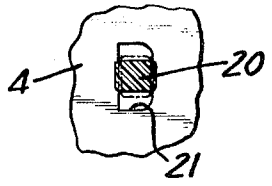


FIG. 4

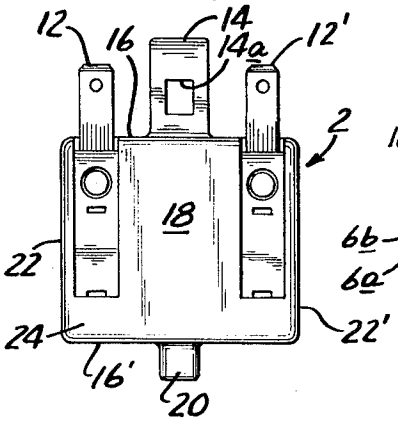


FIG. 2

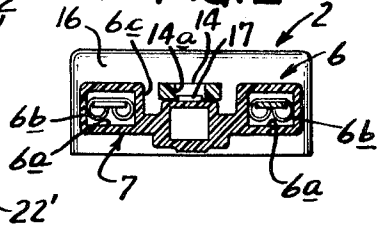
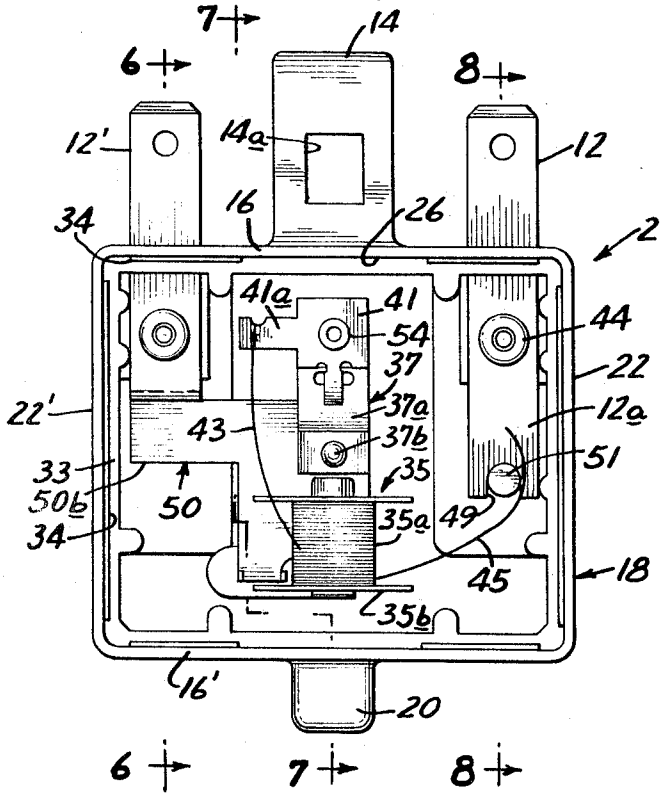


FIG. 5



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FIG. 6

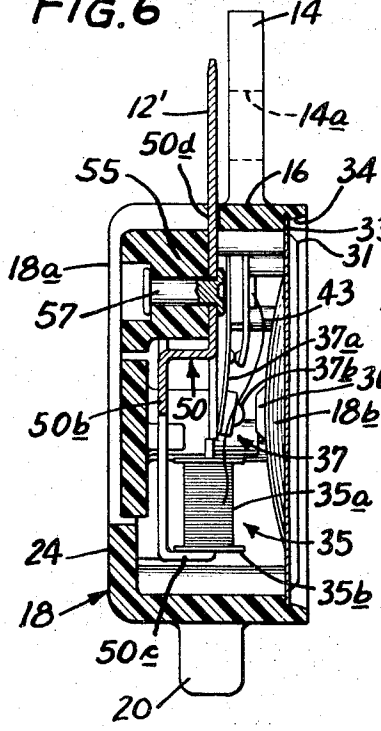


FIG. 7

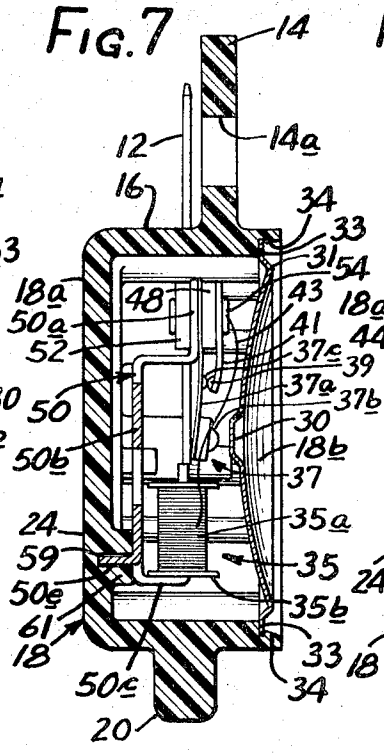


FIG. 8

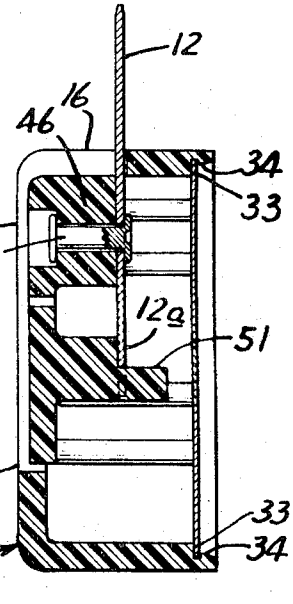


FIG. 10

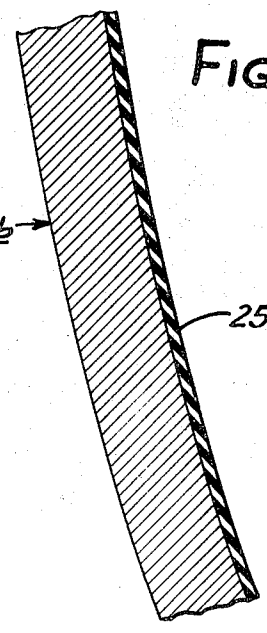
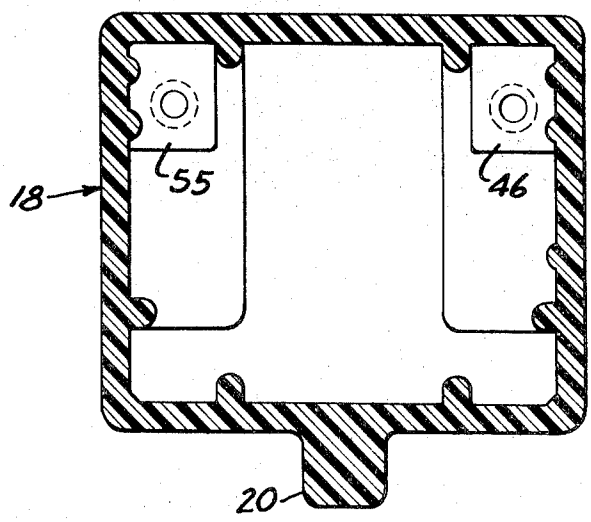


FIG. 9



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AUDIO SIGNALLING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to audio signalling devices or buzzers having use, for example, in automobiles to signal a warning to the driver when he opens the front door of the automobile without removing his keys from the ignition. The present invention provides an improvement in buzzers heretofore made for this and other purposes in providing a more simple and reliable buzzer with less shock and short circuit hazards.

In one form of buzzer heretofore developed for the purpose described above there is included a base of insulating material having supported thereon the various electrical components forming a buzzer, including a magnetic field producing coil, metal terminals, a contact plate and a vibratable reed made of metal or the like. The reed carries a magnetic member initially attracted to the core of the coil when the same is energized and a contact which controls the flow of current to the coil which is interrupted when the reed is attracted by the coil,to cyclically effect vibration of the reed. A cup-shaped metal cover member is secured around the periphery of the base and serves both as a closure housing for the buzzer and a vibratable wall struck by a striker member also carried by the vibrating reed of the buzzer. To minimize shock and short circuit hazards, the striker member was made of glass or other similar insulating material.

One of the objects of the invention is to provide a buzzer of the above-described type where an outer wall of the housing forms a vibratable wall for the buzzer and wherein the component parts of the buzzer contained within the housing can be more easily mounted and positioned within the buzzer housing during the manufacture thereof.

Another object of the invention is to provide a buzzer of the type described wherein the entire reed and the magnetic member, contact and striker member carried thereon may be made of metal or other conductive material and wherein the vibratable wall of the buzzer may be made of metal and yet be devoid of any significant shock or short circuiting hazards.

SUMMARY OF THE INVENTION

In accordance with one of the features of the invention, in a buzzer of the general type previously described all of the outer walls of the buzzer housing including the vibratable wall struck by the striker member of the vibrating reed have exposed surfaces made of insulating material, so that no electrical contact can be readily externally made to components inside of the housing except through electrical terminals thereof which may project therefrom. The vibratable wall forming one of the outer walls of the housing is made of metal to provide an efficient sound generating diaphragm, and the outer surface of the metal vibratable wall is coated with an insualting material to insulate the outside of the same from any conductive parts or surfaces on the inside of the housing. The other walls of the housing are most desirably made of molded synthetic plastic material and the insulating material coated metal vibratable wall most desirably bridges and is supported by insulating side walls of the housing defining the opening into the housing through which the parts making up the buzzer are passed initially into the housing.

In the most desirable form of the invention just described, the open ended housing body closed by the vibratable wall has positioning shoulders and locator means molded as an integral part thereof for enabling the various parts of the buzzer to be readily located and supported prior to final anchoring and soldering operations.

The above and other objects, advantages and features of the invention will become apparent upon making reference to the specification to follow, the claims and the drawings wherein:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a buzzer unit of the present invention mounted in an opening within a wall and removably receiving a socket connector unit which electrically interconnects the buzzer unit to a source of voltage and control switch means;

FIG. 2 is a sectional view through the socket connector unit containing portion of FIG. 1, taken along section line 2—2 therein;

FIG. 3 is a fragmentary sectional view through the assembly of FIG. 1, as seen along a plane 3—3 therein and showing the manner in which the buzzer unit is mounted on the wall shown therein;

FIG. 4 is a rear view of the buzzer unit shown in FIG. 1;

FIG. 5 is an elevational view of the buzzer unit of FIG. 4 with the vibratable closure wall portion thereof removed from the buzzer unit to expose the interior of the buzzer unit housing;

FIG. 6 is an enlarged sectional view through the buzzer unit shown in FIG. 5, taken along section line 6—6 therein with with the vibratable closure wall mounted in place;

FIG. 7 is an enlarged sectional view through the buzzer unit shown in FIG. 5,taken along section line 7—7 therein with the vibratable closure wall mounted in place;

FIG. 8 is an enlarged sectional view through the buzzer unit shown in FIG. 5,taken along section line 8—8 therein;

FIG. 9 is an enlarged sectional view through the buzzer unit housing with all parts normally contained therein removed; and

FIG. 10 is a greatly enlarged sectional view through the vibratable wall of the buzzer unit housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Refer now to FIGS. 1-3 showing the assembly of a buzzer unit 2 of the invention mounted in a support wall 4 and carrying a removable socket connector unit 6. A pair of insulated conductors 8—8 extend from the socket connector unit 6 and terminate in terminal strips 10—10 which connect to a source of energizing voltage (not shown), such as the 12 volt battery of an automobile, and a control switch which controls the operation of the buzzer unit 2. The socket connector unit 6 has a housing 7 made of synthetic plastic insulating material and having a pair of parallel extending sockets 6*a*—6*a* in which tubular terminals 6*b*—6*b* are mounted for removably frictionally receiving terminals 12-12' projecting through openings in a side wall 16 of a housing 18 of the buzzer unit 2. The housing 7 has a recess or channel 6*c* into which extends a socket holding extension 14 projecting from the side wall 16 of the

buzzer unit housing **18**. The socket unit holding extension **14** has an opening **14***a* into which extends a locking detent **17** which removably holds the socket connector unit **6** in a fixed position upon the buzzer unit **2**.

The buzzer unit housing **18** has an anchoring extension **20** projecting from a side wall **16'** of the housing opposite the side wall **16** previously described. The mounting extension **20** is of a size and shape to fit loosely within a D-shaped opening **21** formed in the mounting wall **4** when the buzzer unit is held in one orientation, and to frictionally lock within the opening **21** when the buzzer unit **2** is turned 90° from the latter orientation.

The buzzer unit housing **18** most desirably comprises a main housing body **18***a* having a rear or end wall **24** from the margins of which transversely extend the aforementioned side walls **16–16'** and side walls **22–22'**. The side walls **16–16'** and **22–22'** define an opening **26** into the housing body **18***a* through which various parts of the buzzer unit to be described are inserted into the housing body **18***a* when the buzzer unit is fabricated. The various parts of the housing body **18***a* above described including the rear or end wall **24**, the side walls **16–16'** and **22–22'** and the extensions **14** and **20** are formed as a single molded part made from a suitable synthetic plastic insulating material.

The opening **26** into the housing body **18***a* is closed by a vibratable closure wall **18***b* which bridges the side walls **16–16'** and **22–22'** of the housing body **18***a*. The vibratable closure wall **18***b* forms a vibratable diaphragm for the buzzer unit **2** and therefore desirably is made of relatively thin metal. As best shown in FIG. **10**, the vibratable closure wall **18***b* has applied to the outer side thereof a coating **25** of insulating material so that all outer surfaces of the buzzer unit **2** except the projecting terminals **12–12'** are electrically insulated so no electrical connections to any parts within the buzzer unit can be made from outside of the buzzer unit except through the terminals **12–12'**. The vibratable closure wall **18***b* has an inwardly dished main central portion terminating in a sharply inwardly projecting nose portion **30** at the center thereof. The vibratable closure wall **18**b has a reversely bent peripheral portion **31** abutting shoulders **33** (FIG. **7**) formed by the edges of the side walls **16–16'** and **22–22'** of the housing body **18***a* and snap fitting within an undercut portion **34** (FIG. **7**) of the side walls.

As best shown in FIG. **5–8**, the buzzer unit housing **18** encloses various components forming an electrical buzzer, namely a coil assembly generally indicated by reference numeral **35** and including coil windings **35***a* wound on a coil frame **35***b* and a cantilevered vibrating reed **37** including a main spring metal body **37***a* carrying a combination striker and magnetic member **37***b* at the free end thereof which strikes the nose portion **30** of the vibrating closure wall **18***b* when the buzzer is operating. As best shown in FIG. **7**, the reed **37** further includes an electrical contact **37***c* adapted to make electrical contact with a stationary contact **39** carried on the end of a metal contact plate **41**. The coil windings **35***a* terminate in a pair of conductors **43** and **45** (FIG. **5**) which respectively connect to a tab **41***a* projecting from contact plate **41** and the inner end portion **12***a* of the aforementioned terminal **12**. The inner end portion **12***a* of the terminal **12** is anchored by a rivet **44** (FIG. **8**) to an insulating block **46** molded integrally with the housing body **18***a*. The inner end portion **12***a* of the terminal **12** has a notch **49** (FIG. **5**) receiving a locator pin **51** also molded integrally with the housing body **18***a*. The base of the spring metal body **37***a* of the reed **37** is sandwiched between an insluating washer **48** and the end leg **50***a* of a metal stamping generally indicated by reference numeral **50** forming part of what may be referred to as a terminal bracket assembly. The end leg **50** *a* is sandwiched between the base of the reed **37** and an insulating washer **52** which together with the other washer **48** form an assembly held together by a rivet **54** insulated from the end leg **50***a* of the metal stamping **50** and the spring metal body of the reed **37**. The metal stamping **50** has a portion **50***b* offset from the end leg **50***a* which portion **50***b* merges with a bent back portion **50***c* forming an anchoring leg around which the coil assembly **35** is mounted. The metal stamping **50** has a terminal-forming leg **50***d* (see FIG. **6**) which bears against,and is anchored by a rivet **57** to, a block **55** forming part of the molded housing body **18***a*. The terminal-forming leg **50***d* forms the terminal **12'** previously described which passes out of the buzzer unit housing through an opening in the side wall **16**. The offset portion **50***b* of the metal stamping **50** has extending therefrom a short anchoring tab **50***e* passing into a locator hole **59** formed in a boss **61** projecting from the inside of the rear or end wall **24** of the housing body **18***a*.

The operation of the buzzer is as follows. When the coil windings **35***a* of the coil assembly **35** are de-energized, contact **37***c* carried by the reed **37** makes contact with the stationary contact **39** to establish electrical continuity between the terminals **12** and **12'** via a circuit including the projecting terminal **12**, the conductor **45**, coil windings **35***a*, conductor **43**, the contact plate **41**, stationary contact **39**, contact **37***c* and the metal stamping **50** including the other projecting terminal **12'**. The combination striker and magnetic member **37***b* carried on the end of the reed **37** is initially out of alignment with the center of the coil windings **35***a*. When a voltage is connected across the projecting terminals **12–12'** of the buzzer unit **2**, the coil windings **35***a* become momentarily energized to generate a magnetic flux which draws the combination striker and magnetic member **37***b* toward the center of the coil windings which causes the separation of the contacts **37***c* and **39** and the de-energization of the coil windings **35***a*. A vibratory action is thus imparted to the reed **37** which repeatedly strikes the nose portion **30** of the vibrating closure wall **18***b* of the buzzer unit to generate an audible signal.

It should now be apparent that the design of the buzzer unit housing is such that the various buzzer forming parts described can be very easily mounted in position within the housing body **18a** and electrically interconnected. Also, the design of the housing **18** is a simple and economical one which provides an overall compact buzzer unit which is insulated to avoid any shock or short circuit hazards.

It should be understood that numerous modifications may be made in the most preferred form of the invention described above without deviating from the broader aspects thereof.

I claim:

1. An electromagnetically-actuated, low energy audio signalling device comprising a housing with electrical terminals accessible at the exterior of the hous-

ing, said housing having outer walls with exposed surfaces made of insulating material so no electrical contact can be made to components inside of the housing except through said electrical terminals, one of said outer walls of said housing being made of metal and forming an electrically insulated vibratable buzzer-forming diaphragm, said one vibratable outer wall having an outer coating of an insulating material for electrically isolating the metal of the wall from the exterior of the housing, a flexible conductive reed cantilever mounted within said housing and supported thereon, said reed carrying a conductive striker extending adjacent to said vibratable wall of the housing and adapted to strike the same, an electrical contact carried by said reed and adapted to cooperate with an adjacent fixed contact to control an electrical circuit between said electrical terminals, a magnetic field producing coil supported within the housing adjacent said reed and electrically connected in series with said contacts, the flux linkage of said coil and reed when the coil is energized serving to flex said reed to open said contacts, the consequent de-energization of said coil releasing said reed to reclose said contacts, the cyclical flexing of the reed causing said striker repeatedly to strike said vibratable housing wall to produce a vibration of said wall producing an audial signal.

2. The signalling device of claim 1 wherein said vibratable housing wall is a separate closure wall for an opening in the remaining part of the housing through which opening said reed and coil were initially passed into their mounted positions in said housing before the vibratable wall was attached thereto.

3. The signalling device of claim 2 wherein said remaining part of said housing has end and side walls made of molded synthetic plastic material forming a side wall enveloped space within the confines of which the various parts of the signalling device are mounted including said reed and coil, said vibratable wall supported by and bridging the space between the opening defining ends of said housing side walls.

4. The signalling device of claim 3 wherein said vibratable end wall is an inwardly dished wall which extends inwardly of said housing side walls.

5. An electromagnetically-actuated, low energy audio signalling device comprising a housing having outer walls, one of which forms an electrically insulated vibratable buzzer-forming diaphragm, a pair of electrical terminals at least one of which extends through and projects from both sides of one of said housing walls, said terminals constituting the means for feeding energizing current to the device, a flexible conductive reed cantilever mounted within said housing and said reed carrying a striker extending adjacent to said vibratable wall of the housing and adapted to strike the same, an electrical contact carried by said reed and adapted to cooperate with an adjacent fixed contact to control an electrical circuit between said electrical terminals, a magnetic field producing coil unit supported within the housing, said one terminal having a projecting portion within the housing upon which said coil unit is at least partially supported, said coil unit being located adjacent said reed and having a coil winding electrically connected in series with said contacts, said contacts being connected in series with said coil and electrical terminals so the flux linkage of said coil and reed when the coil is energized thus serving to flex said reed to open said contacts, the consequent de-energization of said coil releasing said reed to reclose said contacts, the cyclical flexing of the reed causing said striker repeatedly to strike said vibratable housing wall to produce a vibration of said wall producing an audial signal.

6. The signalling device of claim 5 wherein one or more of said outer walls of said housing other than the vibratable wall thereof includes positioning shoulders for holding and locating portions of said terminals.

7. The signalling device of claim 6 wherein said vibratable end wall is an inwardly dished wall which extends inwardly of said housing walls.

8. The signalling device of claim 5 wherein said electrical terminals project through the same outer wall of the housing, and said housing having an outward extension between said terminals which has a retainer-forming means for making interlocking engagement with a socket connector to be engaged over said projecting terminals.

9. The signalling device of claim 8 wherein another of said outer walls has an outward extension adapted frictionally to fit within a mounting opening in a support wall for the signalling device.

10. The signalling device of claim 5 wherein all of said housing walls have outer surfaces made of insulating material, said vibratable wall having a metal wall with an outer coating of an insulating material for electrically isolating the metal of the wall from the exterior of the housing.

11. The signalling device of claim 5 wherein said flexible conductive reed is cantilever mounted within said housing against the portion of one of said terminals projecting from the inner side of said one outer wall so the terminal portion acts as a backing support and makes electrical contact therewith.

12. The signalling device of claim 11 wherein the same one of said terminals acts as a backing support for said reed and as a support for said coil unit.

13. An electromagnetically-actuated, low energy audio signalling device comprising a housing having outer walls, one of which forms an electrically insulated vibratable buzzer-forming diaphragm, a pair of electrical terminals at least one of which extends through and projects from both sides of one of said housing walls, said terminals constututing the means for feeding energizing current to the device, a flexible conductive reed cantilever mounted within said housing against the portion of said one terminal projecting from the inner side of said one outer wall so the terminal portion acts as a backing support and makes electrical contact therewith, said reed carrying a striker extending adjacent to said vibratable wall of the housing and adapted to strike the same, an electrical contact carried by said reed and adapted to cooperate with an adjacent fixed contact to control an electrical circuit between said electrical terminals, a magnetic field producing coil unit supported within the housing adjacent said reed and having a coil winding electrically connected in series with said contacts, said contacts being connected in series with said coil and electrical terminals so the flux linkage of said coil and reed when the coil is energized thus serving to flex said reed to open said contacts, the consequent de-energization of said coil releasing said reed to reclose said contacts, the cyclical flexing of the reed causing said striker repeatedly to strike said vibratable housing wall to produce a vibration of said wall producing an audial signal.

14. The signalling device of claim 13 wherein said one terminal has a projecting portion within the housing upon which said coil unit is at least partially supported.

* * * * *