United States Patent [19]

Heath

[11] **3,774,200**

[45] **Nov. 20, 1973**

[54] **BUZZER INCLUDING COIL WITH WOUND CONNECTIONS**

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[73] Assignee: **General Motors Corporation,** Detroit, Mich.

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[21] Appl. No.: **305,305**

[52] **U.S. Cl.** ..... **340/384 R,** 340/402

[51] **Int. Cl.** **G08b 3/00**

[58] **Field of Search** 340/384, 307, 400, 340/402, 403, 401

[56] **References Cited**

UNITED STATES PATENTS

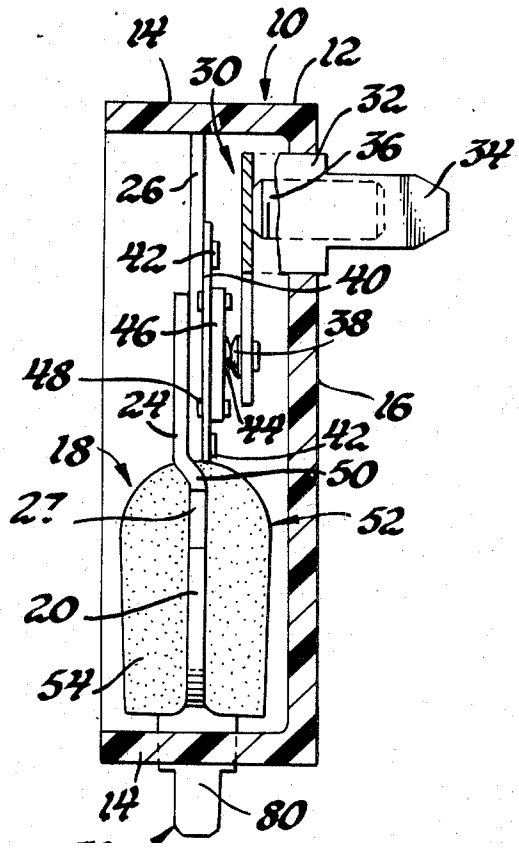
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Primary Examiner—Thomas B. Habecker
Assistant Examiner—William M. Wannisky
Attorney—W. E. Finken et al.

[57] **ABSTRACT**

A buzzer includes a plastic housing which has a box-like configuration and supports a generally U-shaped ferrous core whose base has a number of relatively sharp edges. An electrically conductive resilient support member is mounted on one of the legs of the core and supports a ferrous armature adjacent the other leg of the core in laterally spaced relationship relative thereto. The support member is deflected when the armature moves into alignment with the adjacent leg of the core and thereby disengages a first contact mounted on the housing to break a path of electric current flow to the core. A coil of the buzzer includes a spool member of a generally saddle-shaped configuration and having primary and secondary winding portions. The spool member is mounted on the base of the core so as to leave the sharp edges of the base exposed to wire which is wound on the primary winding portion of the spool member such that insulation is scraped from the wire to provide an electrical connection between the core and the inner end of the coil wire. A second contact is mounted on the spool member and includes a flange with relatively sharp edges that scrape the insulation from the other end of the coil wire as it is wound on the secondary winding portion of the spool member. A voltage applied across the contacts activates the buzzer to energize the coil and provide a flux field that moves the armature to an aligned relationship relative to the adjacent leg of the core. The path of current flow through the buzzer is cyclically interrupted by this movement of the armature to its aligned relationship and cyclically de-energizes the coil to allow the resilient support member to return the armature to its unaligned relationship with the core and thus provide rapid cyclic movement that emits an audio signal.

5 Claims, 5 Drawing Figures



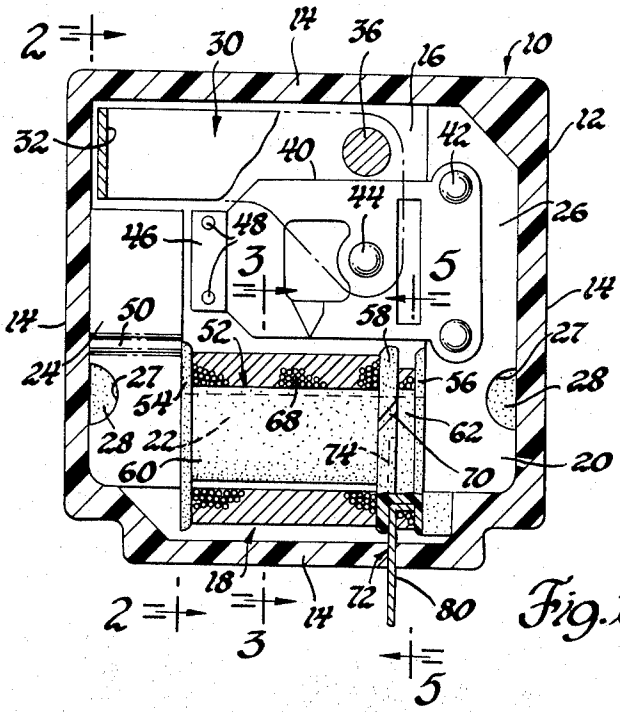


Fig. 1

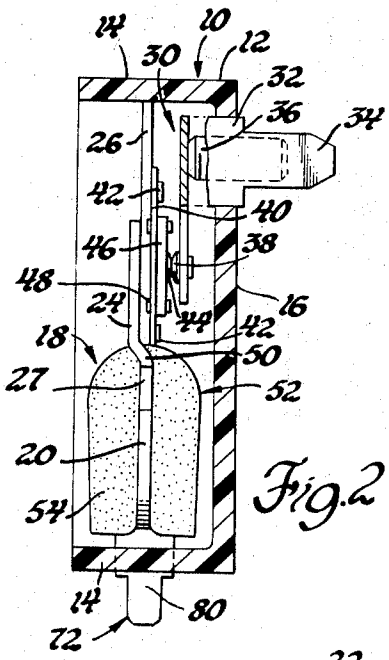


Fig. 2

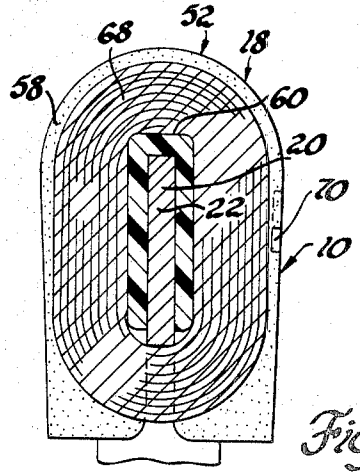


Fig. 3

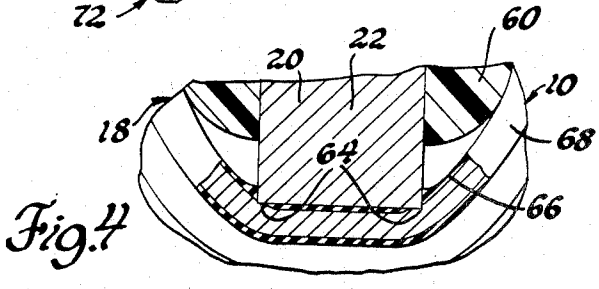


Fig. 4

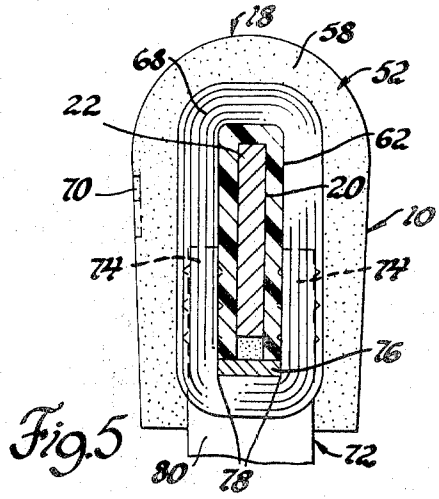


Fig. 5

BUZZER INCLUDING COIL WITH WOUND CONNECTIONS

BACKGROUND OF THE INVENTION

This invention relates generally to a buzzer in which a voltage is supplied to a coil to provide a flux field which cyclically aligns a ferrous armature with the field and allows a resilient support member of the armature to return the armature to an unaligned relationship upon interruption of current flow in a cyclic manner so as to provide a rapid cyclic movement which produces an audio signal.

Buzzers of the above-described type have been known for many years and have many applications. For instance, they may be utilized in vehicles to provide a suitable audio signal to apprise a vehicle occupant of a predetermined vehicle condition. They may be utilized to advise the vehicle driver upon opening the driver's door that the vehicle ignition key has not been removed from the ignition lock. Likewise, they may be utilized to remind vehicle occupants to utilize the restraint belt arrangements that are provided on current production vehicles.

The coils of this type of buzzer utilize a relatively fine wire wound on a spool member with its ends connected to respective contacts so as to provide a means for energizing the coil and providing the required flux field to move the ferrous armature. Since the wire of the coil must be relatively fine to provide the required flux field, connection of the wire ends to the contacts is a process which is somewhat delicate and may entail appreciable expense. This connection process requires that insulation be stripped from the wire and that the wire be soldered or otherwise secured in position such as by crimping a contact portion over the wire. The expense involved with this connection process may result in a total cost of the buzzer which prohibits its use in certain high production applications.

SUMMARY OF THE INVENTION

This invention provides a buzzer whose coil wire is electrically connected in an energizing circuit of the coil by edge portions of the buzzer that scrape insulation from the wire during the coil winding process.

One feature of this invention is that it provides a buzzer in which the core of the buzzer coil carries the current used to energize the coil and the coil wire is wound on a spool member mounted on the core so as to leave a relatively sharp edge portion of the core exposed to the wire as it is wound such that this edge portion scrapes off the insulation of the wire and provides electrical connection to the core. Another feature of the invention is that the spool member includes a primary winding portion where the one end of the wire is electrically connected to the core and also includes a secondary winding portion where the other end of the wire is wound and similarly engages a relatively sharp edge of an associated contact to scrape the wire insulation and provide a similar electrical connection at the other wire end. Another feature of the invention is that the core has a generally U-shaped configuration and an electrically conductive resilient support member on one of its legs supports the ferrous armature of the buzzer adjacent the other leg of the core out of alignment with the center of the flux field supplied by the coil which is mounted on the base of the core. Another feature of the invention is that the spool member has a saddle-shaped configuration which is elongated and divided into the primary and secondary winding portions by a saddle-shaped flange adjacent one of its ends.

BRIEF DESCRIPTION OF THE DRAWING

The above-specified features and other features of this invention are readily apparent from the following description of the preferred embodiment and the drawings in which:

FIG. 1 is a sectional view through a buzzer whose coil is electrically connected in an energizing circuit during the coil winding process in a manner according to this invention;

FIG. 2 is a sectional view of the buzzer taken generally along line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view of the coil taken generally along line 3—3 of FIG. 1;

FIG. 4 is an enlarged portion of FIG. 3 and shows the manner in which one end of the coil wire is electrically connected to the core of the coil; and

FIG. 5 is an enlarged sectional view taken generally along line 5—5 of FIG. 1 and shows the manner in which the other end of the coil wire is connected to an associated contact of the buzzer.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, a buzzer according to this invention is generally indicated by **10** and includes a box-like housing **12** with side walls **14**. A base wall **16** of the housing, see FIG. **2**, is integrally formed with the side walls **14** and closes one end of the housing. The other end of the housing, the left-hand end as shown in FIG. **2**, may be open or may be closed by a suitable member. The housing **12** receives a coil indicated generally by **18** and having a generally U-shaped ferrous core **20**. The core **20** is formed from a relatively thin stock of ferrous material, see FIGS. **2** and **3**, and includes a base **22** extending between the lower ends of a pair of vertical legs **24** and **26**. These legs of the core include suitable semi-circular arcuate slots **27** which receive suitable mounting lugs **28** on the adjacent side walls **14** of the housing. These lugs are hot staked over the core legs to secure the core **20** in position.

The left-hand leg **24** of the core **20** has a somewhat shorter configuration that the right-hand leg **26** and terminates just below a first contact of the buzzer which is indicated generally by **30**. Contact **30** includes a mounting portion **32** adjacent its FIG. **1** left-hand end and this mounting portion extends through the base wall **16** of the housing to a connection portion **34** of the contact so as to mount the contact on the housing. A threaded adjustment member **36** also extends through the base wall **16** of the housing and has its inner end engageable with the FIG. **1** right-hand end of contact **30**. Rotation of this adjustment member controls the distance between the right-hand end of contact **30** and the base wall **16** so as to control the position of a contact button **38** of the contact relative to the base wall.

An electrically conductive resilient support member **40** is secured to the right-hand leg **26** of the core **20** by rivets **42** and includes a contact button **44** for normally engaging the contact button **38** of contact **30**. The left-hand end of support member **40** supports a ferrous armature **46** which is secured thereto by way of suitable rivets **48**. As best seen in FIG. **2**, the shorter leg **24** of

the housing includes a laterally offset portion **50** such that the free end of this core leg is located out of the plane of the rest of the core and the armature **46** is thus laterally spaced from the adjacent portion of this core leg.

The coil **18** also includes a spool member **52** which is mounted on the base **22** of the core and has a generally elongated saddle-like configuration. The spool member includes saddle-shaped end flanges **54** and **56** respectively adjacent the core legs **24** and **26.** A saddle-shaped intermediate flange **58** of the spool member is located adjacent to the right-hand end flange **56** and provides primary and secondary winding portions **60** and **62.** The primary winding portion **60** of the spool member has a downwardly opening U-shaped cross section, seen best in FIG. **3,** and leaves the lower edge portion of the core base **22** exposed to wire which is wound on the primary winding portion. The lower edges **64** of the lower edge portion of core base **22** are relatively sharp as can be best seen by FIG. **4.** Since these edges are exposed, they scrape through the insulation **66** on the coil winding wire **68** as this wire is wound on the primary winding portion **60.** The wire **68** is wound on the primary winding portion so as to provide an inner layer which completely covers the exposed lower edge portion of core base **22** prior to the winding of the second and subsequent outer layers of this portion of the coil. Consequently, the inner end of the wire **68** will be electrically connected to the core **20** but the insulation **66** of the wire will provide insulation on all but the inner layer so that the primary winding portion of the coil will provide a flux field when current is passed through it.

The outer end of the wire **68** extends from the primary winding portion **60** through an angled slot **70** in the saddle-shaped intermediate flange **58** of the spool member **52,** see FIG. **1.** The wire extends through this slot and is wound on the secondary winding portion of the spool member which is best seen in FIG. **5.** Prior to this secondary winding of the wire, a second contact **72** is mounted on the spool member by inserting studded leg portions **74**of this contact to within **74** of apertures in the intermediate flange **58** of the spool member. These studded leg portions engage the spool member and position a flange **76** of the contact across the open lower end of the secondary winding portion **62,** see FIG. **5.** The U-shaped cross section of the spool member has a slightly longer vertical configuration at the secondary winding portion than at the primary winding portion and the contact flange **76** is consequently located in spaced relationship to the lower edge of core base **22** and is insulated from the core. The contact flange **76** includes relatively sharp lower edges **78** which engage the inner layer of the small portion of wire **68** that is wound on the secondary winding portion of the spool member and scrape through the insulation **66** of the wire to provide an electrical connection to the second contact **72.** A connection portion **80** of the second contact extends through the lower side wall **14** of the housing and is adaptable for connecting the buzzer within an electric circuit.

The buzzer **10** is activated by supplying a voltage across the connection portions **34** and **80** of the first and second contacts **30** and **72.** Current flows through contact **30** to the contact button **38** which engages contact button **44** on the armature support member **40** and passes the current to the core **20** of coil **18.** From the core, the current flows through the wire on the primary winding portion **60** of the coil and to the secondary winding portion which is connected to the second contact **72** and its connection portion **80.** This current flow energizes the coil **18** and provides a flux field which flows from the shorter leg **24** of the housing to the longer leg **26.** Since the armature **46** is laterally spaced relative to the adjacent free end of coil leg **24** due to the lateral offset portion **50** of this coil leg, the flux field causes the armature to tend to move laterally into alignment with the adjacent portion of core leg **24.** This movement of the armature acts against the resilient bias of support member **40** and moves the armature to the left as shown in FIG. **2** such that the current path is broken by disengagement of the contact button **44** from the contact button **38** on the first contact **30.** This contact disengagement de-energizes the coil to terminate the flux field. The resilient bias of the support member then returns the armature to its FIG. **2** position where electrical contact is again made to again energize the coil and repeat the cycle. This movement occurs in a very rapid manner so as to provide a rapid cyclic motion which produces an audio signal.

Also, the adjustment screw **36** readily controls the positioning of contact button **38** relative to contact button **44** to ensure the proper amount of contact disengagement and effective operation of the buzzer.

It is thus apparent that the manner in which the wire ends of the coil are readily connected to the core and the contact of the secondary winding portion provides an inexpensive method for attaching the coil to an electric circuit and thus enables the buzzer to be used in high-production low-cost applications.

What is claimed is:

1. A buzzer comprising:

a housing;

a ferrous core mounted by the housing and including armature and coil supporting portions, the coil supporting portion having a relatively sharp edge portion;

a ferrous armature and electrically conductive resilient means supporting the armature on the armature supporting portion of the ferrous core in laterally spaced relationship to an adjacent portion of the core, the resilient means deflecting to allow the armature to move into alignment with the adjacent portion of the core;

a first contact mounted by the housing and engaging the resilient means when the armature is in its unaligned relationship with the core so as to transmit an electric current to the core, the resilient means moving out of engagement with the first contact when the armature moves into alignment with the core to thus break the path of current flow;

a coil including a spool member with insulated wire wound thereon in a layered manner, the spool member being mounted on the coil supporting portion of the core prior to the winding of the wire so as to leave the sharp edge portion thereof exposed such that this edge portion scrapes the insulation from the inner end of the wire to electrically connect the wire to the core; and

a second contact mounted relative to the housing and being electrically connected to the outer end of the wire so as to allow the buzzer to be activated by supplying a voltage across the first and second contacts to energize the coil and provide a flux field

that moves the armature into alignment with the core, the path of current through the buzzer being cyclically interrupted by movement of the armature to its aligned relationship with the core to cyclically de-energize the coil and allow the resilient means to return the armature to its unaligned relationship so that this cyclic movement provides an audio signal.

2. A buzzer comprising:

a housing;

a ferrous core mounted by the housing and including armature and coil supporting portions, the coil supporting portion having a plurality of relatively sharp edge portions;

an armature and electrically conductive resilient means supporting the armature on the armature supporting portion of the ferrous core in laterally spaced relationship to an adjacent portion of the core, the resilient means deflecting to allow the armature to move into alignment with the adjacent portion of the core;

a first contact mounted by the housing and engaging the resilient means when the armature is in its unaligned relationship with the core so as to transmit an electric current to the core, the resilient means moving out of engagement with the first contact when the armature moves into alignment with the core to thus break the path of current flow;

a coil including a spool member with primary and secondary winding portions, the spool member being mounted on the coil supporting portion of the core so as to leave the sharp edge portions thereof exposed to wire wound on the primary portion of the spool member and insulated wire wound on the primary portion of the spool member in a layered manner so that the edge portions of the core scrape the insulation from the wire at the inner end thereof to provide an electrical connection to the core; and

a second contact mounted on the spool member of the coil and including a relatively sharp edge portion for engaging and scraping insulation from the other end of the wire as it is wound on the secondary winding portion of the spool member to thus allow the buzzer to be activated by supplying a voltage across the first and second contacts so as to energize the coil and provide a flux field that moves the armature into alignment with the core, the path of current through the buzzer being cyclically interrupted by movement of the armature to its aligned relationship with the core to cyclically de-energize the coil and allow the resilient means to return the armature to its unaligned relationship so that this cyclic movement provides an audio signal.

3. A buzzer comprising:

a housing;

a ferrous core of a generally U-shaped configuration and having a number of relatively sharp edges on the base of the core;

a ferrous armature and electrically conductive resilient means secured to one leg of the core and supporting the armature adjacent the other leg of the core in laterally spaced relationship relative thereto, the resilient means deflecting to allow the armature to move into lateral alignment with the other leg of the core;

a first contact mounted by the housing and engaging the resilient means when the armature is in its unaligned relationship with the core so as to transmit an electric current to the core, the resilient means moving out of engagement with the first contact when the armature moves into alignment with the core to thus break the path of current flow;

a coil including a spool member of a generally saddle-shaped configuration and having primary and secondary winding portions, the spool member being mounted on the base of the core so as to leave the sharp edges of the base exposed to wire wound on the primary portion of the spool member, and insulated wire wound on the primary portion of the spool member in a layered manner so that the edges of the base scrape the insulation from the wire at the inner end thereof to provide an electrical connection to the core; and

a second contact mounted on the spool member of the coil and including a flange with a relatively sharp edge for engaging and scraping insulation from the other end of the wire as it is wound on the secondary portion of the spool member to thus allow the buzzer to be activated by supplying a voltage across the first and second contacts so as to energize the coil and provide a flux field that moves the armature into alignment with the core, the path of current through the buzzer being cyclically interrupted by movement of the armature to its aligned relationship with the core to cyclically de-energize the coil and allow the resilient means to return the armature to its unaligned relationship so that this cyclic movement provides an audio signal.

4. A buzzer according to claim 3 wherein the coil core is manufactured from relatively thin ferrous stock and the normal laterally spaced relationship between the armature and the adjacent leg of the core is a result of an offset portion of this core leg.

5. A buzzer according to claim 3 wherein the primary and secondary winding portions are defined by saddle-shaped flanges of the spool member.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,774,200 Dated November 20, 1973

Inventor(s) Thomas C. Heath

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 42 delete "74 of", second occurrence and insert --suitable--.

Signed and sealed this 16th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents