Feb. 7, 1967 P. E. McKEON ETAL 3,303,442

REED RELAY CONSTRUCTION

Filed Nov. 26, 1965 2 Sheets-Sheet 1

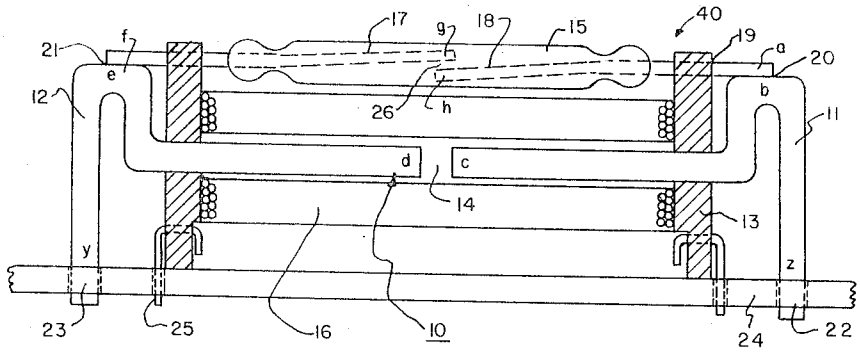


FIG. 1

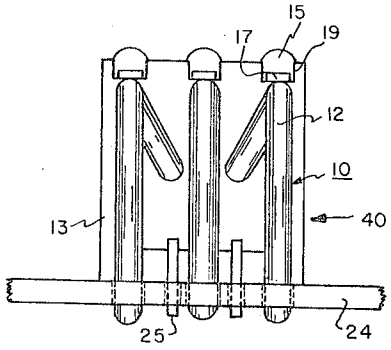


FIG. 2

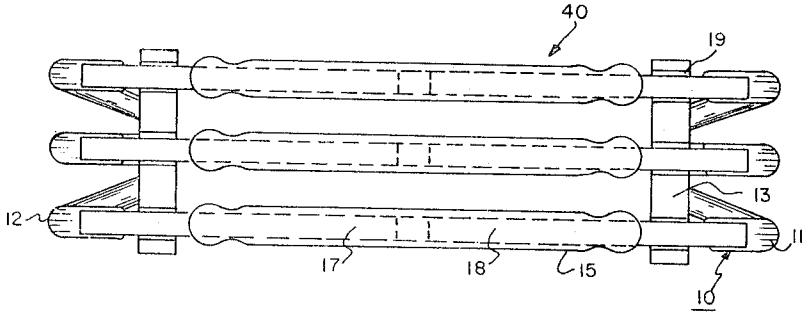


FIG. 3

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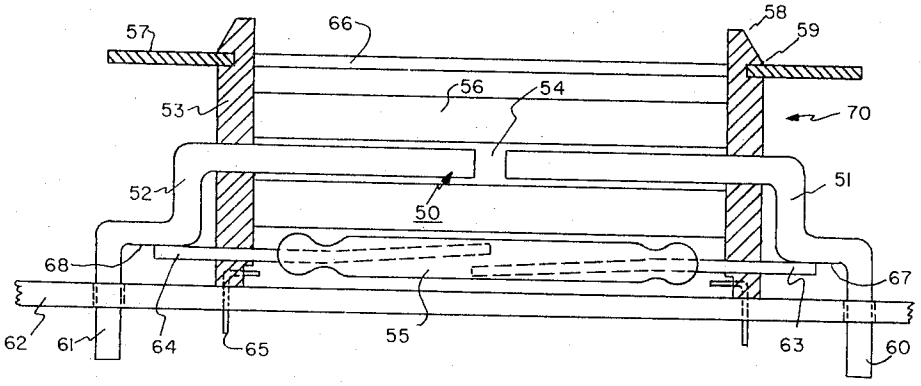


FIG. 4

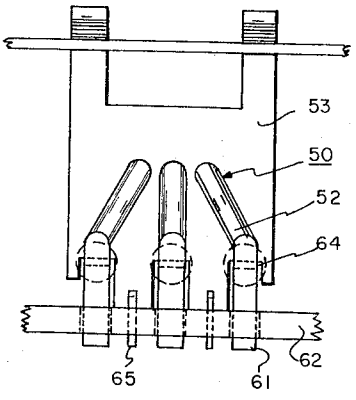


FIG. 5

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REED RELAY CONSTRUCTION

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4 Claims. (Cl. 335—153)

This invention relates to relays and more particularly to reed relays of the type having a magnetic core inside a coil wound bobbin and reed switches located externally of the bobbin. A relay of this type is shown in U.S. Patent 3,188,424.

It is an object of this invention to provide a new and improved reed relay of greatly simplified design.

Another object of this invention is to provide a relay of the above mentioned type which is easy to fabricate and requires a minimum of time to assemble.

This invention features a relay having magnetic cores each with two end-to-end sections which: provide a low reluctance magnetic path for the relay and thereby render the relay magnetically highly efficient, act as terminals for the electrical connection of the reed switches of the relay, and may also provide mounting support for the reed switches of the relay.

Other objects and features of the present invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings of which:

FIG. 1 is a side, sectioned view of one embodiment of a reed relay according to the invention.

FIG. 2 is an end view of the relay of FIG. 1.

FIG. 3 is a top view of the relay of FIG. 1.

FIG. 4 is a side, sectioned view of another embodiment of a reed relay according to the invention.

FIG. 5 is an end view of the relay of FIG. 4.

The particular embodiments of the relay as will be described herein, have been designed for use in a cross-point matrix of an electronic telephone exchange. However, the relay is not limited to such application.

FIGS. 1–3 show a reed relay according to the invention which is made particularly for use with printed circuit boards. As can be seen, cores such as **10**, which are electrically and magnetically insulated from each other, each comprise two sections, such as **11**, **12** which are inserted into the opposite ends of bobbin **13** of relay **40**. Core sections **11**, **12** are electrically insulated from one another due to an air gap such as **14** between them near the center of bobbin **13**. A plurality of reed capsules, such as **15**, are mounted externally of coil **16** which is wound about bobbin **13** of relay **40**. As will be noted from FIG. 2 of the drawings, each reed capsule is associated with a corresponding two-sectioned core. Each reed capsule has located therein a pair of reeds, such as **17**, **18**, the free ends of which are mounted in guides, such as **19**, in bobbin **13**, shown best in FIG. 2. In turn, the free ends of the reed capsules are connected to their corresponding core sections at shoulder portions such as **20**. **21**.

The reed members are preferably welded or soldered to the last mentioned shoulder portions.

The free ends of core sections **11**, **12** comprise terminals such as **22**, **23** respectively, for plugging relay **40** into printed circuit board **24**. Plug-in coil terminals such as **25**, which are embedded in bobbin **13** which is made preferably of a plastic material are also provided.

Referring now to FIGS. 4 and 5 of the drawings, there is shown an embodiment of a relay according to the invention which may be panel mounted or mounted on a printed circuit board. The relay is shown both ways for purposes of illustration.

This embodiment of the relay also comprises a plurality of cores, such as **50** which have two-sections **51**, **52**. Each of these sections is inserted from opposite ends of relay bobbin **53** with an air gap **54** therebetween to electrically insulate the sections **51**, **52** from one another. Here too, the cores such as **50**, are both electrically and magnetically insulated from each other.

This embodiment **70** of the relay also has a plurality of reed capsules, such as **55** mounted externally of the relay coil **56**. Because this embodiment is made primarily for mounting on a panel, such as **57**, bobbin **53** has been elongated at its ends such as **58**, where lugs such as **59** have been formed to enable relay **70** to be snapped into an aperture **66** in panel **57**. The relay shown has lugs such as **59** integrally molded with bobbin **53**, however, this does not preclude the use of auxiliary snap on lugs which may be fitted to bobbin **53**.

When relay **70** is used as a panel mounted relay, terminals **60**, **61** are of the wire wrap type.

Relay **70**, as shown in FIG. 4, as mentioned above also, may be plugged into a printed circuit board **62**. This requires terminals **60**, **61** to be of the plug-in type.

However, because this embodiment of the relay is primarily for panel mounting, when it is used for printed circuit board mounting, the reed capsules are located between the coil and the printed circuit board. As in relay **40** of FIGS. 1–3, each reed capsule is attached at the free ends of its reed members, such as **63**, **64** to shoulder portions **67**, **68** of core sections **51**, **52** respectively. Terminals such as **65**, are also provided as termination points for coil **56**.

A more detailed description as to the manner in which the relay according to the invention functions will now be given.

Referring to the embodiment of the relay of FIGS. 1–3, for example, upon energization of coil **16**, a magnetic field is produced to operate the reed members **17**, **18**, in reed switches such as **15**. As stated before, each reed switch has associated with it a corresponding core **10**. Therefore, each reed switch and core provides a separate magnetic path which the magnetic field traverses to operate the corresponding reed switch.

Because this path *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, is primarily of magnetic material, e.g., core sections **11**, **12**, reed members **17**, **18** and small air gaps **14**, **26**, it is of low reluctance. Consequently, the relay according to the invention operates more efficiently with less ampere-turns being needed in the relay coil. This aids too in being able to make the relay physically smaller.

Cores **10**, serve a second purpose. This is to provide terminals such as **22**, **23**, for the electrical connection of the reed members of each reed switch. As will be noted in FIG. 1 of the drawings, electrical paths such as *a*, *b*, *z* and *f*, *e*, *y* are provided by core sections such as **11**, **12**.

A third purpose of core sections **11**, **12**, is to provide a mounting place for the reed switches such as **15**. This is provided by shoulder portions such as **20**, **21** where the free ends of reed members **17**, **18** are connected. In the embodiment of the relay shown in FIGS. 1–3 shoulder portions **20**, **21**, in addition to providing a connecting place, aid guides **19** in the relay bobbin in supporting the reed switches.

Because the reed switches are connected to the shoulder portions in the manner mentioned above, a minimum amount of stress is applied to the reed members when electrical connections are being made to the terminals at the end of the core sections.

In addition to the above-mentioned features, both embodiments of the relay according to the invention, e.g., relay **40** of FIGS. 1–3, when it is plugged into a printed circuit board, and relay **70** of FIGS. 4, 5 when it is panel

mounted, allow easy replacement of the reed switches without removal of the entire relay from its mounting.

Through the use of the multipurpose core sections, assembling of the relay according to the invention can be done in less time than it would take to assemble comparable prior art reed relays. For example, since no separate terminals are needed to electrically connect up the reed switches of the relay, assembly time which was used to imbed these separate terminals into the bobbin of the relay, and to strap the free ends of the reed members to these terminals is eliminated. Also, fewer kinds of parts are needed for the relay according to the invention, thus, fabrication costs can be reduced.

It will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broadest aspects and therefore the aim in the appended claims is to cover all such changes and modifications as in the true spirit and scope of this invention.

What is claimed is:

1. A reed relay comprising:

a coil wound bobbin;

at least one core of magnetic material, each said core comprising two sections each having within said bobbin a main portion and outside of said bobbin a terminal portion and a shoulder portion intermediate said main portion and said terminal portion, said main portions of the two sections being mutually aligned longitudinally in end to end relationship but electrically insulated from each other, and said shoulder portions extending in a direction parallel to said main portions while said terminal portions extend in a direction perpendicular to said main portions and shoulder portions; and

at least one reed switch comprising an elongated capsule of insulating material, having a pair of reed members therein, each of said reed members extending outwardly, along the axis of, and from the opposite ends of, said capsule to form terminals, said reed switch disposed externally and parallel to the length of said bobbin, said terminals each being mechanically supported by and electrically connected to the shoulder portion of the corresponding core sections.

2. A reed relay as claimed in claim 1 wherein the ends of said terminal portions are formed to provide plug-in connections to a printed circuit board.

3. A reed relay as claimed in claim 1 wherein the shoulder portions of said core sections are U-shaped and wherein said terminals are electrically connected to and mechanically supported by said shoulder portions at the base of said U.

4. A reed relay as claimed in claim 1 wherein the shoulder portions of said core sections are S-shaped and said terminals are electrically connected to and mechanically supported by said shoulder portions at the center section of said S, wherein said bobbin includes integrally molded therewith lugs for snapping said relay into a mounting frame, and wherein said terminal portions are of the type upon which wire may be wrapped.

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