

Dec. 15, 1970

TEIZO FUJITA

3,548,349

MAGNETIC CONTROL RELAY

Filed Feb. 19, 1969

3 Sheets-Sheet 1

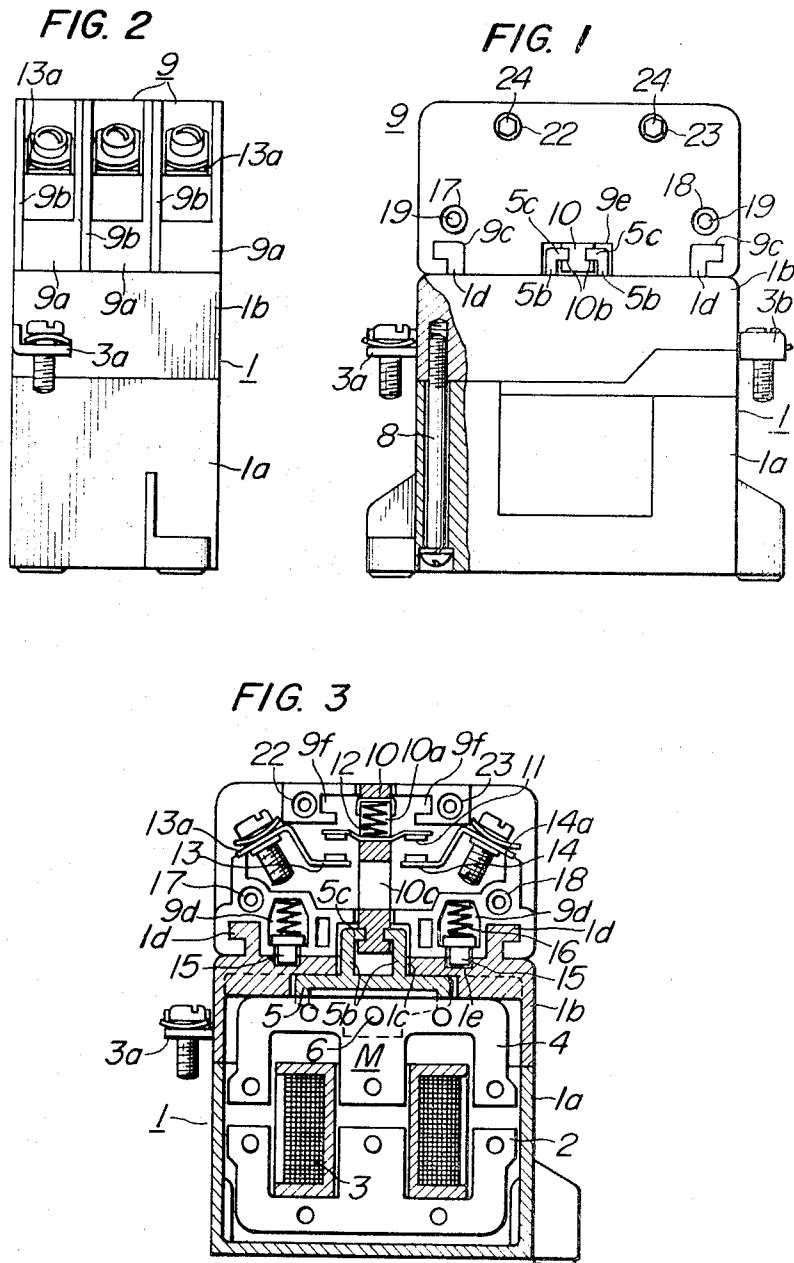


FIG. 7

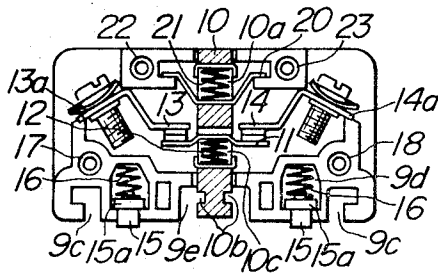


FIG. 6

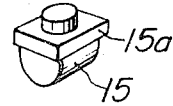


FIG. 8

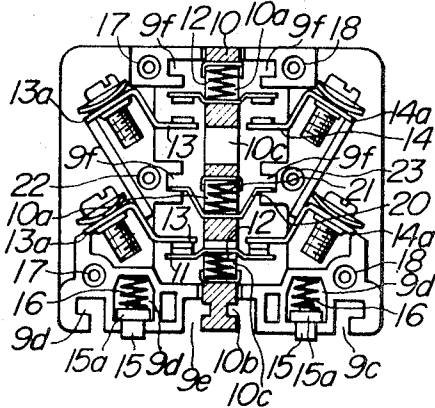


FIG. 5

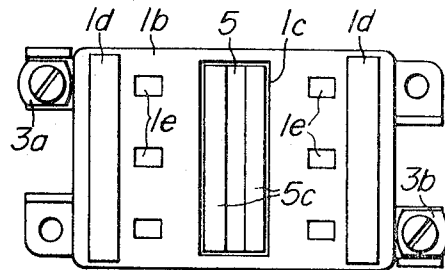


FIG. 9

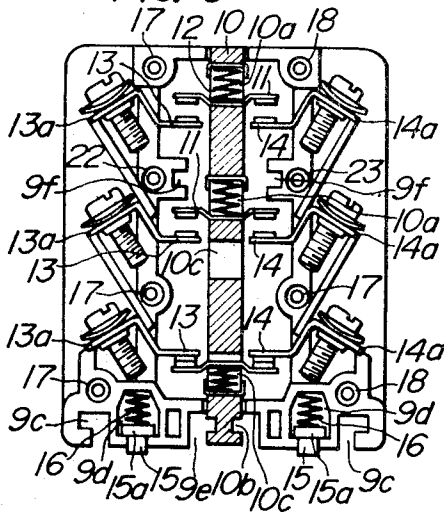
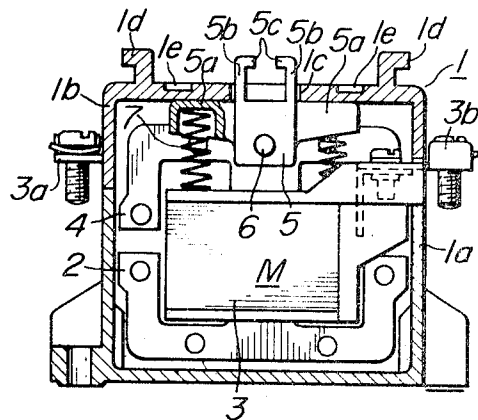


FIG. 4



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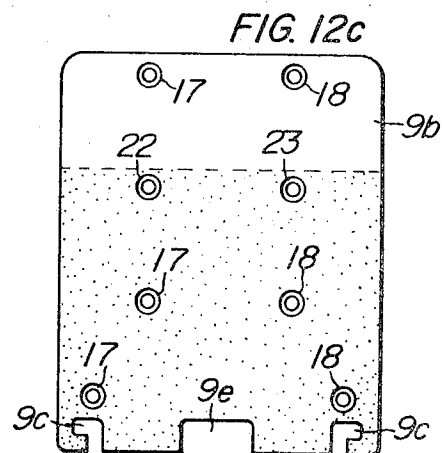
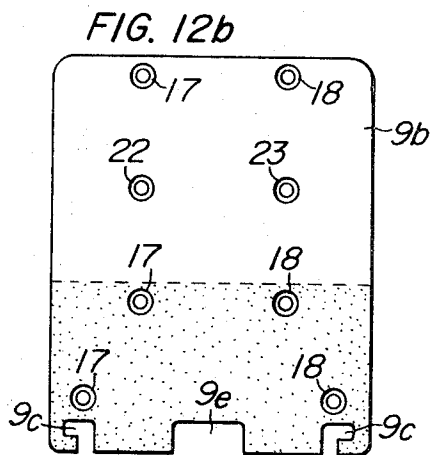
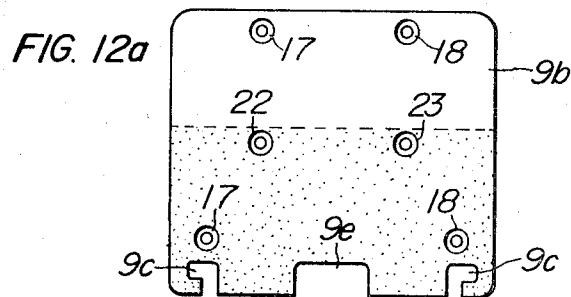
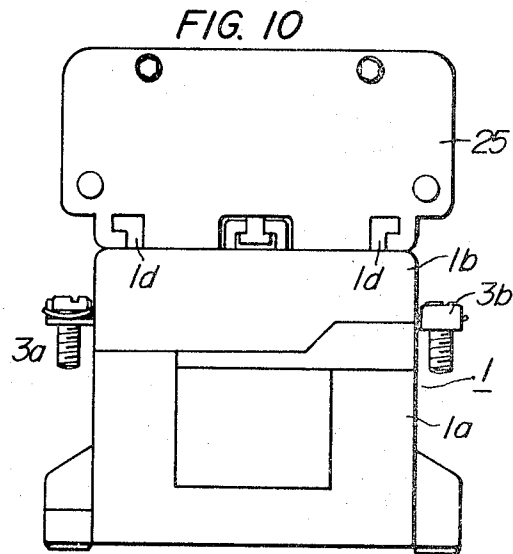
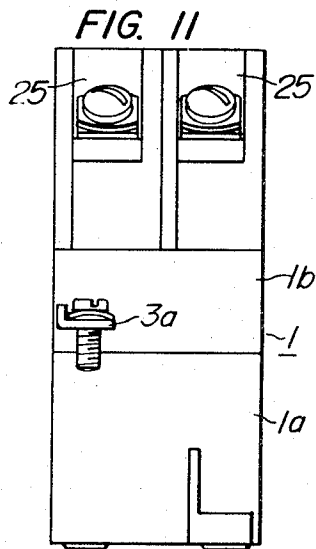
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3,548,349

MAGNETIC CONTROL RELAYTeizo Fujita, 34 Tezukayamanaka 3-chome,
Sumiyoshi-ku, Osaka, Japan

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1 Claim

ABSTRACT OF THE DISCLOSURE

A magnetic control relay wherein contact portions are provided separately from and independently of an electromagnet portion, said contact portions are constructed independently of each other for the respective poles, each independent contact portion for each pole is constructed in the form of a unit contact box, and such unit contact boxes are placed side by side on said electromagnet portion and attached to the latter.

BACKGROUND OF THE INVENTION**Field of the invention**

This invention relates to a magnetic control relay, and more particularly it pertains to such relay for use in a variety of operating circuits, which is a combination of contact portions adapted to open or close an electric circuit and an electromagnetic portion for driving said contact portions.

In the conventional magnetic control relays, there is such a drawback that it is necessary to replace both the contact portions and electromagnet portion with new ones when trouble occurs in one of them, since these two portions are constructed as a unitary arrangement.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a magnetic control relay capable of overcoming the aforementioned drawback of the conventional magnetic control relay.

Another object of this invention is to provide a magnetic control relay characterized in that contact portions are provided separately from and independently of an electromagnet portion, said contact portions are constructed for the respective poles independently of each other, each independent contact portion for each pole is constructed in the form of a unit contact box, and such unit contact boxes are placed side by side on said electromagnet portion so as to be detachably mounted thereon.

In accordance with the present invention, design is made such that the contact portions can be easily attached to or detached from the electromagnet portion.

Furthermore, in accordance with the present invention, it is possible to obtain an arrangement wherein the number of contacts can be freely selected and the capacity and number of poles can be changed as desired.

It is also possible to adopt such an arrangement that the type of contact arrangement constructed independently in the form of unit contact box can be easily and clearly indicated.

Still furthermore, in accordance with the present invention, it is possible to obtain a simplified and inexpensive arrangement without changing the configuration of a conventional magnetic control relay of this type.

With the conventional magnetic control relay of this kind, the number of poles and the type of contact arrangement could not be freely selected and difficulties have been encountered in the maintenance and inspection thereof, since it was the usual practice that the contact portions

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and the electromagnet portion were constructed as a unit. In accordance with the present invention, however, it is possible to optionally select the type of contact arrangement associated with the electromagnet portion and easily exchange such contact arrangement since not only the contact portion is provided separately from and independently of the electromagnet portion but also the contact portion is constructed separately and independently for each pole. Thus maintenance and inspection can be easily and conveniently carried out for each separate portion.

As will be appreciated from the foregoing, in accordance with the present invention, it is possible to easily obtain a reasonable and compact magnetic control relay adapted for use in a wide variety of applications.

The other objects, features and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view, partly cut-away, showing the magnetic control relay according to an embodiment of this invention;

FIG. 2 is a side view thereof;

FIG. 3 is a longitudinal sectional front view thereof;

FIG. 4 is a longitudinal sectional side view showing the electromagnet casing;

FIG. 5 is a plan view thereof;

FIG. 6 is a perspective view showing the stopper;

FIGS. 7, 8, and 9 are longitudinal sectional views showing single-contact, double-contact and triple-contact type unit contact boxes respectively;

FIG. 10 is a front view showing a high-capacity type unit contact box mounted in place;

FIG. 11 is a side view thereof; and

FIGS. 12A, B, and C are front views showing the covers for the contact boxes according to embodiments of the present invention wherein the type of contact arrangement can be identified from a color applied thereon, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described in detail with respect to the embodiments shown in the drawings.

Referring first to FIGS. 1 to 5, the reference numeral 1 represents a casing in which an operating electromagnet M is accommodated, 2, 3, and 4 a fixed core, excitation coil and movable core which constitute the electromagnet M respectively, and 3a and 3b terminals taken from the excitation coil 3. The reference numeral 5 denotes a connector member which is coupled to the movable core 4 through a shaft 6. The connector member 5 is held in an elevated position by means of springs 7 inserted between spring receiving portions 5a, 5a projecting sidewise therefrom and the top surface of a bobbin on which the excitation coil 3 is wound, so that the movable core 4 coupled to the connector member 5 is also held in an elevated position. Two engaging pieces 5b, 5b are provided on the top surface of the connector member 5 in opposing relationship with each other, and they are made to project upwards through an aperture 1c formed in the center portion of an upper box 1b of the casing 1. The ends of the engaging pieces 5b, 5b are inwardly bent so that the spacing therebetween is reduced so as to define engaging ends 5c. Provided in the neighborhood of the opposite sides on the top surface of the casing upper box 1b are engaging pieces 1d, 1d in parallel relationship to the aforementioned engaging pieces 5b, 5b. Furthermore, formed in the top surface of the casing upper box 1b are six recesses 1e, respective three of which are located at

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equal intervals between the engaging pieces 5b, 5b and 1d, 1d. The upper box 1b is combined with lower box 1a of the casing by means of screws 8, as shown in FIG. 1, these boxes being made independent of the electromagnet portion as shown in FIGS. 4 and 5.

The reference numeral 9 indicates a unit contact box comprising a main body 9a which is open at one side and a cover 9b covering the open face of the main body. The reference numeral 10 represents a movable contact supporting member vertically extending through the main body 9a and supporting movable contacts 11 with the aid of a spring 12. The reference numerals 13 and 14 indicate fixed contacts provided in opposing relationship to the movable contacts 11 and which are adapted to be contacted by the movable contacts 11 so as to be short-circuited therethrough. Connection terminals 13a and 14a are taken from the fixed contacts 13 and 14 sidewise of the main body 9a respectively. In the bottom surface of the contact box 9 at the opposite sides thereof, there are formed recessed grooves 9c which are configured in substantially the same shape as the engaging pieces provided on the upper box 1b, 1d so that the engaging pieces may be snugly fitted therein. The reference numeral 15 represents stoppers each of which is so adapted that the lower end thereof is inserted in an associated recess 1e. The lower ends of the stoppers 15 are normally projected downwardly of the bottom surface of the main body 9a by inserting flanges 15a of the stoppers in recesses 9d formed in the main body and downwardly biasing them with the aid of springs 16. Furthermore, formed in the bottom surface of the contact box 9 in the center portion thereof is a recessed groove 9e extending laterally thereof into which can be inserted that portion of the connector member 5 which projects out of the upper box 1b of the casing. The support 10 has its lower end placed in the recessed groove 9e, and it is provided in the lower end portion at the opposite sides with slots 10b, 10b with which the engaging ends 5c formed by banding the engaging pieces 5b of the connector member 5 can be engaged when the engaging pieces 5b are inserted in the recessed grooves 9e.

The reference numerals 17 and 18 indicate through-holes extending through the main body 9a and cover 9b which are secured to each other by means of pins 19 to assemble the unit contact box 9. In order to attach the unit contact box 9 to the electromagnet casing 1, the former is slid longitudinally of the engaging pieces 1d and engaging pieces 5b while the engaging pieces 1d, 1d projecting from the top surface of the upper box 1b are fitted in the recessed grooves 9c, 9c formed in the bottom surface of the contact box 9 and the engaging pieces 5b of the connector member 5 are inserted in the recessed grooves 9e so that the engaging ends 5c, 5c are fitted into the slots 10b, 10b formed in the lower end portion of the support 10. Naturally, at this time, the unit contact box is displaced with the lower ends of the stoppers 15 disposed in contact with the casing 1 so as to be pushed up by means of the springs 16. When stoppers 15 are brought above the recesses 1e of the casing 1, the lower ends of the stoppers are dropped into the recesses 1e with the aid of the springs 16, so that the contact box 9 is stopped from displacement. Thus, the contact box 9 is caused to rest on the casing 1 and combined therewith. The combined relationship between the contact box 9 and the casing 1 is as shown in FIG. 3. By combining three such contact boxes 9 with the casing 1, it is possible to construct such a three-pole magnetic control relay as shown in FIG. 2. In order to facilitate the displacement of the contact box 9 on the casing, the stoppers 15 are rounded with respect to the direction of the movement, as will be seen from FIG. 6. Thus, the contact box 9 can be easily displaced against the springs 16 by imparting only a slight force thereto so that the contact box can be freely attached to or detached from the casing 1. FIG. 3 shows a contact box for normally-open contacts as mounted in place. However, it

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is also possible that a contact box for normally-closed contacts such as shown in FIG. 7 may be mounted instead of that for normally-open contacts.

FIG. 8 shows a double-contact type magnetic control relay wherein the contacts are mounted in two steps, one of the two contacts being normally open and the other one being normally closed.

FIG. 9 shows a triple-contact type magnetic control relay wherein the contacts are mounted in three steps, two of the three contacts being normally open and the other one being normally closed. By making the intermediate contact normally closed, it is possible to obtain a magnetic control relay of the triple-contact type wherein one of the contacts is normally open and the remaining two contacts are normally closed.

As will be appreciated from what has been described above, in accordance with the present invention, not only a single-contact type but also a double- or triple-contact type contact box can be freely attached to the casing 1, as shown in FIGS. 8 and 9. That is, the present invention is advantageous in that it is possible to adopt any desired type of contact arrangement.

In the magnetic control relay according to the present invention use is made of electromagnet M having a capacity sufficient to operate three contact boxes of the triple-contact type attached to the casing 1, as shown in FIG. 9. Therefore, there tends to occur such a danger that the fixed core 2 of the electromagnet M is violently shocked by the movable core 4 thereof in the case where use is made of contact boxes of the double- or single-contact type as shown in FIG. 7 or 8. In order to avoid such danger, a buffer spring 20 is employed. Description will be made of this spring 20. In accordance with the present invention, a normally-closed contact can be established merely by supporting the movable contact 11 with the aid of spring 12 in a window aperture 10c formed in the support 10 below the window aperture 10a so that the fixed contacts 13, 14 and movable contact 11 may be utilized for the arrangements of both the normally-open type and normally-closed type (see FIG. 7). Thus, in the case of the normally-closed type, the buffer spring 20 is inserted in the window aperture 10a for normally-closed contact while being supported by means of a spring 21 in such a manner that the opposite ends of the spring 20 are projected out of the window aperture 10a so as to be engaged with recesses 9f formed in the opposite side portions of the contact box between which the support 10 is interposed.

In the case of the normally-open contact type, the fixed contacts 13, 14 are bridged with the movable contact 11 before the movable core 4 is caused to violently strike against the fixed core 2. In this case, the support spring 12 serves as buffer, and therefore there is no need to use any special buffer spring.

The reference numerals 22 and 23 indicate through holes extending through the contact box 9. These through holes are formed for the purpose of inserting screws 24 therethrough to thereby fixedly attach all the plural contact boxes 9 to the casing 1 with the aid of nuts or the like.

FIG. 10 shows a contact box 25 of a high capacity as being attached to the casing 1. In this example, design is made such that only two such contact boxes are placed on the area of the casing 1 where three contact boxes are normally located, as shown in FIG. 11. Thus, there is provided a double-pole type magnetic control relay.

Furthermore, in accordance with the present invention, the cover 9b attached to each unit contact box is colored in a different color to distinguish between the normally-open contact type and the normally-closed contact type. Thus, the internal contact arrangement can easily be determined from the color since the cover 9b for each contact box 9 has its side end surface exposed even in the case where the contact boxes 9 mounted on the casing 1 correspond to three poles, as shown in FIG. 2. In the case

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of the double-contact type, if it is constructed in such a manner that one of the contacts is normally open while the other one is normally closed, the upper and lower portions of the cover 9b are colored in different colors according to the contact arrangement, as shown in FIG. 12a. Referring to FIGS. 12b and 12c, there are shown covers for the triple-contact type box and which are colored in different colors to distinguish between the arrangement wherein two of the contacts are normally open and the other one is normally closed and that wherein one of the contacts is normally open and the other two contacts are normally closed.

What is claimed is:

1. A magnetic control relay comprising an electromagnet casing accommodating therein an operating electromagnet, a plurality of unit contact boxes having movable contacts and support for said movable contacts, first and second slidable casing engaging portions provided respectively on opposite sides of the lower surface of each of said unit contact boxes and on opposite sides of the upper surface of said electromagnet casing, first and second slidable engaging portions provided respectively on the lower end of said support and the upper end of said

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movable core, and stoppers carried by each of said unit contact boxes and projecting downwardly therefrom, said stoppers being spring biased downwardly to engage a plurality of spaced recesses in the upper surface of said electromagnet casing, whereby said unit contact boxes slidably engage said electromagnet casing and said support slidably engages said movable core, proper positioning and retention of said unit contact boxes on said electromagnet casing as well as ease of installation and removal being assured by the interaction of said stoppers with said recesses.

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HAROLD BROOME, Primary Examiner