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(54) ELECTROMAGNETIC RELAY

(57) Electromagnetic relay comprising a coil (4) and a core (3) connected to parts (1) and (2), such that when the coil is excited the magnetic circuit is closed and acts on moving part (5), which in turn and by means of insulating part (8) uniformly moves plates (6) and plastic indicator (22), which are welded or riveted to the bridges formed by conducting parts (10), which through support plate (11) are connected to the external terminals (12), where relay case (20) defines an upper recess (13) with a horizontal partition (14) housing a printed circuit (15), duly insulated from the contact block, where connection to the printed circuit (15) in through terminals (16) and (17).

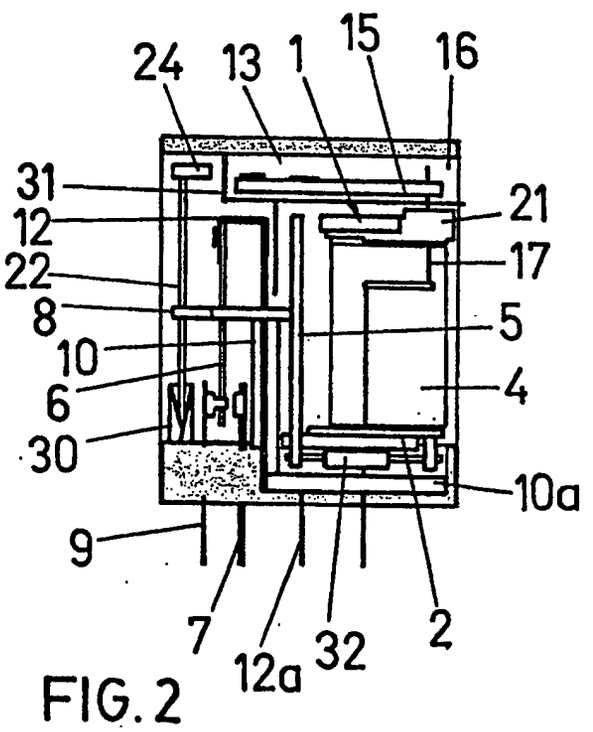

FIG. 2

EP 1 241 696 A1

Description

OBJECT OF THE INVENTION

[0001] The invention here disclosed relates to an electromagnetic relay of those essentially comprising a coil, a core, an armature, fixed contact plates and other mobile contact plates with their corresponding terminals, as well as means for indicating the state of the relay.

[0002] The relay of the present invention means to solve the demands of current technology in applications for these components, mainly in those related to automation systems in industrial process where they are involved, without prejudice of visually observing the state of the operated relay. Furthermore, the recommendations published in the Low Voltage Directive regarding these components must be complied with.

[0003] Programmed logic controls (PLC) require elements used as interfaces in signal inputs or outputs (electromagnetic or solid state relays) to be protected against instantaneous over currents carried by the lines or generated by the relay itself when the coil is disconnected.

[0004] In order to obtain this protection, suppressor circuits are used with diodes, varistors, capacitors, etc. Which are connected in series or in parallel to the relay coil. These circuits may be placed outside the relay, in which case a plug particularly designed for this is required, thus depending on a single manufacturer, or placed inside the relay. The latter solution is the preferred one by technical design and maintenance personnel, as it allows using standard plugs available in the market, or even those already installed in the control units, thus simplifying maintenance tasks.

[0005] Housing these circuits inside the relay presents problems, due to the small sizes available, as well as the difficulty in preserving the required insulation between these circuits and the output contacts block of the relay. These problems are even greater when dealing with small relays which must comply with international regulations regarding insulation distances between the coil and contacts and with protection levels established in said regulations.

BACKGROUND OF THE INVENTION

[0006] Electromagnetic relays with several poles conventionally incorporate a coil mounted on a support, as well as an armature which is attracted by coil core when it is excited, the armature carrying when it is attracted a number or movable plates, losing contact with normally closed contacts and contacting normally open contacts, which are on the base of the relay and connected to the external connection pins. Movable plates are joined to the armature as the armature carries with it said plates when it is displaced. Connection pins is by means of a cabling which must be performed manually, representing a great investment of both time and labour for a perfect connection.

[0007] Additionally, in these relays the incorporation of protection circuits is limited to simple circuits consisting of few components, which must be distributed in the spaces allowed by the relay mechanisms without hindering moving parts and maintaining the required insulation. Connection between components is generally achieved by welded cables, so that said insulation distances are seriously compromised and the labour employed is expensive.

[0008] Furthermore, inserting any king of printed circuit bearing the protection and other circuits required for operation of the relay is complicated by the distances required to avoid electromagnetic interferences.

[0009] Therefore, the object of the present application for an electromagnetic relay is to solve said disadvantages arising in obtaining a connection between the moving contacts and the external connection pins, without requiring cabling for this and achieving this connection by means of a number of elements which simplify an automated assembly without resorting to cabling, as well as the possibility of integrating in the relay itself the circuitry defined in an exchangeable board and integration of the various elements which comprise the relay as several easily assembled modules.

DESCRIPTION OT THE INVENTION

[0010] The electromagnetic relay of the invention fulfils the above characteristics to full satisfaction, essentially consisting of an easily assembled multimodule set mainly comprising a case with a recess meant for a small exchangeable circuit board, a base plate on which the plates are mounted, terminals, a magnetic circuit and a reel for mounting the coil.

[0011] On the base module is mounted the support and the coil reel with their various elements, all within a large recess provided inside the case.

[0012] The case has a rectangular prism shape open on its bottom face, which leads to the aforementioned inner recess which is internally limited by a horizontal partition which is the base of a small cubicle defined in the top face of the case, and longitudinally limited by a further vertical partition.

[0013] The circuit is thereby housed within said cubicle, covered by an easily removable lid which is removed when exchanging the printed circuit board, thus allowing a simple exchange of the circuits in order to provide different applications for the relay.

[0014] In addition, said plate is provided with a number of openings through which the relay terminals project outside.

[0015] The coil reel consists of a cylindrical portion ending in a top laminar base which extends beyond said portion, which is provided with end notches meant for coupling terminals.

[0016] The movable contacts are moved by a plastic

part which is connected by lugs to the moving part or armature in recesses provided in it, as through openings in said plastic part pass the bridges which in turn are connected to the moving contacts. This same plastic part, by means of other openings provided in it transmits the motion to plastic indicator which shows the status of the relay.

DESCRIPTION OF THE DRAWINGS

[0017] As a complement of the description and in order to aid a better understanding of the characteristics of the invention the present description is accompanied by a set of drawings where, for purposes of illustration only and in a non-limiting manner the following is shown:

Figure 1 shows a front view of the electromagnetic relay object of the invention.

Figure 2 shows a side view of the relay where the various elements can be seen.

Figure 3 shows a rear view of the relay.

Figure 4 shows a front view of the indicator.

Figure 5 shows the insulator part meant to transmit the motion to the moving contacts when the coil is excited.

PREFERRED EMBODIMENT OF THE INVENTION

[0018] A preferred embodiment of the electromagnetic relay object of the invention is now described with reference to these figures.

[0019] Figures 1 to 5, described simultaneously, show the magnetic circuit comprising parts (1) and (2), which are adjusted and attached to a core (3) which once activated by coil (4) attracts movable part (5), where said part (5) moves on part (2). Part (5) is retained in its resting position by spring (32).

[0020] Reel (21) of coil (4) is positioned by partitions (34), which extend from base plate (11), remaining next to the reel covers.

[0021] Insulator (8) is in charge of moving the contacts (6), for which purpose said insulator part (8) is joined to the moving part (5) of the magnetic circuit, by means of two lugs (27) provided on part (8) which insert in orifices (29) of part (5), so that when moving part (5) moves it transmits its motion to moving contacts (6) through openings (26).

[0022] Moving contacts (6) are moved simultaneously, opening normally closed contacts (9) and closing normally open contacts (7), when the coil receives a suitable voltage, the magnetic circuit then attracting armature (5) and moving part (8).

[0023] When the coil is d-excited, armature (5) returns to its resting position forced by spring (32) and by the action of movable contact plates (6) which have been previously provided with an initial pressure on normally closed contacts (9), thus performing an initial switching of electrical charge between both contacts.

[0024] Moving plates (6) are welded or riveted to the bridges formed by parts (12), which are bent such that their lower ends form terminals (12a). Said parts (12) are duly guided and insulated from each other by parts (10) and (10a), which extend from support plate (11).

[0025] Insulator part (8) is designed such that a it has a number of openings (26) and (28), where openings (26) are placed and sized matching the heads of bridges (12), so that it may insert on the top part of bridges (12), and so as part (8) is moved all moving plates (6) are simultaneously carried with it. Figure 5 shows the respective position of moving plates (6) and windows (26).

[0026] Additionally, and as previously mentioned, this relay is provided with a mechanical indicator, consisting of the insulating indicator part (22). Figure 4 shows said part (22), which comprises two pins (23) which pass through openings (28) of part (8) is moved it carries part (22), whose top part ends in a flag (24) which is visible from the outside of the relay through a transparent window suitably made and located on the top lid of the relay (19) when activated, and which is hidden when deactivated.

[0027] Relay case (20), preferably made from a transparent insulating material, is open on its top end (33) and is has a box (13) defined by bottom partition (14) and vertical partition (31), which cubicle is meant to house a printed circuit board (15) provided with a number of electrical components (35) for protecting the relay. Said printed circuit (15) has a number of tinned orifices arranged so that they match terminals (16) and (17) of the terminals of coil (4). Terminals (17) are an extension of terminals (18) and are guided by grooves made on the top lid of reel (21). The orifices and reels are preferably aligned to simplify automated welding of these terminals onto the printed circuit board.

[0028] Cover (19) has an opening for visualising an LED lamp which indicates the relay status, as well as a further opening which reveals flag (24) of plastic indicator part (22), so that flag (24) is opposite the opening made in relay cover (19). Additionally, cover (19) is also provided with a housing for an indicator label.

[0029] Relay cover (19) is preferably opaque and is coupled to case (20) by suitable fasteners so that it fully closes the top open part of lid (33). The cubicle which houses the printed circuit and its components is thus closed, ensuring a full insulation between said components and conducting parts (12). There are therefore three areas defined inside case (20), the coil housing, the printed circuit board housing and the contacts area, thus complying with the insulation requirements of the Low Voltage Regulations.

[0030] This description is not extended in the understanding that any expert in the field will understand the scope of the invention and the advantages derived

thereof.

[0031] The materials, shape, size and arrangement of the elements may vary within the same characterisation, as long as the essence of the invention is unaltered.

[0032] The terms used in this memory shall always be taken in a wide and non-limiting sense.

Claims

1. Electromagnetic relay comprising a coil (4), a magnetic circuit consisting of two parts (1) and (2) attached to a core (3) which is activated by coil (4), wherein the core attracts moving part or armature (5) which closes the magnetic circuit, wherein the entire unit is inside a case (20), **characterised in that** when coil (4) is excited it moves moving part (5), which in turn moves insulating part (8) as it is joined to moving part (5), and where through the openings made in insulating part (8) pass bridges (12), which are connected to moving plates (6), so that these moving plates (6) are simultaneously moved when insulating part (8) is moved, and furthermore where conducting parts (12), duly insulated, pass through support plate (11) and whose lower ends form terminals (12a), which are the external terminals of the switching contacts.

2. Electromagnetic relay as claimed in claim 1, **characterised in that** case (20) which covers the relay defines on its top part a cubicle (13) which houses a printed circuit (15), where said cubicle is defines by a lower partition (14) and a vertical partition (31), thus ensuring the insulation of printed circuit (15) from the contacts block, wherein connection to the components of printed circuit (15) is through terminals (16) inserted in reel (21) and terminals (17) which are an extension of terminals (18) arranged aligned, and wherein terminals (17) are guided by the grooves on the top lid of reel (21).

3. Electromagnetic relay as claimed in claim 1, **characterised in that** relay case (20) is closed by a lid (19) which is fitted onto said case (20), and additionally on said lid are provided orifices for fitting a removable identification label for the relay, a further orifice for the light to pass from an LED placed on printed circuit (15) which indicates the relay status and an opening allowing to see the status of the relay by means of flag (24) of the plastic indicator part (22), so that when the relay is activated flag (24) coincides with the orifice provided on lid (19).

4. electromagnetic relay as claimed in claim 1, **characterised in that** plastic part (8), which is in charge of transmitting the motion of armature (5) to moving plates (6) and to plastic indicator (22) when coil (4) receives the suitable voltage, is provided with a number of openings (26) through which pass bridges (12), which are connected to moving plates (6) and further openings (28) through which pass pins (23) of plastic indicator (22).

5. Electromagnetic relay as claimed in claim 1, **characterised in that** plastic indicator (22) is provided with a flag (24) on its top and has two pins (23) which pass through openings (28) of plastic part (8), so that when it is carried by part (8) flag (24) of plastic indicator (22) coincides with the opening on the relay lid (19).

6. Electromagnetic relay as claimed in claim 1, **characterised in that** conducting parts or bridges (12) are duly aligned, insulated and separated from each other by parts (10) and (10a), while moving plates (6) and plastic indicator (22) return by means of part (8), which in turn is carried by moving part or armature (5), which in turn is restored to its initial position by a spring (32).

7. Electromagnetic relay as claimed in claim 1, **characterised in that** part (8) is attached to moving part or armature (5) by means of lugs (27) provided in part (8), which insert in orifices (29) made in moving part or armature (5).

8. Electromagnetic relay as claimed in claim 1, **characterised in that** inside case (20) are defined three cavities, the one occupied by the coil, cavity (13) defined by bottom partition (14) and vertical partition (31) which houses the printed circuit, and that meant for the contacts, where all said contacts defined in case (20) are insulated from each other according to the recommendations of the Low Voltage Regulations.

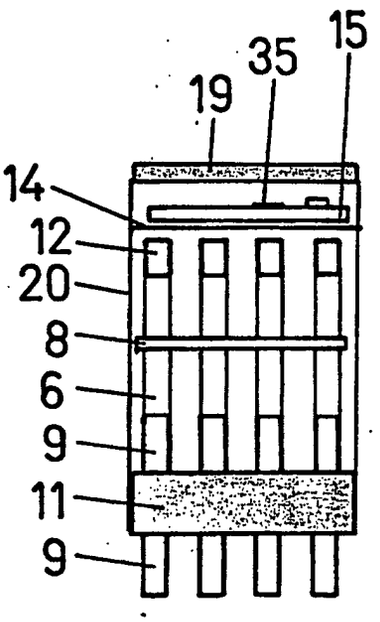
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FIG.1

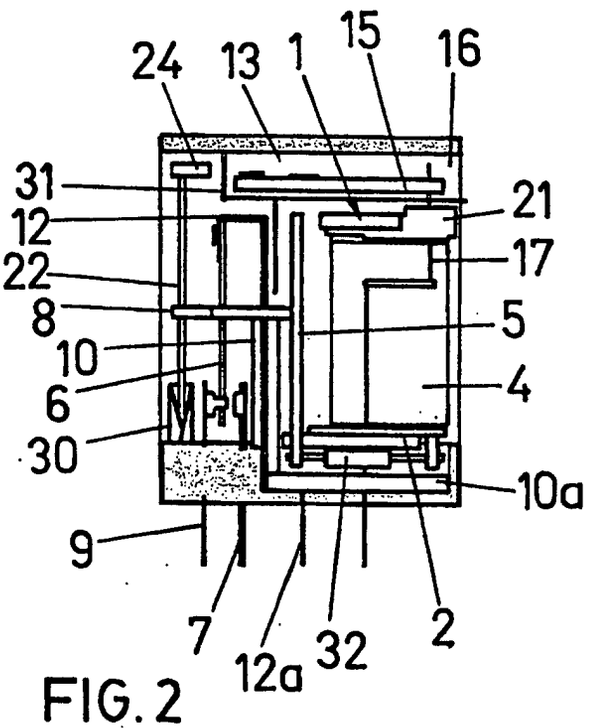
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FIG.2

FIG. 3

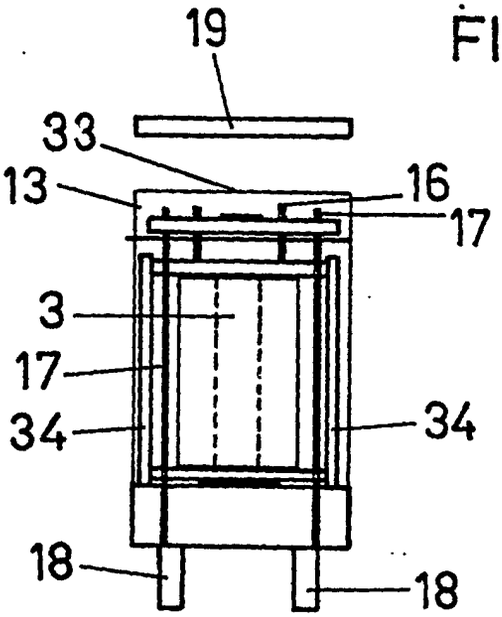


FIG. 4

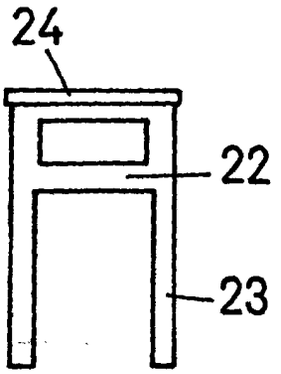
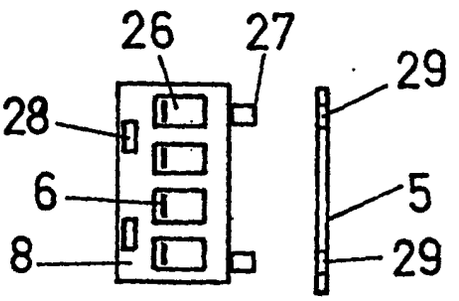


FIG. 5



INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/ES 00/00210

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01H50/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A		4-6

Y	EP 0 308 547 A (RELE FINDER SPA) 29 March 1989 (1989-03-29) the whole document	1-3
A		4-6

A	EP 0 306 013 A (OMRON TATEISI ELECTRONICS CO) 8 March 1989 (1989-03-08) the whole document	1,3-6

A	US 4 771 253 A (SASAKI NARUHITO ET AL) 13 September 1988 (1988-09-13) the whole document	1,3-6

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
5 October 2000	13. 11. 2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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