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(54) **Connector for terminal block**

(57) This invention relates to an electrical connector for a terminal block comprises an electrical insulated housing and a conducting pipe including a longitudinal hole mounted in said body, and each end of the longitudinal hole containing a wire inserted in for electrical adjoining; a longitudinal metal plate including two squeezing feet is mounted along with the sidewall of said conducting

pipe, and each squeezing foot squeezes corresponding wire on the sidewall of said conducting pipe driven by corresponding bolt. The object of the present invention is to improve the reliability of electrical conduction and to protect the wire as well. Compared with the prior art, the advantage of the present invention is to form a conducting route directly for the pair of the adjoined wires.

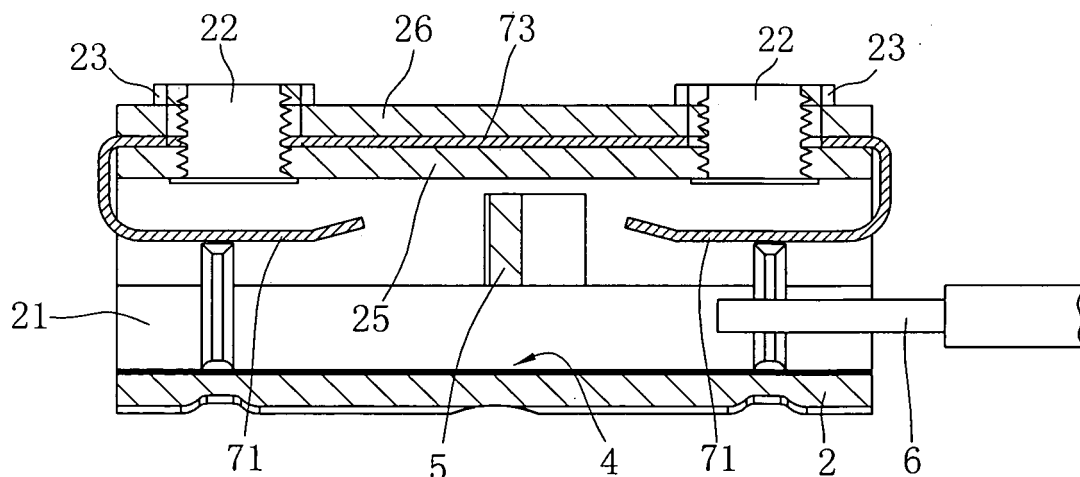


Fig.6

Description

Field of the invention

[0001] The present invention relates to a connector for a terminal block connecting a pair of wires electrically together.

Background

[0002] Traditional terminal blocks are in the form of a plurality of parallel individual connectors. Each connector includes an individual conducting pipe mounted in an insulated housing and be capable of adjoining at least two wires. Generally, the conducting pipe positioned in the insulated housing is entirely made of metal or alloy, such as copper, to ensure the best possible electrical conduction. A wire can be inserted into the end of the opening of the conducting pipe and be squeezed firmly onto the inner sidewall of the conducting pipe to provide electrical conductivity between pairs of wires or cables adjoining via the conducting pipe. However, making a conducting pipe entirely of copper via machining processes becomes expensive.

[0003] For manufacturing costs consideration, the existing structure of the connector for terminal block is improved. Such as the European patent EP1852941A1 discloses a connector for terminal blocks as follows: a conducting pipe made of steel including a hollow inner space is mounted in a cylindrical connector body, a conduction plate made of phosphor bronze is clad onto the inner surface of the conducting pipe and the said conducting plate includes a concaved surface having a length substantially the same as that of said conducting pipe along the longitudinal direction thereof. Therefore, the conducting pipe can be made of structurally strong and yet cheap metallic or alloy material, such as iron, and the inner surface of the conducting pipe for wire contacting includes an inner lining brass conduction plate that is capable of saving the more expensive brass material to achieve the characteristic of optimized price-performance.

[0004] However, the brass conduction plate and the inner surface of the conducting pipe are stamping-riveted, that is, the conduction plate and the inner surface of the conducting pipe are detached, and are only riveted together in a press-form machining procedure. As a result, the brass conduction plate is not rigidly fastened or securely attached on the inner surface of the conducting pipe and is of low conductive reliability, furthermore, it is hard to practice by the technological process of die punching and needs to spend higher costs.

[0005] Moreover, the wires in the above structure of the connector are squeezed firmly onto the inner sidewall of the conducting pipe by bolt tips directly, so it is easy to destroy the wires, especially to the multi-core wires. Besides, the contact area between the wire and the inner wall of the conducting pipe is small and limited so as to weak the capability of electrical conduction of the said

connector. Therefore, the conductive structure of a connector for a terminal block needs to be improved further to resolve the existed problems in the above mentioned patent and to achieve a more optimized performance both in structure and costs.

Summary of the invention

[0006] It is an object of the present invention to provide a connector for a terminal block with a metal plate mounted along with the sidewall of said conducting pipe to protect the wires and to ensure higher conducting reliability.

[0007] For achieving the above stated object, the connector for a terminal block of the present invention comprises:

an insulated housing, including two radial first screw holes opened through the thickness of the sidewall of the housing; and

a conducting pipe, mounted in said insulated housing, including a longitudinal hole whose each end containing a wire inserted in for electrical adjoining, two corresponding radial second screw holes are formed on the sidewall of said conducting pipe aligned to corresponding said first screw holes separately, each pair of aligned said first screw hole and said second screw hole receive a bolt;

characterized in that a longitudinal metal plate is mounted along with the sidewall of said conducting pipe, and two third holes are formed on said metal plate, each third hole aligns to corresponding said first screw hole as well as to corresponding said second screw hole, and each end of said metal plate is bended inward into the longitudinal hole of the conducting pipe forming a squeezing foot, and each said squeezing foot squeezes corresponding said wire on the sidewall of said conducting pipe driven by corresponding said bolt which pass through the aligned said first screw hole, said second screw hole and said third hole.

[0008] The said metal plate including its two squeezing feet can be entirely mounted inside the longitudinal hole of said conducting pipe, while considering stably fixing the metal plate to the conducting pipe, said conducting pipe is formed by an integrative sheet metal being curled to a D-shape cylindrical body which includes a plat portion where the two ends of the sheet metal comprising a first end portion and a second end portion overlapped one on top of the other, and the first said end portion includes a protruding part, the second end portion includes a corresponding slot receiving said protruding part, furthermore, the middle portion of said metal plate is mounted between said first bended portion and said second bended portion.

[0009] In order to enhance the electrical conduction, a longitudinal conducting copper layer in contact with said inserted wire is embedded on the inner sidewall of said conducting pipe, and the surface of the copper layer be-

comes a part of the inner surface of the sidewall of said conducting pipe, the material of the conducting pipe is a kind of metal whose capability of electrical conduction is weaker than copper, and corresponding wire is squeezed on said conducting copper layer by said bolt. Thus, the entire conducting pipe made of the cheap sheet metal, such as iron, and can be produced via machining processes by punching directly. The inner sidewall of the conducting pipe having a copper layer for electrical conducting makes the intensity of the conducting portion higher, the costs of the conducting pipe lower and the manufacture of the connector easier.

[0010] Compared with the prior art, in this invention, a longitudinal metal plate is mounted in the sidewall of said conducting pipe to form a conducting route directly for the pair of the adjoined wires inserted into the hole of said conducting pipe and to enhance the electrical conduction. Furthermore, the wire pressed between the squeezing foot and the copper layer is fixed indirectly by the end portion of said bolt to protect the exposed conductive ends of said wires as well as to expand the contact area between said wires and said copper layer.

Description of the drawings

[0011]

FIG.1 is an exploded perspective view of a terminal block in accordance with the first embodiment of the present invention.

FIG.2 is a perspective view of a conducting pipe assembly in accordance with the first embodiment of the present invention.

FIG.3 is a sectional view of the conducting pipe shown in FIG.2.

FIG.4 is a plan view of copper layer in accordance with the first embodiment of the present invention.

FIG.5 is a perspective view of a metal plate in accordance with the second embodiment of the present invention.

FIG.6 is a sectional view of the conducting pipe in accordance with the second embodiment of the present invention.

FIG.7 is a perspective view of a conducting pipe assembly in accordance with the second embodiment of the present invention.

FIG.8 is a side view of the conducting pipe shown in FIG.7.

FIG.9 is a cross sectional view of an assembly in accordance with the second embodiment of the present invention.

Detailed description of the preferred embodiment

[0012] To enable a further understanding of the innovative and technological content of the invention herein, refer to the detailed description of the invention and the accompanying drawings below:

[0013] FIGS. 1-4 show the first preferred embodiment of the present invention.

[0014] In this embodiment, the connector for a terminal block includes two electrical insulated housings 1 in parallel which are in the form of structurally connected by a common traverse connecting bar 14, and each insulated housing 1 is capable of adjoining at least two wires 6. The individual insulated housing 1 contains a rectangular opening 13 in which mounts an iron conducting pipe 2 with a longitudinal hole 21, and a copper layer 4 in contact with said wires is embedded in the inner sidewall of the conducting pipe 2, which is in a length along the longitudinal direction of the conducting pipe 2 and the surface of the copper layer 4 becomes a part of the inner surface of the sidewall of said conducting pipe 2.

[0015] A pair of first screw holes 11 that are suit for bolts extending through the opening 13 are symmetrically set on the sidewall of each insulated housing 1, and a screw well 12 is provided on its corresponding first screw 11 hole for which making the bolts 3 sink into, two corresponding second screw holes 22 which are opposite to the first screw hole 11 are opened through the entire thickness of the sidewall of the conducting pipe's cylindrical body, each second screw hole 22 includes a protruding platform 23 and wires 6 can be inserted into the longitudinal hole 21 of the conducting pipe 2. The wire 6 inserted into the longitudinal hole 21 of the conducting pipe 2 can be squeezed firmly onto the copper layer 4 of the inner sidewall of the conducting pipe 2 under the pressure of a bolt 3 screwed into the first screw hole 11 as well as its corresponding second screw hole 22.

[0016] As shown in FIG 2 and FIG 3, the said conducting pipe 2 is formed by an integrative sheet metal being curled to a D-shape cylindrical body with two end portions 25, 26 of the sheet metal being bended oppositely. The drawings of FIG 2 depicts the conducting pipe 2 with a letter D end shape forming a flat portion where the two ends of the sheet metal comprising a first end portion 25 and a second end portion 26 overlapped one on top of the other. Also, the first end portion 25 has two protruding part 251 and the second end portion 26 includes two corresponding slots 261 receiving said protruding part 251, and the protruding part 251 can be inserted into the slots 261 to make sure the two ends of the roll-formed sheet metal overlapped connection and fastened to each other. The conducting pipe 2 also includes an end shape in conformity with the curved segment of the letter D end shape and the wire 6 is inserted into the longitudinal hole 21 of the conducting pipe 2 directly next to the curved sidewall 24. Preferably, the entire conducting pipe 2 is made of iron and a copper layer 4 is embedded into the sheet material of the curved sidewall 24 of the conducting pipe 2 by means of strong force, instead of the original press-formed conduction plate, to make sure the copper material compounded within the sheet material.

[0017] When using the connector, the wires 6 to be electrically connected for either power or signal relay purposes are each inserted into the longitudinal hole 21 of

the conducting pipe 2 from its corresponding end and can be firmly squeezed between the bolt tip and the concaved surface of the copper layer 4 so as to ensure the electrical conduction between the two adjoined wires 6. For preventing the adjoined wires 6 interfering with each other, a wire end plate 5 can be formed from the middle portion of the sidewall of the conducting pipe 2 via punching through the sidewall of the conducting pipe 2 and bending inwardly toward the longitudinal hole 21 of the conducting pipe 2, as show in FIG 2. For there is a copper layer 4 in placed of the traditional conducting plate inside the inner sidewall of the conducting pipe 2, it provides a firmly connection between the copper material and the iron material and avoids the copper plate breaking off from the inner surface of the conducting pipe 2, and therefore the connector achieves a higher reliability of electrical conduction.

[0018] Said connector for a terminal block can also include only a single electrical insulated housing or include a plurality of electrical insulated housings connected in parallel.

[0019] FIGS.5-9 show the second preferred embodiment of the present invention.

[0020] The difference of this embodiment compared with the first embodiment is that: as show in FIG6, a longitudinal metal plate 7 made of phosphor bronze material is mounted along with the sidewall of said conducting pipe 2 in order to prevent the bolt tip directly pressing onto the wire 6 so as to destroy the wire (especially to multi-core wire) and it also reduces the sliding friction and improves the reliability of electrical conduction.

[0021] The metal plate 7 includes two ends, and each end of said metal plate 7 extends outside said conducting pipe 2 and then bends inward into the longitudinal hole 21 of the conducting pipe 2 forming a squeezing foot 71, as shown in FIG 6. The middle portion 73 of said metal plate 7 is mounted between said first bended portion 25 and said second bended portion 26.

[0022] As show in FIG 5, the drawing depicts that two third holes 72 are formed on said metal plate 7, each third hole 72 aligns to corresponding said first screw hole 11 as well as to corresponding said second screw hole 22.

[0023] As show in FIG 9, the blot 3 sinks into the screw well 12 provided on the insulated housing 1 and passes through of its corresponding first screw hole 11, the third hole 72 and the second screw hole 22 in sequence and arrives at the upper surface of the metal plate 7, and each said squeezing foot 71 squeeze corresponding said wire 6 onto said conducting copper layer 4 driven by corresponding said bolt 3 which pass through the aligned said first screw hole 11, said second screw hole 22 and said third hole 72. As a result, the metal plate 7 serves to prevent inserted wires from wearing off by bolt tips, especially to the wires with multi-strands cores, which provides a larger interface between the wire 6 and the bolt tips to improve the reliability of the electrical conduction and contacts more smoothly between the wire 6 and the

bolt tips to prolong the working life of the wire.

[0024] Additionally, the wire 6 inserted into the longitudinal hole 21 of the conducting pipe 2 can be electrical conducted by another conducting route through the said metal plate 7 which is mounted into the sidewall of the conducting pipe 2 in an axial direction except for the conducting route by the copper layer 4 which is embedded in the iron material of the conducting pipe 2. Thus, the ability of electrical conduction is enhanced and the reliability of the electrical conduction is improved as well.

[0025] To summarize, the present invention has the following advantages compared to prior art:

1. It contains a copper layer which is firmly well connected within the part portion of the iron material so as to receive a good structural strength for the general body of the conducting pipe;
2. The capability of electrical conduction is enhanced and the reliability of the electrical conduction is improved;
3. It reduces the costs of machining processes and is easy to realize by the technological process of punching.

Claims

1. A connector for a terminal block, comprising:

an insulated housing (1), including two radial first screw holes (11) opened through the thickness of the sidewall of the housing(1); and
a conducting pipe (2), mounted in said insulated housing (1), including a longitudinal hole (21) whose each end containing a wire inserted in for electrical adjoining, two corresponding radial second screw holes (22) are formed on the sidewall of said conducting pipe (2) aligned to corresponding said first screw holes (11) separately, each pair of aligned said first screw hole (11) and said second screw hole (22) receive a bolt (3);

characterized in that a longitudinal metal plate (7) is mounted along with the sidewall of said conducting pipe (2), and two third holes (72) are formed on said metal plate (7), each third hole (72) aligns to corresponding said first screw hole (11) as well as to corresponding said second screw hole (22), and each end of said metal plate (7) is bended inward into the longitudinal hole (21) of the conducting pipe (2) forming a squeezing foot (71), and each said squeezing foot (71) squeezes corresponding said wire (6) on the sidewall of said conducting pipe (2) driven by corresponding said bolt (3) which pass through the aligned said first screw hole (11), said second screw hole (22) and said third hole (72).

2. The connector of claim 1, wherein said conducting pipe (2) is formed by an integrative sheet metal being curled to a D-shape cylindrical body which includes a plat portion where the two ends of the sheet metal comprising a first end portion (25) and a second end portion (26) overlapped one on top of the other, and the first said end portion (25) includes a protruding part (251), the second end portion (26) includes a corresponding slot (261) receiving said protruding part (251), furthermore, the middle portion (73) of said metal plate (7) is mounted between said first bended portion (25) and said second bended portion (26). 5 10
3. The connector of claim 1 or 2, wherein a longitudinal conducting copper layer (4) in contact with said inserted wire (6) is embedded on the inner sidewall of said conducting pipe (2), and the surface of the copper layer (4) becomes a part of the inner surface of the sidewall of said conducting pipe (2), the material of the conducting pipe is a kind of metal whose capability of electrical conduction is weaker than copper, and corresponding wire (6) is squeezed on said conducting copper layer (4) by said bolt (3). 15 20 25

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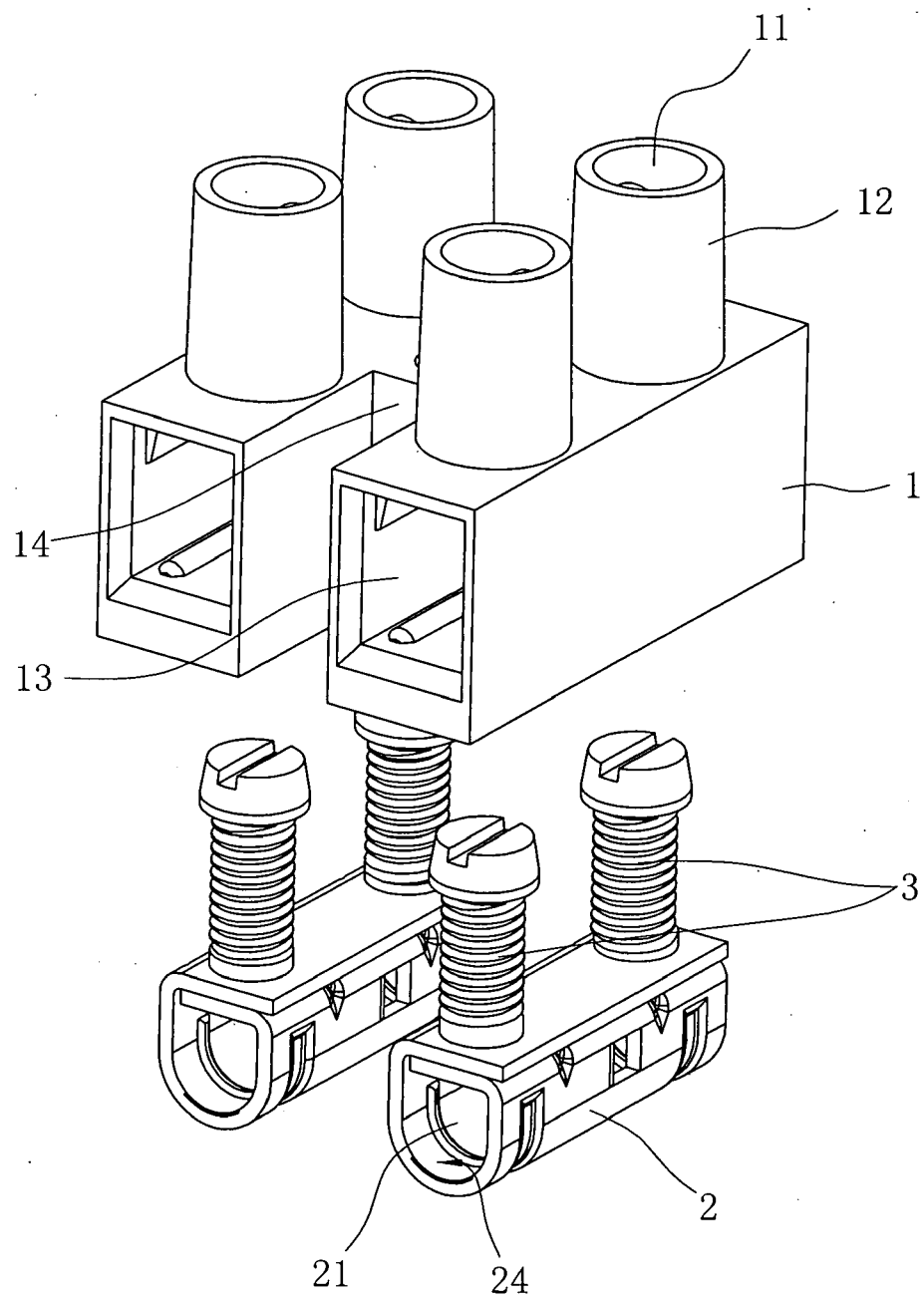


Fig.1

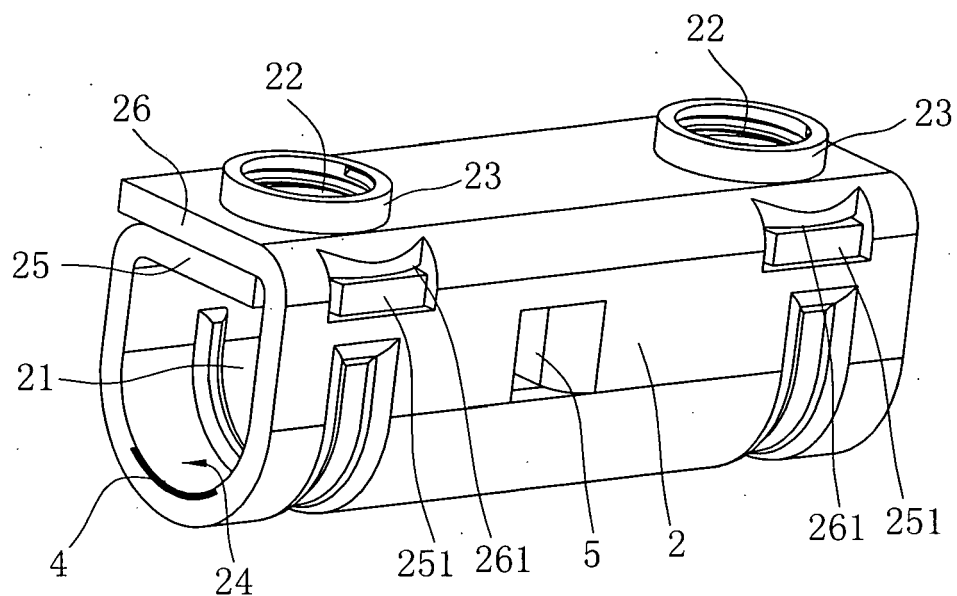


Fig.2

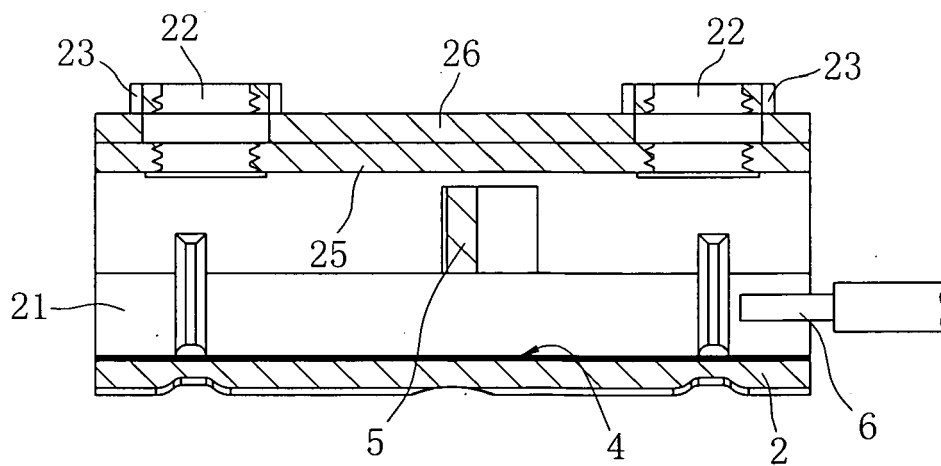


Fig.3

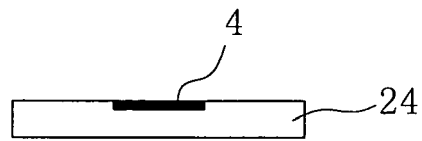


Fig. 4

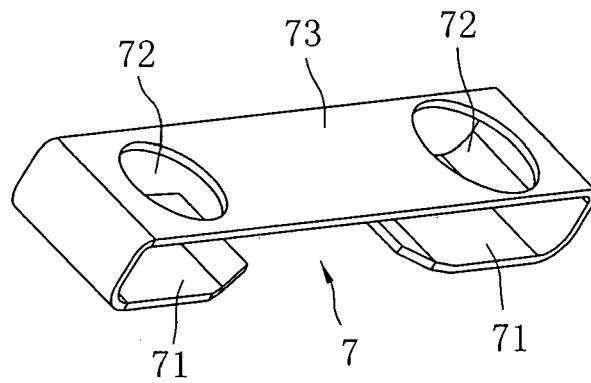


Fig. 5

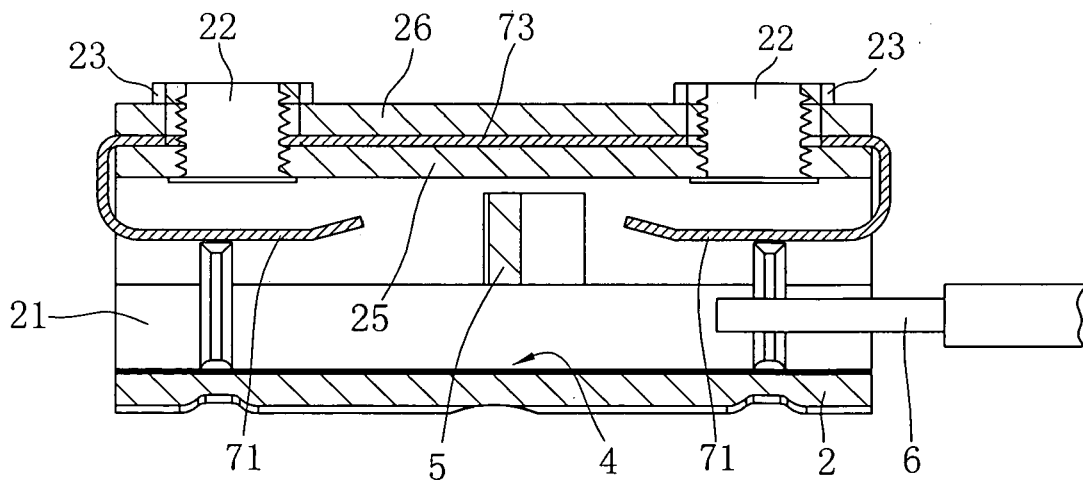


Fig. 6

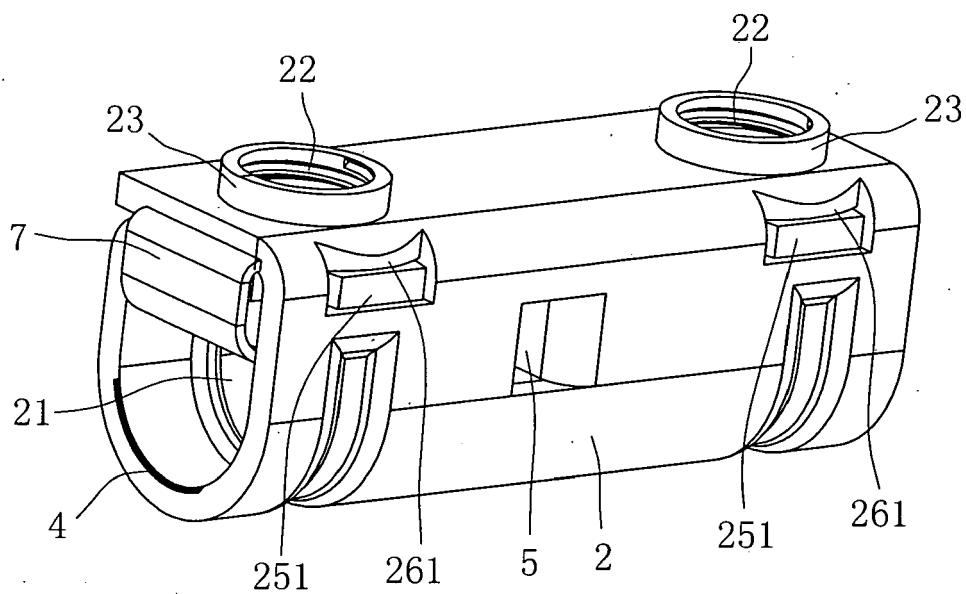


Fig.7

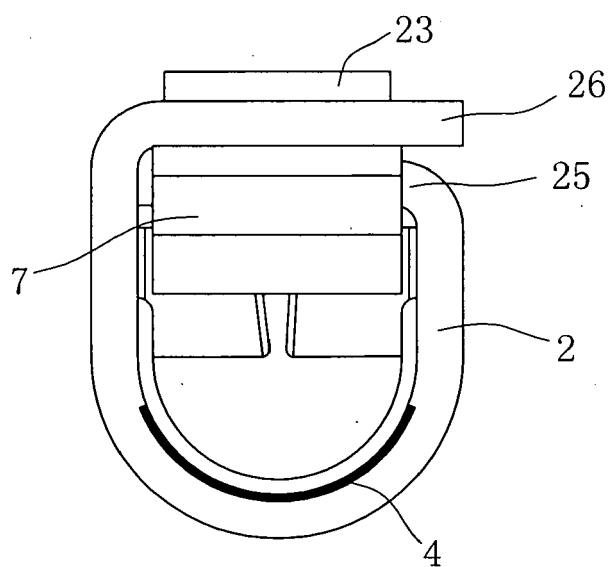


Fig.8

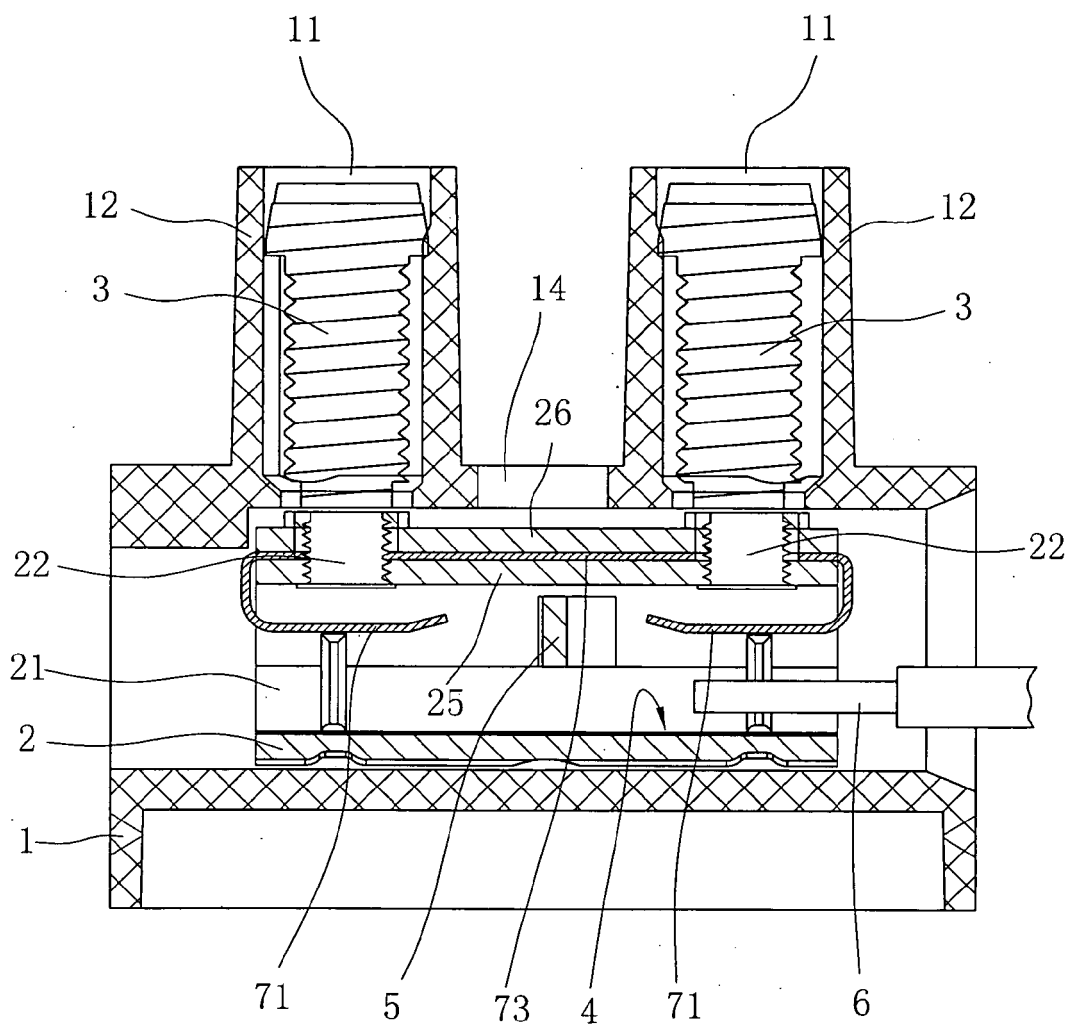


Fig.9



EUROPEAN SEARCH REPORT

Application Number
EP 08 25 3767

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 12 62 400 B (C A WEIDMUELLER K G) 7 March 1968 (1968-03-07)	1	INV. H01R4/36 H01R9/24
Y	* column 3, line 10 - column 4, line 22 * * figures 1-12 *	2	
Y	----- DE 91 11 075 U1 (METALLUK BAUSCHER GMBH & CO KG, 8600 BAMBERG, DE) 9 January 1992 (1992-01-09) * page 4, lines 13-34 * * figures 1-6 *	2	
A	----- CH 225 299 A (LICENTIA GMBH [DE]) 15 January 1943 (1943-01-15) * page 2, lines 44-64 * * figures 5,6 *	1	
A	----- DE 39 42 520 A1 (KLEINHUIS HERMANN GMBH [DE]) 27 June 1991 (1991-06-27) * column 3, line 11 - column 5, line 1 * * claim 7 * * figures 1,2 *	2,3	
A,D	----- EP 1 852 941 A (HEAVY POWER CO LTD [TW]) 7 November 2007 (2007-11-07) * paragraphs [0010] - [0016], [0019], [0020] * * figures 3-6 *	3	TECHNICAL FIELDS SEARCHED (IPC) H01R
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 May 2009	Examiner Ledoux, Serge
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 25 3767

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-05-2009

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DE 9111075	U1	09-01-1992	NONE	
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DE 3942520	A1	27-06-1991	NONE	
EP 1852941	A	07-11-2007	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1852941 A1 [0003]