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(54) **Connector for electro-mechanic devices, particularly for refrigerators' compressors and similar machines**

(57) A connector for electromechanical devices comprises a support base having a central portion and a peripheral portion surrounding the central portion, and a given number of electric poles housed in the central por-

tion; the connector also comprises mechanical-connection means formed in the support base and adapted to enable plugging, preferably of the reversible type, of at least one electrical-connection unit to the electric poles.

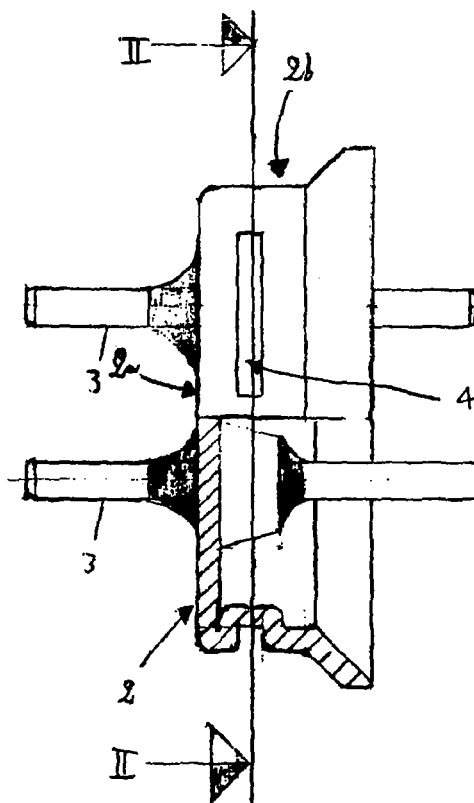


Fig. 1

Description

[0001] The present invention relates to a (power) connector for electromechanical devices, such as compressors to be mounted in home or industrial refrigerators.

[0002] It is known that for connection and operation of particular electromechanical devices (such as motors, compressors and others) inserted in complex machines, said devices are required to be suitably connected to a source of electric energy that can also be of great intensity.

[0003] Under many practical conditions, this connection must also satisfy very severe safety requirements, for example in terms of mechanical stability, impossibility of generating electric arcs or sparks, imperviousness to water or external environmental agents and so on.

[0004] A particular example showing the complexity of the electrical connection of an electromechanical device can be found in the field of refrigerators, in which a compressor has to be structurally and operatively connected to the system for circulation of the refrigerating liquid; usually this compressor is electrically powered by a connector having standard sizes and shapes, known on the market with the name of "FUSITE".

[0005] The hermetic connector of a widespread type is made up of a support base of substantially circular plan, in which three or more electric poles are inserted which pass through the support base and are insulated relative to the latter by suitable hollow spaces filled with an insulating material.

[0006] The connector is then engaged, in accordance with the known art, by an electrical-connection unit that is "external" to the compressor; this connection unit performs the functions, with a more or less high integration degree, of terminal board and/or cable clamping device and/or cover and/or "earthing" device.

[0007] In addition, it is to be pointed out that for the purpose of complying with the severe construction regulations, mounting of this connector on the compressor contemplates the presence of an additional mechanical supporting body (known in the pertinent technical field with the name of "fence") which is designed to bear the whole mechanical interconnection efforts between the compressor and the electrical-connection unit, and in particular the cable clamping device (which, on the contrary, as regards the electric part, is connected to the poles of the "FUSITE" that, however, does not bear any static or dynamic mechanical load).

[0008] While the known art briefly discussed above is widely used, it however has some drawbacks, above all in terms of size compactness, operating flexibility, standardisation and overall production costs, not only of the connector but also of the whole machine making use of it.

[0009] Actually, since a great variety of compressors are known which are very different from each other in terms of shape of the outer casing, positioning at the inside of the refrigerator and sizes, each individual manufacturer of compressors (or more generally each man-

ufacturer of electromechanical devices needing use of a connector of the "FUSITE" type or the like) is necessarily obliged to plan and make, for each of these types, a corresponding mechanical interfacing structure (or fence) and consequently a specific electrical-connection unit; clearly this involves an increase in the production costs and in addition, when the machines is being assembled, also involves the necessity to mount different electrical-connection units each time, depending on the manufacturer producing the compressors (or the electromechanical devices that are necessary for completing the assembly), which adversely affects the operating time on the assembly line, the quality of the finished product and the overall costs and also makes storage of the different pieces more complicated.

[0010] It is also to be pointed out that the operating separation between the capability of absorbing (static or dynamic) mechanical stresses and the capability of ensuring the electrical connection/continuity represents a further factor making planning and manufacture more complicated and also requires the overall bulkiness of the assembly consisting of "connector + electrical-connection unit + compressor" to be increased, which is clearly disadvantageous during planning and manufacture of the whole refrigerator.

[0011] Accordingly, the present invention aims at conceiving a connector for electromechanical devices, in particular for refrigerators' compressors and the like, that is capable of obviating the problems connected with above mentioned limits.

[0012] Mainly, the present invention aims at conceiving a connector allowing a higher standardisation of the mechanical and electrical interfacing of a compressor (or, more generally, of a similar electromechanical device) and at the same time enabling a substantial integration of the functions of mechanical and electrical connection.

[0013] In addition, the present invention aims at conceiving a connector that can be mounted on any type of compressors or electromechanical machines, also for replacing connectors of known type, without requiring modifications and therefore allowing a complete interchangeability with parts of known type.

[0014] Therefore the present invention aims at conceiving a connector that is able to offer appropriate performances in both the mechanical and the electric field, fully in compliance with the regulations in force, while at the same time involving an important reduction in the production and running costs.

[0015] The technical task mentioned and the aims specified are substantially achieved by a connector for electromechanical devices, preferably for refrigerators' compressors or the like, having the features set out in one or more of the appended claims.

[0016] The description of a preferred but not exclusive embodiment of a connector in accordance with the invention is now given hereinafter and illustrated in the accompanying drawings, in which:

- Fig. 1 is a transverse view, partly in section, of a first embodiment of the present connector;
- Fig. 2 is a sectional plan view of the connector seen in Fig. 1, taken along line II-II in Fig. 1;
- Fig. 3 is a transverse view, partly in section, of a second embodiment of the present connector;
- Fig. 4 is a plan view of the connector seen in Fig. 3; and
- Fig. 5 is a side view, partly in section, of an electrical-connection unit associated with the connector in accordance with the present invention.

[0017] With reference to the drawings, the connector according to the present invention has been generally identified with reference numeral 1 and substantially comprises a support base 2 adapted to be divided into a central portion 2a and a peripheral portion 2b surrounding said central portion 2a; also present is a given number of electric poles 3 (three electric poles for example that are disposed at 120° from each other), which are housed in the central portion 2a.

[0018] Advantageously, the present connector further comprises mechanical-connection means 4 formed in the support base 2 and adapted to enable plugging, preferably of the reversible type, of at least one electric-connection unit to the electric poles 3.

[0019] It should be noted at this point that the present invention markedly differs from the known art: in fact, arrangement of the mechanical-connection means 4 directly on the support base of the connector allows the different types of connections to be standardised and at the same time enables a significant simplification of the assembling operations; by directly connecting, from the mechanical and the electrical point of view, the electrical-connection unit (in turn connectable to cables and/or terminals belonging to an electric circuit) to the connector (which in turn has already been made integral with the compressor or more generally with the electromechanical device), it is possible to eliminate the so-called fence or any other intermediate covering element performing the only function of mechanical support (and possibly the function of environmental protection and/or earthing).

[0020] In other words, by virtue of the mechanical-connection means as above described (and hereinafter claimed) it is advantageously possible to determine two simultaneous functions in a single piece, while respecting the "original" interchangeability with the "FUSITE" connectors of known type and also in compliance with the planning and construction regulations.

[0021] In greater detail, it is possible to see that in the present connector the mechanical-connection means 4 is formed at least partly in the peripheral portion 2b and is also adapted to integrally withstand efforts and/or mechanical reactions resulting from connection of the above mentioned electrical-connection unit; for achieving integration of the present invention into complex machines (refrigerators for example, and the like), this electrical-connection unit will be preferably connected to and/or

integrated into a terminal board or another similar object and in any case will be plugged in connector 1 without transferring mechanical actions onto the electric poles 3, that at all events will be placed under conditions of circuit continuity with the electrical-connection unit.

[0022] With reference to the accompanying drawings, it is possible to see that the mechanical-connection means 4 can be made in different embodiments, provided they are adapted to achieve the above discussed purpose; at all events means 4 comprises a given number of hooking seats 4a adapted to receive corresponding hooking means (described in greater detail in the following) in engagement, preferably of the reversible type and more preferably of the "snap-fitting" and/or "bayonet-coupling" type, the shape of said hooking means 5 at least partly matching the shape of said hooking seats 4a.

[0023] In one example of an embodiment illustrated in the drawings, the hooking seats 4a comprise a given number of shaped recesses; conveniently said hooking seats are angularly spaced apart the same distance along the peripheral portion 2b (for instance, it is possible to see three hooking seats spaced apart through 120° from each other along the peripheral portion 2b).

[0024] According to another embodiment of the present invention, the mechanical-connection means 4 comprises a flanged expansion 6 jutting out of the support base 2; preferably this flanged expansion 6 juts out of the peripheral portion and extends in an offset plane relative to a lying plane of the central portion 2a.

[0025] In order to ensure compliance with the regulations in force, and supplement the electrical connection between any thing that can be interpreted as "circuit terminal" (or any thing that can be defined as "electrical-connection unit" constituting an operating and/or structural end of an electric circuit external to the electromechanical device) and the electromechanical device with suitable safety measures, the present connector can also contemplate the presence of an electric earthing element, which is associable in a circuit with the previously mentioned electrical-connection unit; advantageously, by utilising appropriate connections and/or electric insulators in the main body 2, this electric earthing element can include the mechanical-connection means 4 at least partly.

[0026] At all events, the electric earthing element can possibly also consist of a wire/cable to be directly connected to the outer portion of the electromechanical device, to part of the machine frame or directly to the ground, depending on current requirements.

[0027] It is also an object of the present invention to provide an electrical-connection unit having a more or less high operating/structural integration degree and comprising a main body 7 connectable to a predetermined number of electric wires and/or cables, and suitable electrical-connection means 8 formed in said main body 7.

[0028] The electrical-connection means 8 is connectable to the just mentioned electric wires and/or cables

and is also associable, at least partly, with corresponding electric poles 3 of a connector 1 that advantageously can be of the type as described above and claimed in the following.

[0029] Still in accordance with an advantageous feature of the present invention, it is possible to notice that this electrical-connection unit can comprise hooking means 5 connectable in a reversible manner to a connector 1; this hooking means 5 is therefore adapted to integrally bear efforts and/or mechanical reactions resulting from connection to connector 1, without mechanical actions being transferred onto the electric poles 3 present in said connector 1, which electric poles are therefore brought into a condition of circuit continuity with the electrical-connection means and therefore indirectly with the cables/wires entering the electrical-connection unit itself.

[0030] It will be recognised that, from the point of view of the present invention, other embodiments of same can advantageously contemplate the hooking means 5 being operatively associated with other parts of the electrical-connection unit, with a more or less high integration degree.

[0031] In greater detail, it is possible to notice that the main body 7 has a shape substantially conforming, at least in cross-section, to the shape of a corresponding interfacing surface of connector 1 (see the accompanying figures, for example).

[0032] In order to ensure the connection stability and at the same time the engagement reversibility, the electrical-connection unit in accordance to the invention further comprises driving means 9 that can be operatively activated on the hooking means so as to configure said hooking means in a reversible manner between an engagement condition at which the hooking means interfaces with the mechanical-connection means 4 of connector 1, and a disengagement condition at which, on the contrary, it can be released relative to the mechanical-connection means 4; in an exemplary although non-limiting embodiment of the present invention, this driving means 9 comprises at least one snap device, consisting, by way of example, of a Belleville washer circumscribed about the main body 7 and peripherally acting on the hooking means 5.

[0033] With reference to the accompanying drawings, it is also possible to notice the presence of a selective-lock body 10 to be operatively activated on the above mentioned snap element, or more generally on the driving means 9, to create the engagement and/or disengagement condition of the hooking means 5.

[0034] In the embodiment shown in the figures, this selective-lock body 10 is circumscribed about the Belleville washer and slidable along the main body 7; the selective-lock body, depending on its position relative to the main body 7, allows or inhibits release of the hooking means 5 from seats 4a.

[0035] As regards the hooking means 5, it is possible to see that the latter can conveniently comprise expansions the shape of which at least partly matches that of

the mechanical-connection means 4 of connector 1, and/or hooking projections adapted to be at least partly interfaced with a possible flanged expansion 6 connected to the connector 1 itself.

[0036] In compliance with the safety regulations in force, the electrical-connection unit too can contemplate the presence of an electric earthing element to be connected to the cables and/or wires and/or the electrical-connection means 8.

[0037] Should it be possible in accordance with the current requirements, this electric earthing element may preferably comprise at least part of the hooking means 5, so as to obtain an operating integration between the requirements of mechanical-connection/support and the requirements of electric insulation/leakage; alternatively, and by analogy to the description relating to connector 1, the earthing element can consist of a wire/cable to be directly connected to the outer portion of the electromechanical device or to part of the machine frame or also to the ground, depending on current requirements.

[0038] The invention achieves important advantages.

[0039] In fact, due to the particular construction architecture of the present connector, it is possible to gather the functions of mechanical connection and electrical contact in a single piece, which will make use of the so-called fence typical of the known art redundant; in addition, the connection that, as previously seen, can be of the reversible type, in any case ensures accessibility and possibility of disassembling and can be implemented in compliance with the safety regulations in force.

[0040] Among other things, the present invention enables a complete standardisation of the electrical-connection units, irrespective of the shape and/or the sizes of the electromechanical device (or in particular, of the compressor on which connector 1 and/or the electrical connection unit according to the invention is to be installed); in addition, this standardisation is obtained with elimination of the "personalisation" requirement, which personalisation was imposed until now due for example to the different fences adopted by each manufacturer of compressors.

[0041] It should be however appreciated that if use of the fence or "FUSITE-supporting body" is wished to be still continued, as a further safety measure for example, or for enabling use of different electrical-connection units and/or pre-existent electrical-connection units, the present invention does not inhibit installation of same; in other words, while an advantageous and simultaneous synergy between two functions is obtained by the present invention (mechanical connection with the electrical-connection unit and electrical continuity, as well as separation of the flow of the mechanical efforts relative to the physical connections between the different parts of the electric circuit powering the electromechanical device), at all events said invention offers the operating possibility of fitting also pieces or parts borrowed from the known art on the electromechanical device, which is advantageous for a greater operating flexibility.

[0042] In addition, due to the fact that the shape of the present connector can completely take the place of the shape of the traditional known connector or the so-called "FUSITE" type, planning and installation of all possible types of machines that are studied and manufactured exactly for installation of known connectors is not jeopardised.

[0043] Furthermore, due to the present invention, the necessary electrical conductivity can be ensured simultaneously with an efficient "earthing" and together with a satisfactory mechanical efficiency.

[0044] To be remarked is also the fact that the present invention also ensures an efficient insulation of the electrical connections from any type of undesirable external environmental agent.

[0045] It is finally to be pointed out that the present invention enables the connector to be obtained at low manufacturing costs and does not involve particular complications or require modifications or adaptations on machines of known type, which is advantageous for the overall production economy and the final cost price of the product.

Claims

1. A connector for electromechanical devices, preferably for refrigerators' compressors and/or the like, comprising:

- a support base (2) having a central portion (2a) and a peripheral portion (2b) surrounding said central portion (2a); and
- a predetermined number of electric poles (3) housed in said central portion (2a),

characterised in that it further comprises mechanical-connection means (4) formed in said support base (2) and adapted to allow plugging, preferably of the reversible type, of at least one electrical-connection unit to said electric poles (3).

2. A connector as claimed in claim 1, wherein said mechanical-connection means (4) is at least partly formed in said peripheral portion (2b) and is adapted to integrally withstand efforts and/or mechanical reactions resulting from a connection of said electrical-connection unit without transferring mechanical actions onto the electric poles (3).

3. A connector as claimed in claim 1 or 2, wherein the mechanical-connection means (4) comprises a predetermined number of hooking seats (4a) adapted to receive in engagement hooking means (5) of an electrical-connection unit preferably of the reversible type and more preferably of the "snap-fitting" and/or "bayonet-coupling" type, the shape of said hooking means (5) at least partly matching the shape of said

hooking seats (4a).

4. A connector as claimed in claim 3, wherein the hooking seats (4a) comprise a predetermined number of shaped recesses.
5. A connector as claimed in claim 3, wherein the hooking seats are angularly spaced apart the same distance along the peripheral portion (2b).
6. A connector as claimed in anyone of the preceding claims, wherein the mechanical-connection means (4) comprises a flanged expansion (6) jutting out of the support base (2) and preferably jutting out of the peripheral portion (2b), said flanged expansion (6) extending most preferably in an offset plane relative to a lying plane of the central portion (2a).
7. A connector as claimed in anyone of the preceding claims, wherein also present is an electric earthing element that is associable in a circuit with one electrical-connection unit, preferably said electric earthing element at least partly comprising the mechanical-connection means (4).

8. An electrical-connection unit, comprising:

- a main body (7) to be connected to a predetermined number of electric wires and/or cables; and
- electrical-connection means (8) formed in said main body (7) and connectable to said electric wires and/or cables, said electrical-connection means (8) being associable with the corresponding electric poles (3) of a connector (1),

characterised in that it comprises hooking means (5) to be reversibly connected to a connector (1), preferably of the type as claimed in anyone of the preceding claims, said hooking means (5) being adapted to integrally withstand efforts and/or mechanical reactions resulting from connection to said connector (1) without transferring mechanical actions onto the electric poles (3) present on said connector (1).

9. A unit as claimed in anyone of the preceding claims 8 to 10, wherein the hooking means (5) comprises expansions the shape of which at least partly matches that of the mechanical-connection means (4) and/or hooking projections adapted to be at least partly interfaced with a flanged expansion (6) connected to the connector (1).
10. A unit as claimed in claim 8 or 9, wherein also present is driving means (9) that can be operatively activated on the hooking means (5) so that said hooking means (5) is reversibly configured between an engagement

condition at which said means can be interfaced with the mechanical-connection means (4) of the connector (1) and a disengagement condition at which on the contrary said means can be disengaged relative to said mechanical-connection means (4).

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11. A unit as claimed in claim 10, wherein said driving means (9) comprises at least one snap device, preferably comprising at least one Belleville washer circumscribed about the main body (7), peripherally acting on the hooking means (5).
12. A unit as claimed in claim 11, wherein also present is a selective-lock body (10) that can be operatively activated on the driving means (9) to determine the engagement condition and/or the disengagement condition of the hooking means (5), which selective-lock body is preferably slidable along the main body (7), preferably can be activated on said snap device and more preferably can be circumscribed about said Belleville washer.
13. A unit as claimed in anyone of the preceding claims 8 to 12, wherein also present is an electric earthing element to be connected to said cables and/or wires and/or electrical-connection means (8), said electric earthing element preferably comprising at least part of the hooking means (5).

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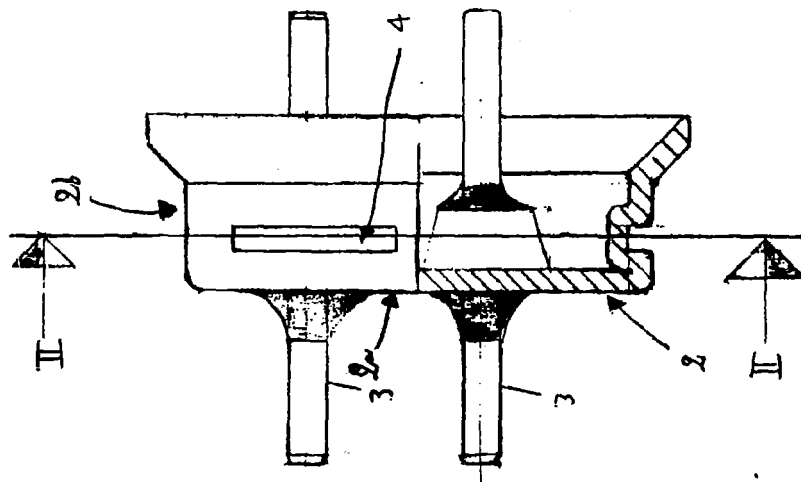


Fig. 1

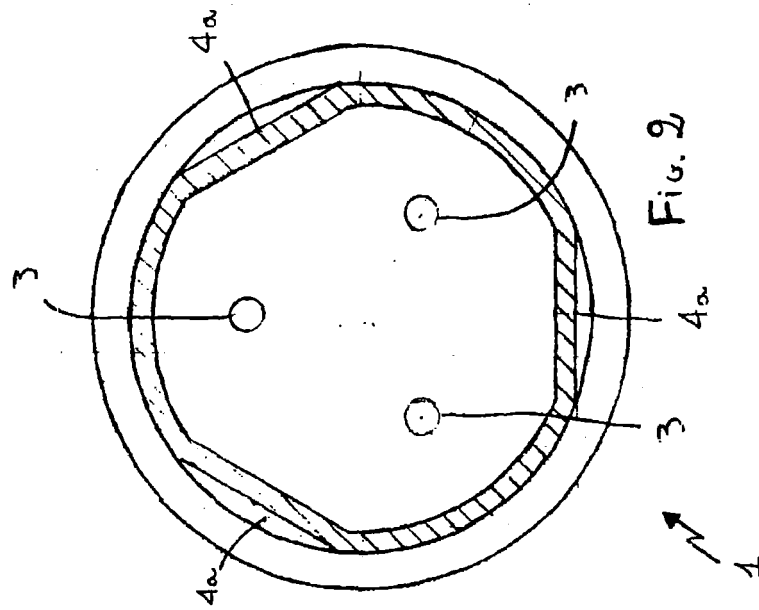


Fig. 2

Fig. 3

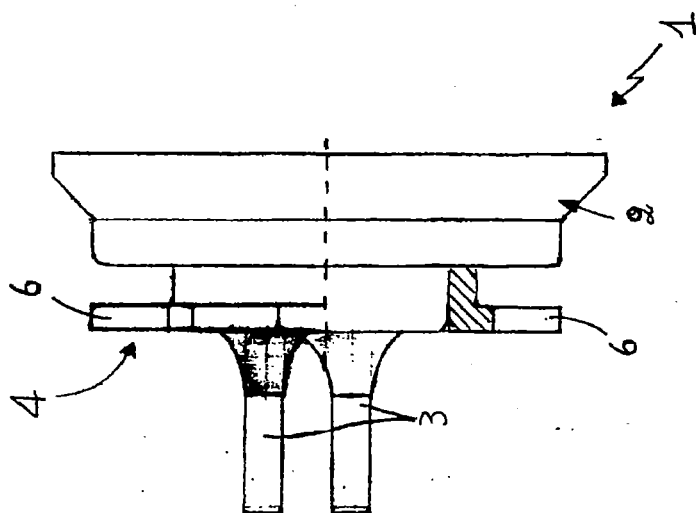
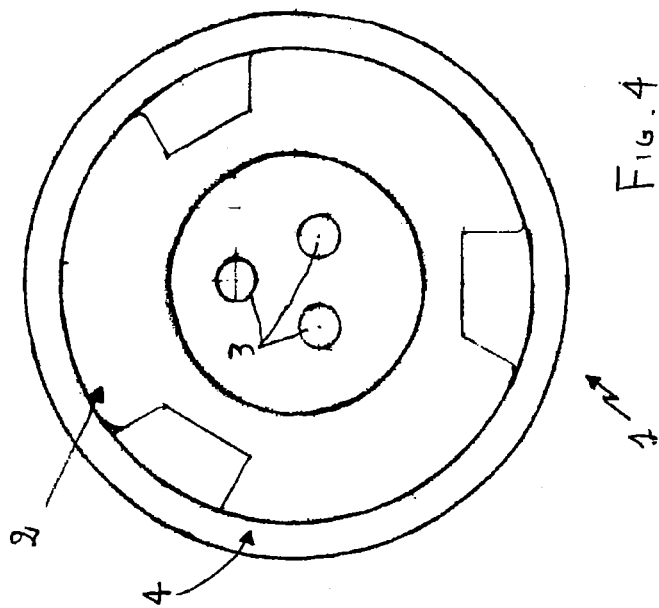
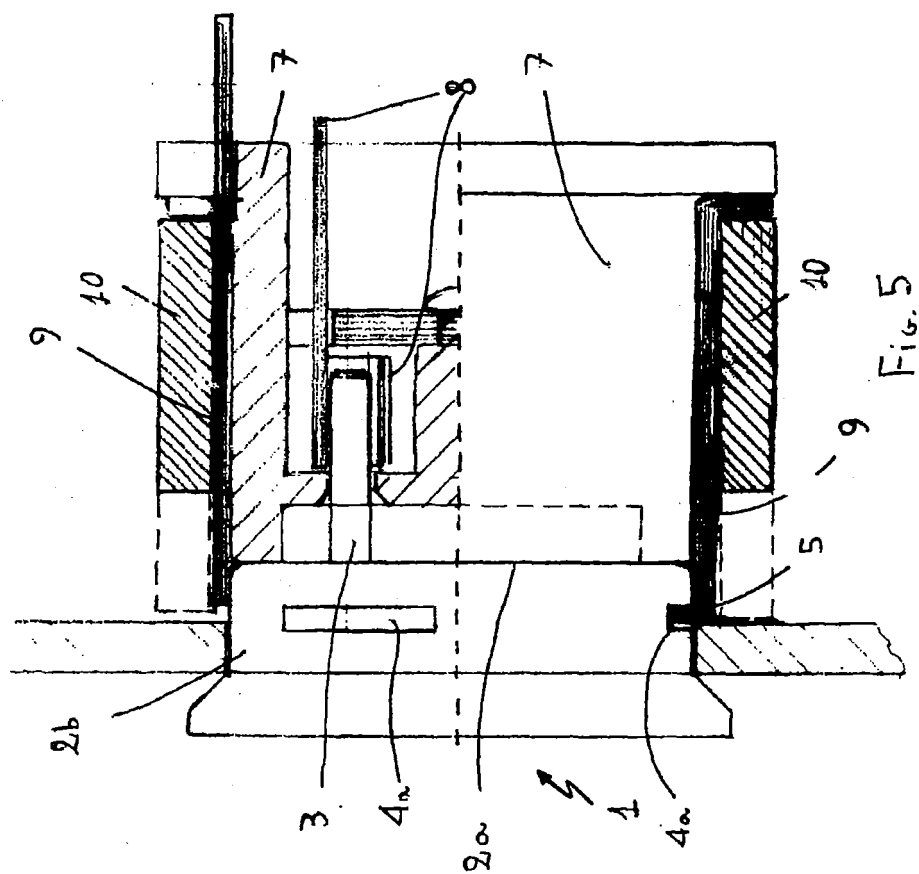


Fig. 4







EUROPEAN SEARCH REPORT

Application Number
EP 09 17 5897

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	US 5 584 716 A (BERGMAN ERNEST [US]) 17 December 1996 (1996-12-17)	1-4,8-9	INV. H01R13/627
Y	* column 8, line 23 - line 39; figure 11 *	5-7, 10-13	
Y	----- US 4 193 655 A (HERMANN HENRY O JR [US]) 18 March 1980 (1980-03-18) * column 2, line 23 - line 37 * * column 3, line 27 - line 41 * * figure 3 *	5-6, 10-12	
Y	----- EP 1 622 228 A1 (ITW IND COMPONENTS SRL [IT]) 1 February 2006 (2006-02-01) * paragraph [0020] - paragraph [0021]; figures 3, 5 *	7,13	
A	----- US 3 719 918 A (KERR W) 6 March 1973 (1973-03-06) * the whole document *	1-13	
A	----- EP 1 081 801 A2 (IMS CONNECTOR SYSTEMS GMBH [DE]) 7 March 2001 (2001-03-07) * paragraph [0022] - paragraph [0030]; figures 1, 2 *	1-13	TECHNICAL FIELDS SEARCHED (IPC) H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 February 2010	Examiner Criqui, Jean-Jacques
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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