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(54) **Industrial socket with live contacts protection device**

(57) A socket for electric vehicles comprises a body (1) suitable to receive a corresponding plug (2) that substantially takes up all the space available inside the body (1), in which there are arranged a plurality of longitudinal cylindrical housings (3) in some of which there are provided metal sleeves (4) acting as live contacts, as well as a pair of covers (5) arranged outside the body (1) and provided with terminal portions (5b) that penetrate the

body (1) through corresponding slots (1a) and extend inside the cylindrical housings (3) containing the metal sleeves (4) so as to cover the live contacts, the covers (5) being moved from said working position, to which they are biased by springs (10), to a rest position, in which the terminal portions (5b) are outside the body (1), by a cursor (9) projecting inside the body (1) and suitable to be moved outside the body (1) by the plug (2) upon insertion of the latter into the socket.

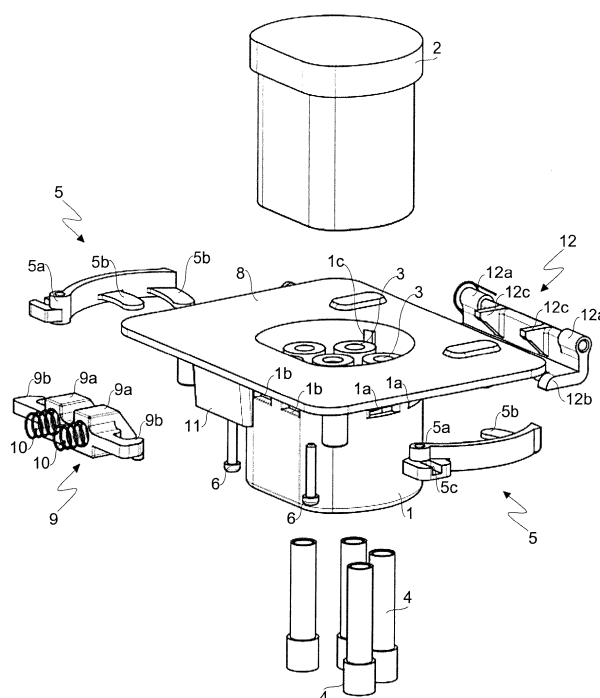


Fig.3

Description

[0001] The present invention relates to industrial sockets, and in particular to a socket for electric vehicles provided with a live contacts protection device that is automatically disengaged upon insertion of the corresponding plug.

[0002] It is known that the market offers sockets, both for industrial and domestic use, provided with a contacts protection device to increase the safety level for the user so that the latter can not accidentally come into contact with live parts. Such a device usually consists of a cover arranged within the socket body, in the space below the holes for the entrance of the pins, which is biased by a spring to cover the live contacts and is moved by the corresponding plug, with a translational or rotational motion, to gain access to the contacts (see e.g. EP 1376772).

[0003] A socket for electric vehicles manufactured according to the IEC 62196-2 standard (Standard Sheet 2-11a) is however designed such that it is not possible to apply the above-illustrated usual protection device. In fact, inside the socket body there is no space suitable to house the cover since the corresponding plug was designed so that it substantially takes up the whole space inside the socket body.

[0004] Therefore the object of the present invention is to provide a socket for electric vehicles of the above-mentioned type which is however provided with a live contacts protection device. This object is achieved by means of a socket provided with a pair of covers arranged substantially outside the socket body and comprising terminal portions that penetrate the socket body to cover the live contacts, said covers being moved from said working position, to which they are biased by elastic members, to a rest position, in which their terminal portions are outside the socket body, by at least one actuating member projecting inside the socket body and suitable to be moved outside the socket body by the corresponding plug upon insertion of the latter into the socket. Other advantageous features of the present industrial socket are recited in the dependent claims.

[0005] The main advantage of the socket according to the present inventions obviously is that of achieving the function of live contacts protection to guarantee the safety of the user of this particular type of socket.

[0006] Another advantage of this socket, in its preferred embodiment, resides in the presence of a mechanism for locking the protection device which prevents the latter from being moved away from the working position when the corresponding plug is not inserted so as to further increase the safety.

[0007] These and other advantages and characteristics of the industrial socket according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 is a perspective exploded view from the rear bottom side of the above-mentioned socket and of the corresponding plug;

Fig.2 is a view similar to the preceding one from the front bottom side;

Fig.3 is a view similar to the preceding one from the rear top side;

Fig.4 is a perspective view from the rear bottom side with a corner portion removed;

Fig.5 is a perspective view from the front top side with the top portion removed and an enlarged detail;

Fig.6 is a view similar to the preceding one with a lateral portion removed and the corresponding plug in the initial phase of insertion into the socket;

Fig.7 is a view similar to the preceding one with the plug in a phase of insertion into the socket just after the phase of Fig.6;

Fig.8 is a side view of the socket with a lateral portion removed and an enlarged detail showing the plug in an intermediate phase of insertion into the socket;

Fig.9 is a perspective view from the rear bottom side of the socket with a lateral portion removed and the plug in the final phase of insertion into the socket;

Fig.10 is a see-through top plan view of the socket with the plug completely inserted; and

Fig.11 is a sectional view taken along line A-A of Fig. 10.

[0008] With reference to figures 1 to 5, there is seen that an industrial socket according to the present invention conventionally includes a socket body 1 suitable to receive a corresponding plug 2, inside said body 1 there being suitably arranged seven cylindrical longitudinal housings 3 in four of which there are fitted metal sleeves 4 acting as live contacts in which the corresponding pins of plug 2 are inserted.

[0009] A first novel aspect of the present socket is the presence on each lateral side of body 1 of a cover 5 that is rotatably mounted outside body 1 by means of a pivot 6 passing through a bushing 5a, formed at an end of said cover 5, and secured in a longitudinal seat 7 formed on the bottom side of a transverse flange 8 integral with body 1. Cover 5 is provided with two elongated terminal portions 5b suitable to penetrate body 1, through corresponding slots 1a, and the adjacent cylindrical housings 3, through similar slots not visible in the drawings, up to a position above sleeves 4 so as to prevent access thereto.

[0010] The rotation of covers 5 around pivots 6 is caused by an actuating member that, in the preferred embodiment illustrated in the drawings, consists of a cursor 9 located at the rear side of body 1 towards which it is biased by a pair of coil springs 10 arranged between cursor 9 and a longitudinal wall 11 formed on the bottom side of flange 8 and provided with suitable seats 11a (see Fig.2 and detail of Fig.8).

[0011] More specifically, cursor 9 has a pair of frontal projections 9a, suitable to penetrate body 1 through cor-

responding openings 1b, whose length at the top is shorter than the length at the bottom so as to form a slanted plane 9aa whose bottom portion 9ab is longitudinally shaped as an arc of circle to mate with the adjacent cylindrical housings 3. Moreover, cursor 9 has a pair of lateral projections 9b shaped to partially enclose bushings 5a and provided with bottom pegs 9c suitable to engage corresponding grooves 5c formed in the top side of covers 5 at an outermost position with respect to bushings 5a, as better illustrated in the enlarged detail of Fig. 5 (where the cylindrical housings 3 are interrupted below cursor 9 and covers 5 for the sake of clarity of the drawing).

[0012] Therefore when the contact protection device is in its working position illustrated in figures 4 and 5, covers 5 are abutting against body 1 with their terminal portions 5b arranged above sleeves 4, while cursor 9 projects inside body 1 with its frontal projections abutting against the adjacent cylindrical housings 3. This position of the protection device is maintained by springs 10 compressed between cursor 9 and wall 11, and the centripetal force on cursor 9 is transferred to covers 5 through pegs 9c and grooves 5c as described above.

[0013] A second novel aspect of the socket according to the present invention is preferably given by the presence of a mechanism for locking the protection device which prevents the latter from moving away from the working position in a safer way than what is provided by the mere resistance of springs 10. In fact although the protection device arranged below flange 8 is enclosed by a casing (not shown), covers 5 are accessible at the terminal portions 5b projecting into the cylindrical housings 3 when the plug is not inserted. The presence of a specific locking mechanism allows therefore to further increase the safety of the socket and to meet the requirements of the standards of the sector.

[0014] This mechanism preferably consists of a lever 12 rotatably mounted outside body 1, at the front side thereof, by means of a pair of pivots 13 passing through bushings 12a, formed at the top ends of said lever 12, and secured in transverse seats 14 formed on the bottom side of flange 8. More specifically, lever 12 has a substantially L-shaped section with the bottom edge shaped as an arc of circle to abut against body 1 under the bias of a torsion spring 15, and in that position it locks covers 5 thanks to its bottom ends 12b as shown in Fig.4 and in the detail of Fig.6. Moreover, lever 12 has a pair of rear teeth 12c suitable to project inside body 1 passing through corresponding slots 1c.

[0015] In the light of the description above, and of figures 6 to 11, the simple and effective operation of the industrial socket according to the present invention is readily understood.

[0016] As shown in the detail of Fig.6, as soon as plug 2 starts to be inserted in the socket body 1 its bottom edge comes into contact with teeth 12c of the locking lever 12 which project inside body 1 just below flange 8. Proceeding with the insertion, plug 2 rotates lever 12

around pivots 13 by pushing teeth 12c outside body 1, whereby ends 12b move downwards and disengage covers 5 (as shown in the detail of Fig.7).

[0017] After this initial phase of insertion, plug 2 encounters the frontal projections 9a of cursor 9 which project inside body 1 through openings 1b, and more precisely the contact occurs at the slanted planes 9aa, as shown in the detail of Fig.8. The push of plug 2 on the slanted planes 9aa causes cursor 9 to move back overcoming the resistance of springs 10, and this backwards motion results in a rotation of covers 5 around pivots 6 thanks to pegs 9c engaged in grooves 5c. As a consequence, the terminal portions 5b are pulled out of body 1 through slots 1a and the pins of plug 2 have free access to sleeves 4, as shown in Fig.9.

[0018] The rest position of the protection device is illustrated in figures 10 and 11 that show plug 2 completely inserted in the socket body 1, with teeth 12c and projections 9a abutting against the body of plug 2 under the bias of springs 10. This bias provides, obviously, to restore the working position of the protection device illustrated in figures 4 and 5 as soon as plug 2 is pulled out of the socket body 1.

[0019] It is clear that the above-described and illustrated embodiment of the socket according to the invention is just an example susceptible of various modifications. In particular, the shape of the covers and of their relevant actuating member can somewhat change while remaining within the present inventive concept. For example, the translating cursor 9 could be replaced with a rotating cursor similar to lever 12 by providing a coupling with covers 5 that converts the rotation of the cursor around a transverse axis into a rotation of the covers around their longitudinal axis.

[0020] As an alternative, cursor 9 could be altogether absent and plug 2 could act directly on an actuating member consisting of terminal portions of the covers shaped with slanted planes similar to the above-described slanted planes 9aa, possibly with the exception of the distal portion that penetrates the cylindrical housings 3 and covers sleeves 4. In this case the covers could be mounted individually in a way similar to the above-described cursor 9, with springs exerting a centripetal bias, while the locking mechanism consisting of lever 12 could remain unchanged. Furthermore, the movement of the two covers could be synchronized by connecting them so as to make the operation of the protection device smoother.

Claims

1. A socket for electric vehicles comprising a body (1) suitable to receive a corresponding plug (2) that substantially takes up all the space available inside said body (1), in which there are arranged a plurality of longitudinal cylindrical housings (3) in some of which there are fitted metal sleeves (4) acting as live contacts in which there are inserted corresponding pins

of said plug (2), **characterized in that** it further includes at least a pair of covers (5) arranged substantially outside the body (1) and provided with terminal portions (5b) that penetrate the body (1) through corresponding slots (1a) and extend inside said cylindrical housings (3) containing said metal sleeves (4) so as to cover said live contacts, said covers (5) being moved from said working position, to which they are biased by elastic members, to a rest position, in which said terminal portions (5b) are outside the body (1), by at least one actuating member projecting inside the body (1) and suitable to be moved outside the body (1) by the plug (2) upon insertion of the latter into the socket.

2. A socket for electric vehicles according to claim 1, **characterized in that** it further includes a mechanism for locking the covers (5), said mechanism comprising at least one disengagement portion projecting inside the body (1) at a position higher than the actuating member so as to be moved outside the body (1) by the plug (2) upon insertion of the latter into the socket and to disengage the covers (5) prior to the plug (2) coming into contact with the actuating member.
3. A socket for electric vehicles according to claim 1 or 2, **characterized in that** the body (1) has a flange (8) under which there are secured the covers (5) and/or the actuating member and/or the locking mechanism.
4. A socket for electric vehicles according to any of the preceding claims, **characterized in that** each cover (5) is rotatably mounted at a lateral side of the body (1) through a pivot (6) passing through a bushing (5a), formed at an end of said cover (5), and secured in a longitudinal seat (7), the rotation of the covers (5) around said pivots (6) being caused by an actuating member that consists of a cursor (9) located at the rear side of the body (1) towards which it is biased by a pair of coil springs (10) arranged between said cursor (9) and a longitudinal wall (11) integral with the body (1), the cursor (9) having a pair of frontal projections (9a) suitable to penetrate the body (1) through corresponding openings (1b) and having a length at the top that is shorter than the length at the bottom so as to form a slanted plane (9aa), as well as a pair of lateral projections (9b) provided with bottom pegs (9c) suitable to engage corresponding grooves (5c) formed in the top side of the covers (5) at an outermost position with respect to the bushings (5a).
5. A socket for electric vehicles according to the preceding claim, **characterized in that** the bottom portion (9ab) of the slanted plane (9aa) is longitudinally shaped as an arc of circle to mate with the adjacent

cylindrical housing (3).

6. A socket for electric vehicles according to claim 4 or 5, **characterized in that** the lateral projections (9b) of the cursor (9) are shaped to partially enclose the bushings (5a) of the covers (5).
7. A socket for electric vehicles according to any of claims 1 to 3, **characterized in that** the actuating members consist of terminal portions of the covers (5) shaped with slanted planes, the covers being mounted for a transverse translation under the action of bias springs biasing them towards the body (1).
8. A socket for electric vehicles according to any of the preceding claims, **characterized in that** the locking mechanism consists of a lever (12) rotatably mounted outside the body (1), at the front side thereof, by means of a pair of pivots (13) passing through bushings (12a) formed at the top ends of said lever (12) and secured in transverse seats (14), the lever (12) being biased into abutment against the body (1) by a torsion spring (15) in a position such as to lock the covers (5) and having a pair of rear teeth (12c) suitable to project inside the body (1) passing through corresponding slots (1c).

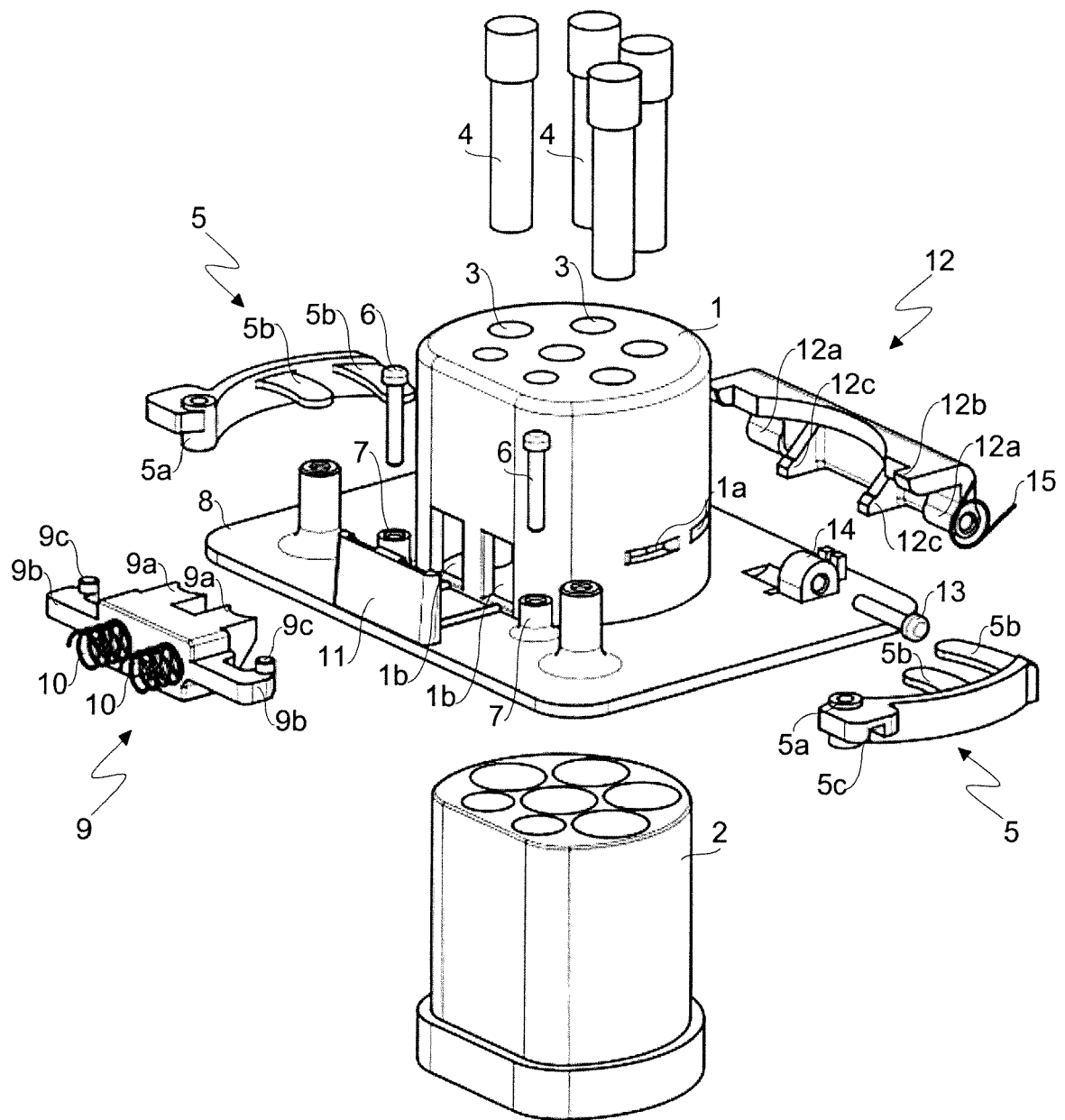


Fig.1

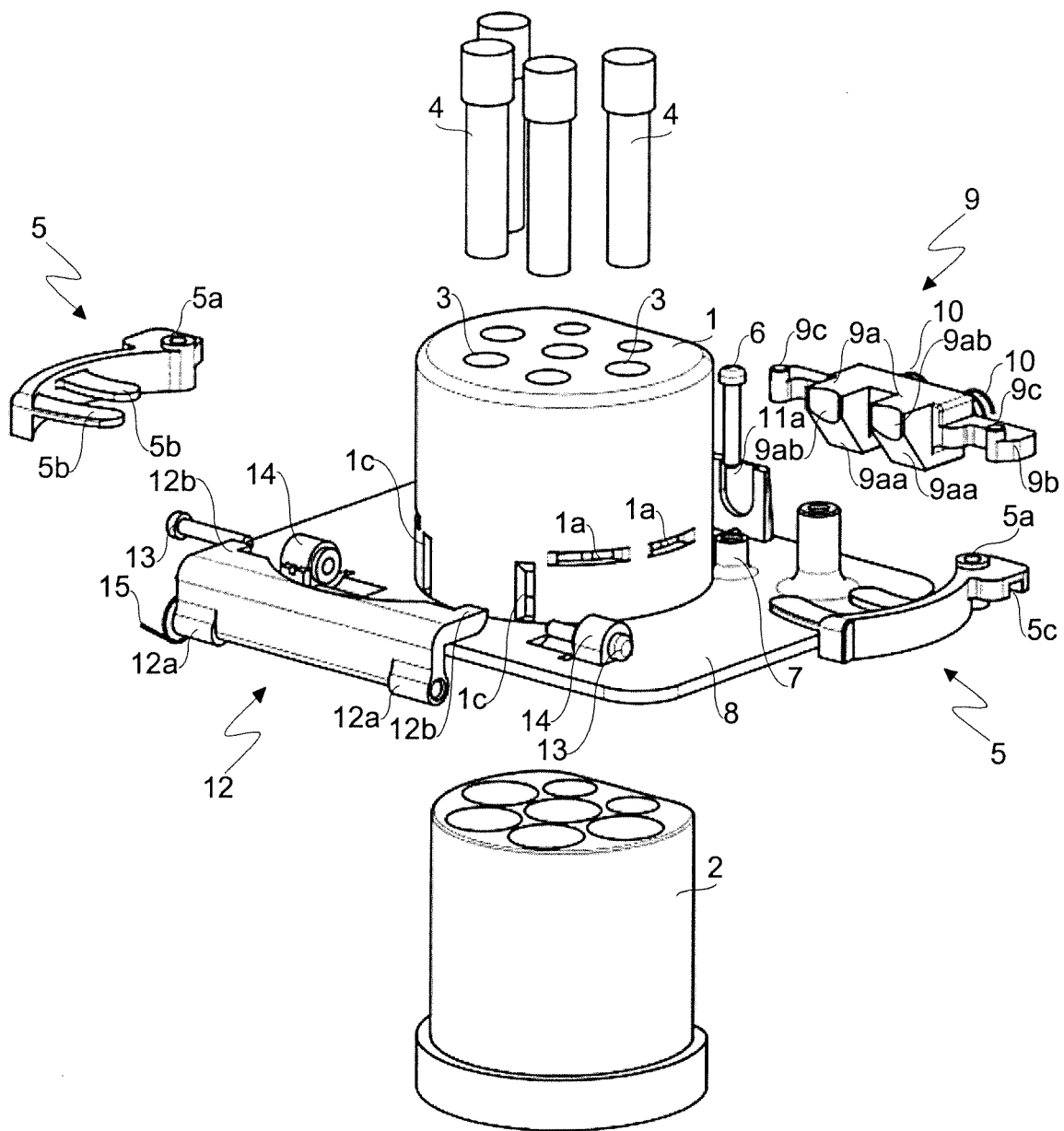


Fig.2

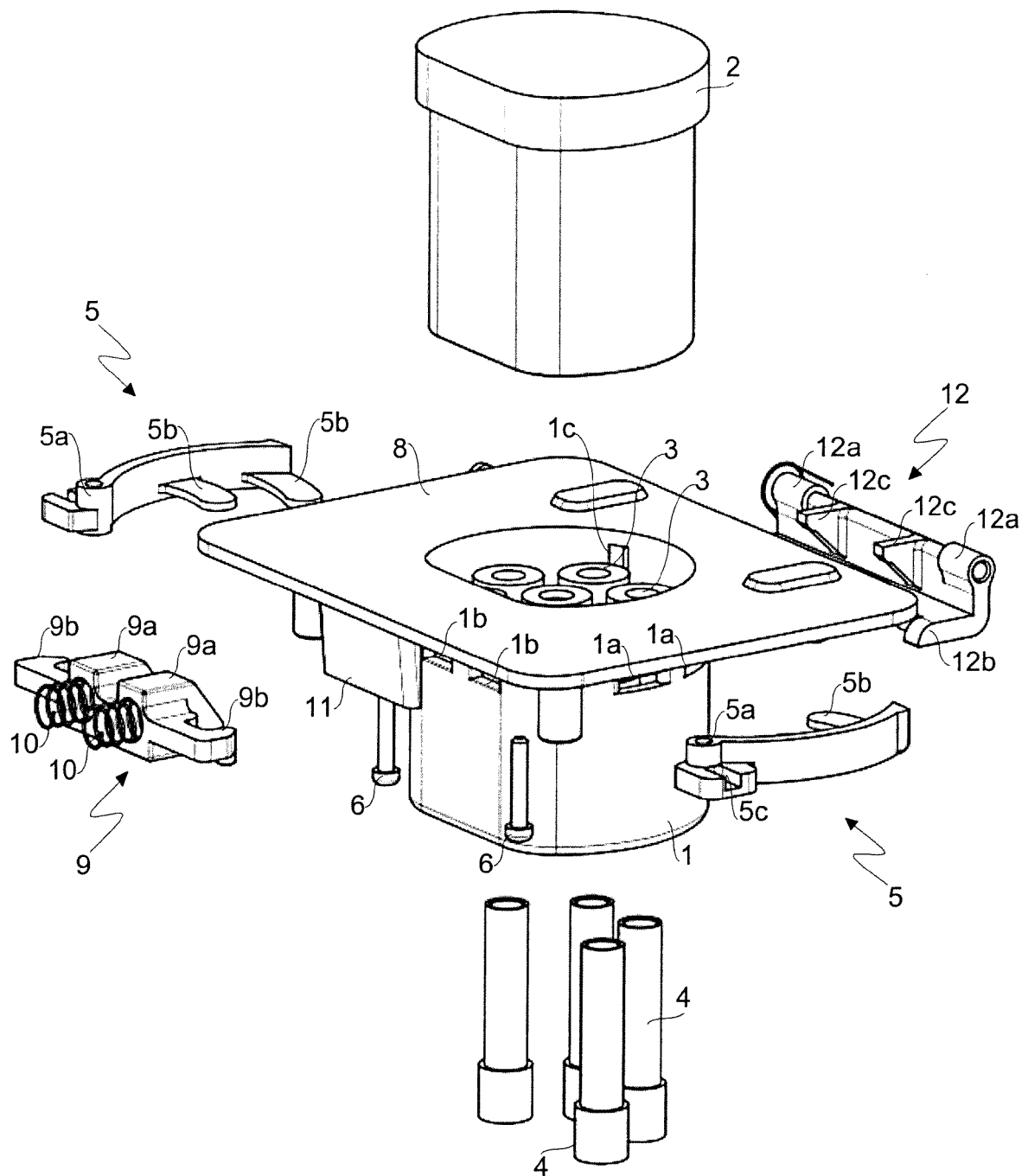


Fig.3

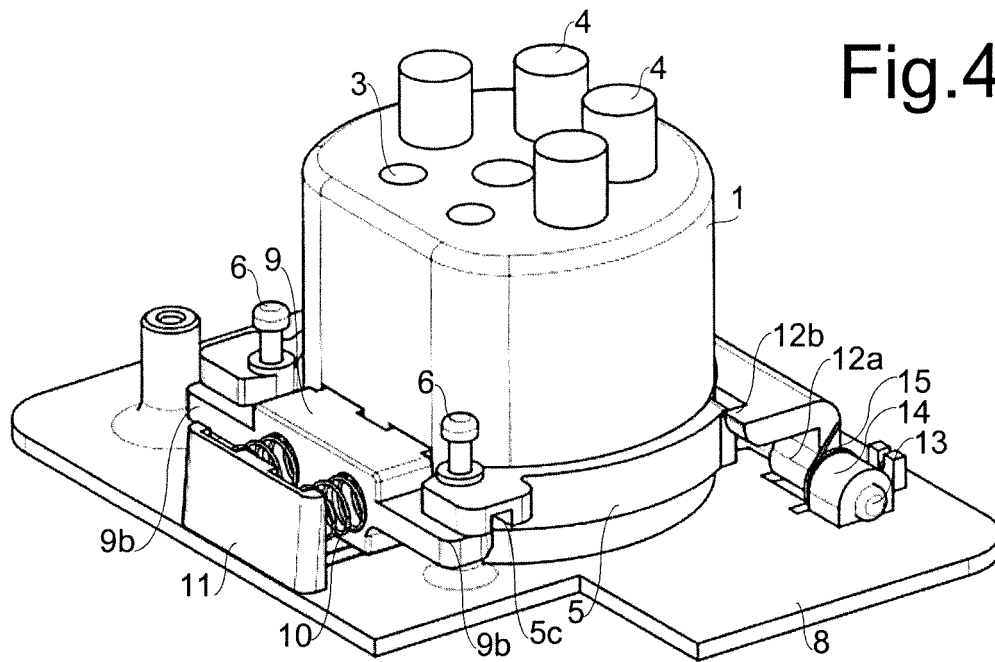


Fig.4

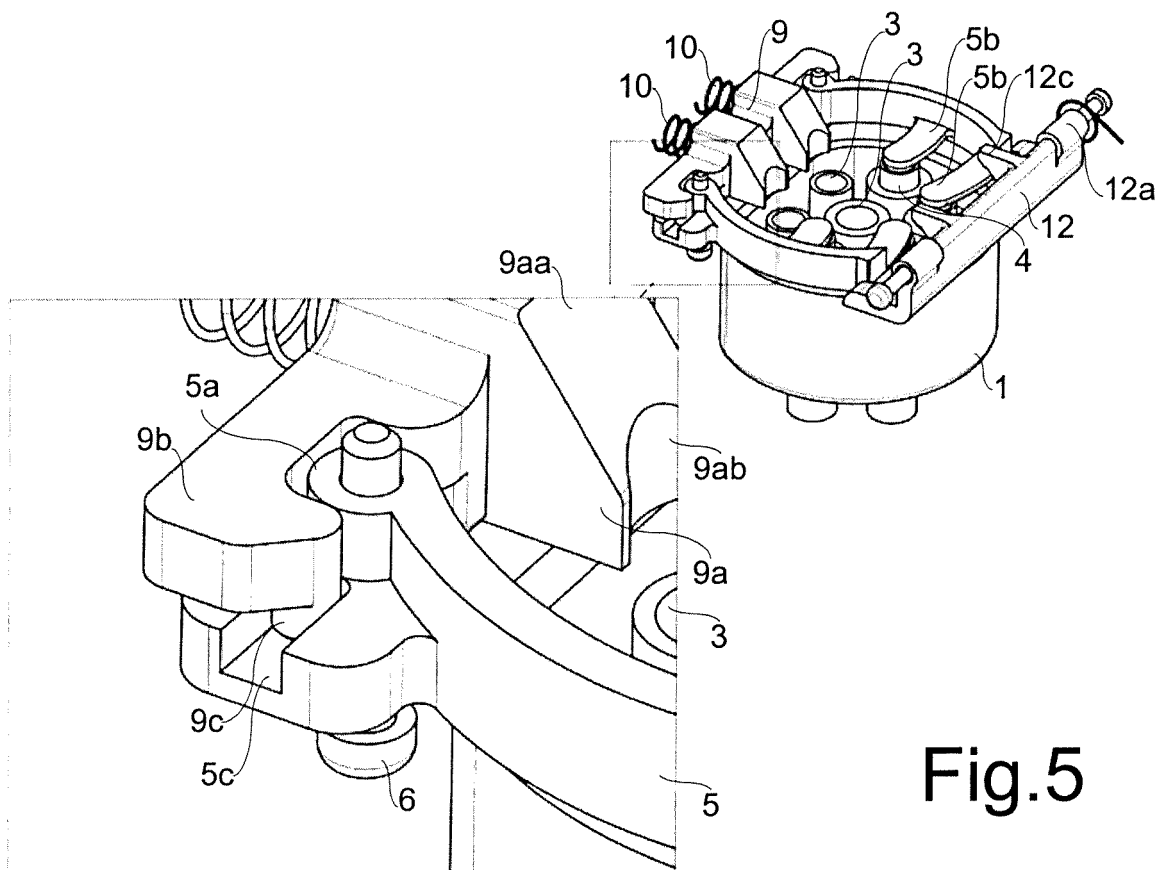
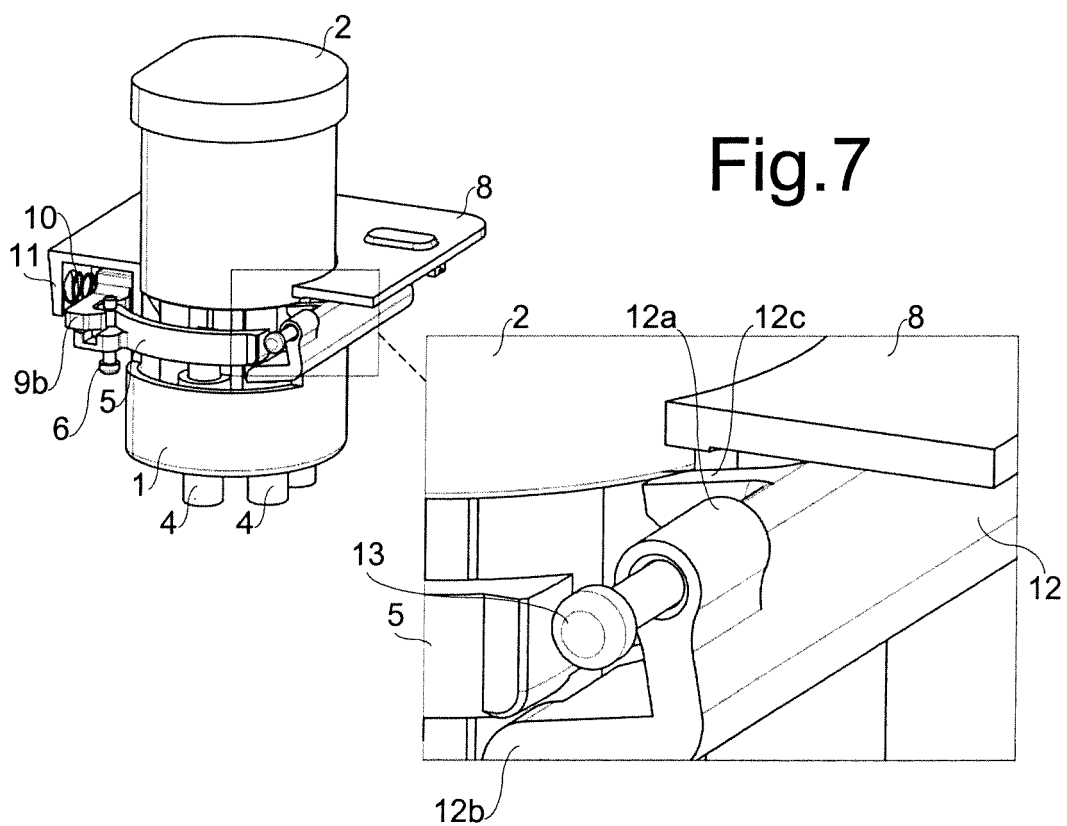
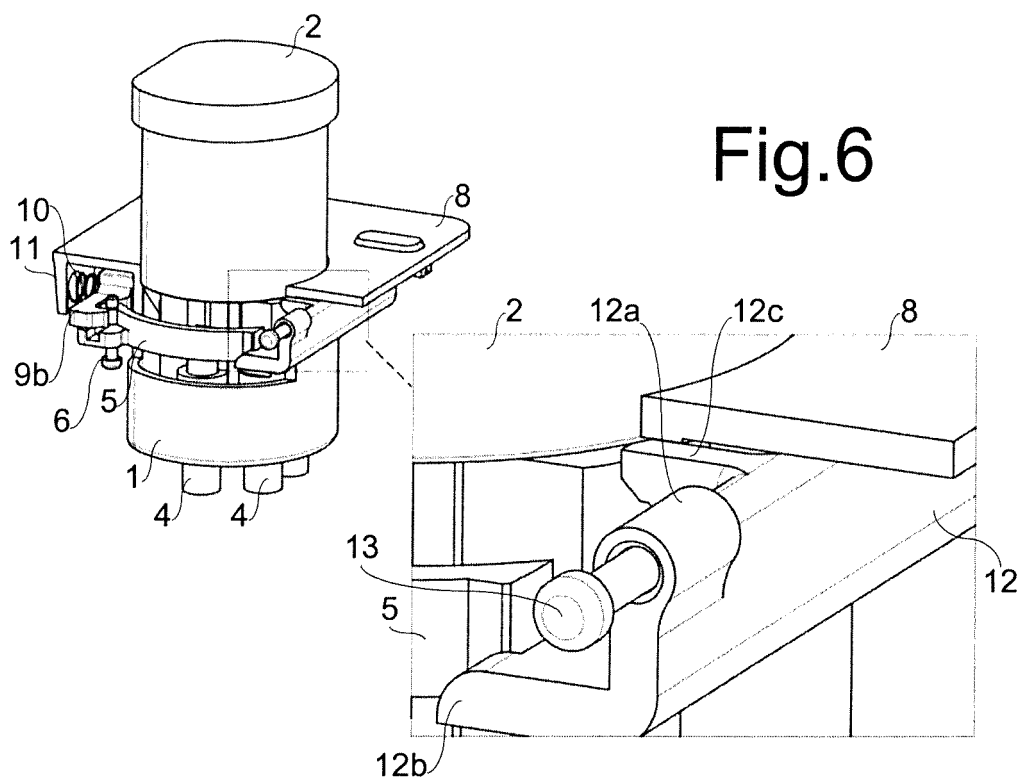


Fig.5



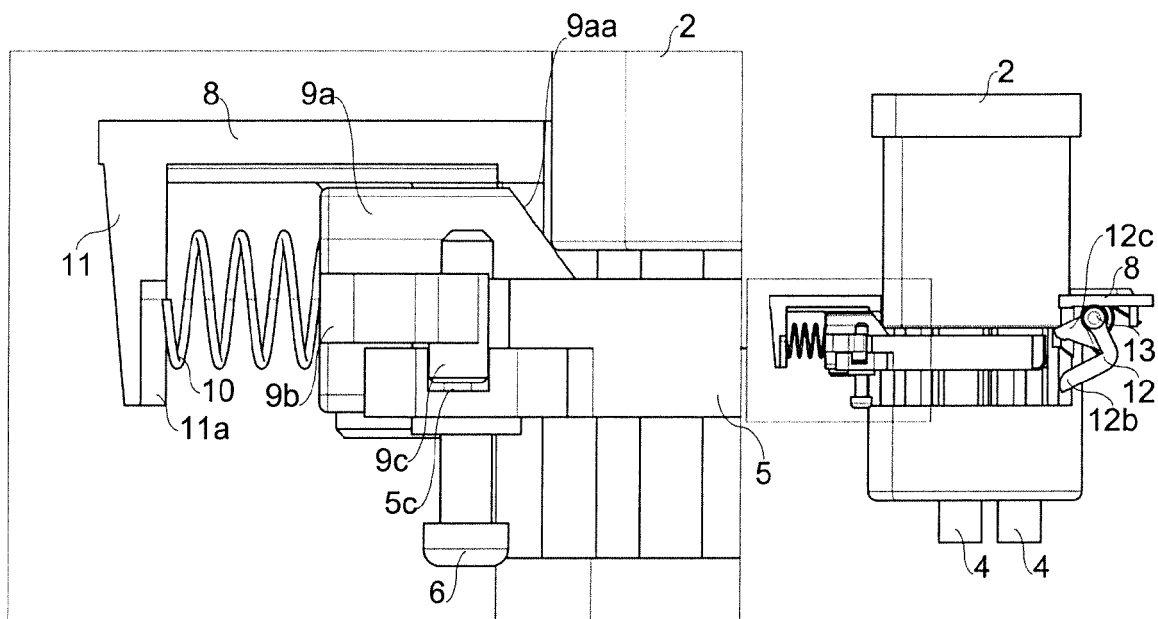


Fig.8

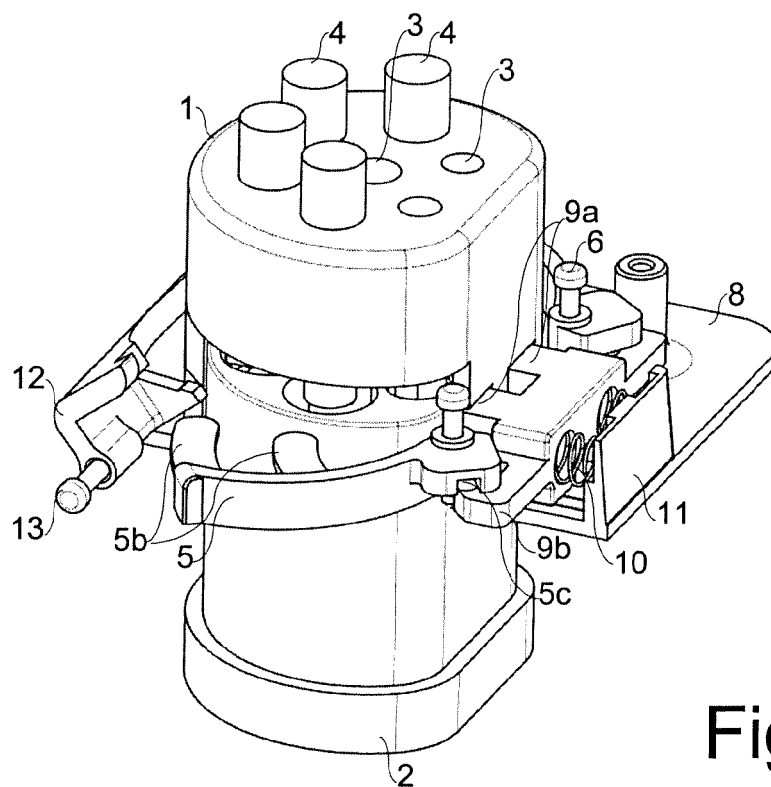


Fig.9

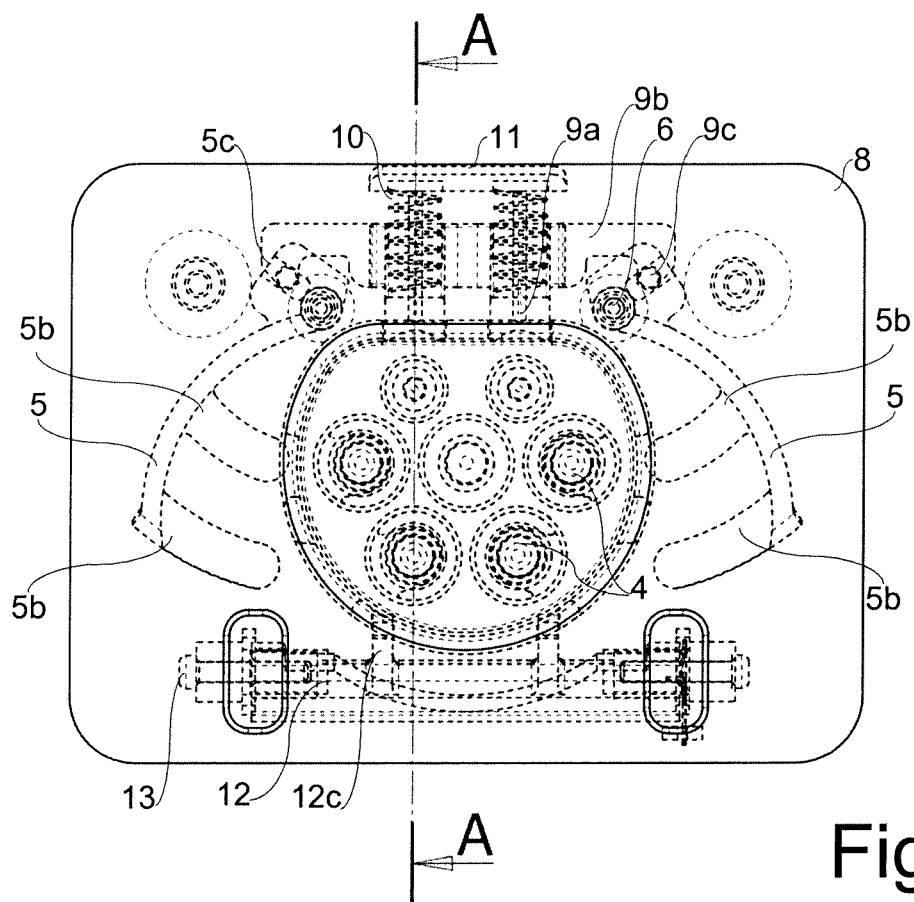


Fig. 10

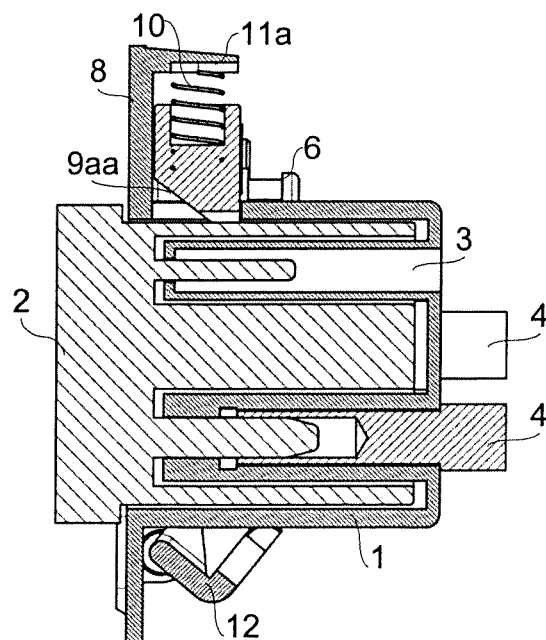


Fig. 11



EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5112

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* the whole document *	2-8	

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			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 29 October 2012	Examiner Salojärvi, Kristiina
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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29-10-2012

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REFERENCES CITED IN THE DESCRIPTION

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