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(54) **Clamp for male terminale**

(57) The present invention relates to a clamp for male terminal comprising a clamping ring having a first and a second jaws opposed to each other and mutually approachable along a clamping direction to tighten the clamping ring on the male terminal. The clamp further comprises a first engaging element coupled abut against the first jaw having a substantially eccentric portion and a second engaging element coupled to the second jaw

and screw-nut clamping means acting on the first and second engaging elements to determine a movement of the jaws along a clamping direction between an open position and a close position wherein they ensure the tightening on the male terminal. Advantageously, the nut, during the tightening approaching movement toward the screw, acts on a substantially eccentric portion of the first engaging element to drive the first jaw toward the second jaw so as to tight the clamping ring on the male terminal.

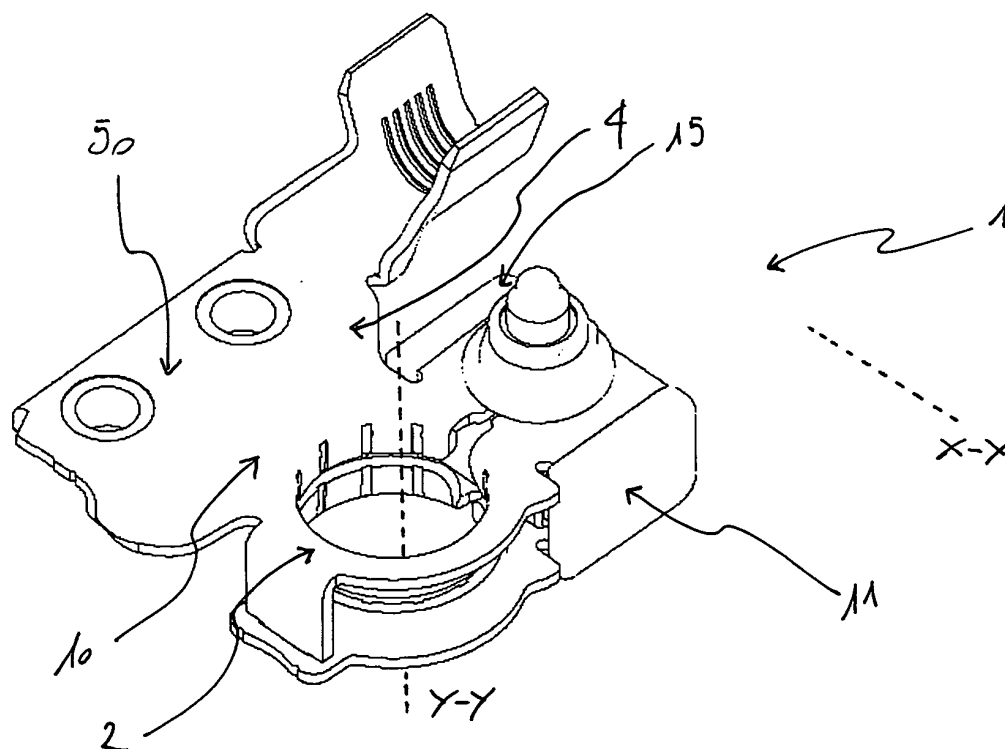


FIG. 1

Description

[0001] The present invention relates to a clamp for male terminal.

[0002] In particular, the present invention refers to a clamp equipped with a clamping ring having opposed jaws mutually approachable along a clamping direction to tighten the clamping ring on the male terminal.

[0003] The clamp of the present invention can find application for the connection to a battery post. In this case, the male terminal is a battery post while the clamp is connected to one or more utilities of a motor vehicle.

[0004] According to a different application, the clamp of the present invention can find application for the grounding of electric and/or electronic devices. In this case, the male terminal is a ground terminal secured to a structure serving as earth ground, while the ground connection of the devices to be grounded is connected to the clamp by electric cable. The structure serving as earth ground can be, for example, the body of a motor vehicle, in particular of a car.

[0005] A clamp for male terminal is disclosed for example in US 5 879 202 patent. This document describes a clamp equipped with a clamping ring having a couple of opposed jaws mutually approachable along a clamping direction to tighten the clamping ring on the male terminal. A screw extended parallel to the clamping direction is connected to a first jaw, while an engaging element equipped with an eccentric portion having a passing opening is connected to a second jaw. In particular, the passing opening comprises a receiving countersink. The clamp further comprises a nut threadably engaged with the screw extending through the passing opening of the engaging element. During the screwing of the nut on the screw, the nut thrustly acts on the receiving countersink of the engaging element so as to drive the jaws along the clamping direction between an open position and a close position so as to tighten the clamping ring on the male terminal.

[0006] The clamp disclosed in US 5 897 202 patent provides that both jaws are configured so as to support the screw and the engaging element respectively. Although such a configuration allows to tighten the clamping ring on a battery male terminal, it is necessary to note that this solution would require the manufacturing of the jaws according to a particular shape and structure resulting in troubles in the clamp design and higher production costs.

[0007] In the light of what evidenced above, it rises the need to easily and economically manufacture a clamp capable of ensuring an effective clamping action on a male clamp while being easily workable.

[0008] The object of the present invention is to provide a clamp for male terminal having such structural and functional features as to meet the above needs, while overcoming the above-mentioned drawbacks with reference to the known art.

[0009] This object is reached by a clamp for male ter-

minal according to claim 1.

[0010] Further features and advantages of the clamp according to the present invention will become apparent from the following description of one preferred exemplary embodiment, which is given by way of illustration and without limitation, referring to the accompanying drawings, in which:

- Figure 1 is a perspective view of a preferred embodiment of a clamp according to the present invention in an assembled configuration,
- Figure 2 is an exploded partial perspective view of the clamp of Figure 1,
- Figure 3 is a perspective view of the conductive body of the clamp of Figure 1,
- Figure 4 is a perspective view of the clamping means and the engaging elements of the clamp of Figure 1,
- Figure 5 is a longitudinally sectional schematic view of a portion of the clamp of Figure 1 in a first clamping configuration,
- Figure 6 is a top partial sectional view of the portion of the clamp of Figure 5,
- Figure 7 shows the portion of the clamp of Figure 5 in a second clamping configuration,
- Figure 8 is a top partial sectional view of the portion of the clamp of Figure 7,
- Figure 9 is a top view of the clamp of Figure 1,
- Figure 10 is a bottom perspective view of the conductive body of the clamp of Figure 3.

[0011] Referring to the annexed figures, numeral 1 generally designates a clamp for male terminal according to the present invention.

[0012] The clamp 1 according to the invention comprises a conductive body 10, clamping means 20 and a support element 50.

[0013] The conductive body 10 is formed by punching, coining and bending starting from a plate made of an electrically conductive material, such as brass or copper alloy having high electrical conductivity and good mechanical strength together with a good ductility. Alternatively, the conductive body 10 can be a melt alloy block or of a different kind.

[0014] The conductive body 10 comprises a clamping ring 2 having an axis Y-Y. This clamping ring 2 is capable of inserting on a male terminal (not shown in the annexed figures) in an insertion direction extended along axis Y-Y. Hereinafter a battery terminal will be referred to, without limitation, it being understood that the clamp of the present invention can be used on any male terminal.

[0015] The clamping ring 2 comprises a first jaw 3 and a second jaw 4 opposed to each other. Both jaws 3,4 are mutually approachable along a clamping direction X-X so as to tighten the clamping ring 2 on the male terminal. In particular, at least one of the two jaws 3,4 is movable.

[0016] As shown in Figures 1 and 2, the first jaw 3 and the second jaw 4 are tied to each other in at least one point.

[0017] Preferably, the clamping direction X-X of the jaws 3,4 lies on a plane substantially perpendicular to axis Y-Y.

[0018] As shown in Figures 2 and 3, the jaws 3,4 comprise respective end terminal portions 30,40 placed side by side. Each end terminal portion 30,40 has opposed sides 31,32 and, respectively, 41,42 oriented in such a way as to be transverse to the clamping direction X-X.

[0019] Said end terminal portions 30,40 of the jaws 3,4 comprise, in correspondence to the respective internal sides 32,42, i.e. the sides not facing each other of the two end terminal portions 30,40, a respective cavity 32a, 42a.

[0020] The two cavities 32a,42a of the jaws 3,4 face each other, so that, as a whole, they define a passing opening 5 extended parallel to the axial direction Y-Y.

[0021] The clamp 1 comprises a first engaging element 11 (Figure 4), coupled abut against the first jaw 3 to drive the first jaw 3 toward the opposed second jaw 4.

[0022] Preferably, the first engaging element 11 engages the first jaw 3 in correspondence to the outer side 31.

[0023] According to the shown embodiment, the first engaging element 11 comprises a body 13 substantially extended in the clamping direction X-X of the jaws 3,4 and a head 14. The head 14 is tied to the body 13 and defines an abut surface 14a which extends in a direction substantially perpendicular to the clamping direction X-X and is fit to abut against the outer side 31 of the first jaw 3 (Figure 9).

[0024] Referring to Figure 2, the first engaging element 11 comprises a substantially eccentric portion 12. The substantially eccentric portion 12 has a passing opening 12a extended parallel to the axial direction Y-Y.

[0025] Preferably, the passing opening 12a comprises a receiving countersink 12b, whose function will be described in detail hereinafter.

[0026] The clamp 1 further comprises a second engaging element 15 coupled with the second jaw 4, as it can be seen in Figure 4.

[0027] Advantageously, the second engaging element 15 of the clamp 1 is coupled abut against the second jaw 4 to drive the second jaw 4 toward the opposed jaw in the clamping direction X-X. Preferably, the second engaging element 15 engages the second jaw 4 in correspondence to the outer side 41.

[0028] According to the shown embodiment, the second engaging element 15 comprises a body 17 substantially extended in the clamping direction X-X of the jaws 3,4 and a head 18. The head 18 is tied to the body 17 and defines an abut surface 18a which extends in a direction substantially perpendicular to the clamping direction X-X and is fit to abut against the outer side 41 of the first jaw 3 (Figure 9).

[0029] As shown in Figure 4, the second engaging element 15 has a through hole 16 extended parallel to the axial direction Y-Y of the clamping ring 2.

[0030] Advantageously, the first engaging element 11

and the second engaging element 15 are mutually coupled so as to slide one toward the other in the clamping direction X-X of the jaws 3,4, in order to guide the approaching/departing movement of the jaws 3,4.

[0031] Referring to the annexed Figures, the clamp 1 comprises clamping means 20 acting on the first engaging element 11 and on the second engaging element 15 to determine said approaching/departing movement of the jaws 3,4 in the clamping direction X-X.

[0032] More specifically, the clamping means 20 act on the engaging elements 11, 15 to determine the reversible movement of the jaws 3,4 between an open position and a close position, wherein the jaws 3,4 ensure the tightening of the clamping ring 2 on the male terminal.

[0033] In particular, the clamping means 20 comprise a first part 21 and a second part 22 movably coupled together in a complementary way. The first part 21 and the second part 22 are coupled in a complementary way to make a mutual tightening approaching movement substantially parallel to axis Y-Y.

[0034] As shown in Figures 7 and 9, the first part 21 of the clamping means 20 is tied to the second engaging element 15. In particular, the first part 21 extends through the passing opening 12a of the first engaging element 11.

[0035] Said first part 21 of the clamping means 20 is inserted into the through hole 16 of the second engaging element 15 to be tied to the second engaging element 15, while the second part 22 of the clamping means 20 thrustly acts on the receiving countersink 12b, which faces the second part 22 of the clamping means 20. Thereby, during the approaching movement of the first part 21 of the clamping means 20 toward the second part 22 of the clamping means 20, the first part of the clamping means 20 thrustly acts on said receiving countersink 12b, so as to drive the first jaw 3 toward the second jaw 4 and cause the tightening of the clamping ring 2.

[0036] As shown in Figures 5, 7 and 9, the first part 21 of the clamping means 20 extends through the opening 5 of the jaws 3,4, through the passing opening 12a of the first engaging element 11, and through the hole 16 of the second engaging element 15.

[0037] Preferably, the first part 21 of the clamping means 20 corresponds to a screw and the second part 22 is a nut threadably engaged with the screw. It is apparent that the clamping means 20 can also differ from the bolt ones indicated above, being it possible to use eccentric and pull, rack and pinion closing systems or other functionally equivalent systems, i.e. systems able to drive a first part of the clamping means toward the second part of the clamping means in a guided, adjustable and resistant way.

[0038] Preferably, the nut 22 end facing the head of the screw 21, i.e. facing the receiving countersink 12b, has a substantially rounded, conical or differently tapering profile, so as to smoothly engage and act on the receiving countersink 12b. In fact, during the tightening approaching movement of the clamping means 20, said rounded, conical or differently tapering profile of the nut

22 allows to thrustly act on the receiving countersink 12b of the first engaging element 11, so as to drive the first jaw 3 toward the second jaw 4, avoiding the occurrence of jamming, excessive friction and/or excessive over-stress in the contacting surfaces.

[0039] As shown in Figures 2 and 3, said two end terminal portions 30,40 of the jaws 3,4 define as a whole a housing 6, extended in the clamping direction X-X, where both the body 17 of the second engaging element 15 and the body 13 of the first engaging element 11 house.

[0040] Particularly referring to Figure 4, the body 17 of the second engaging element 15 defines a tubular element wherein the body 13 of the first engaging element 11 is slidably inserted.

[0041] Advantageously, the bodies 13 and 17 of the first 11 and the second 15 engaging elements cooperate to produce a coupling between splined profiles in the clamping direction X-X of the jaws 3,4. In particular, the body 17 of the second engaging element 15 is slidably inserted into the passing housing 6 of the jaws 3,4 along the clamping direction X-X of the jaws 3,4 and the body 13 of the first engaging element 11 is slidably inserted into the tubular element of the body 17 of the second engaging element 15. Substantially, the passing housing 6 of the clamp 1 serves as guiding element for the second engaging element 15 and the tubular element of the body 17 of the second engaging element 15 serves as guiding element for the first engaging element 11.

[0042] The above is a consequence of the fact that in the embodiment shown in the Figures, the clamping ring 2 is composed of an upper open ring 7 and a lower open ring 8. In fact, the conductive body 10 is formed from a plate (not shown in the Figures) which is folded up so that the lower ring 8 places itself under the upper ring 7, parallel and axially aligned thereto. The upper ring 7 extends to form upper end terminal portions 30a,40a of the jaws 3,4 while the lower ring 8 extends to form respective and corresponding opposed lower end terminal portions 30b,40b. In particular, each upper end terminal portion 30a,40a is connected to each lower end terminal portion 30b,40b by front walls 33,43.

[0043] Each lower end terminal portion 30b,40b of the lower ring 8 has opposed sides 31b,32b and 41b,42b, respectively, oriented in such a way as to be transverse to the clamping direction X-X.

[0044] Referring to Figure 10, the lower end terminal portions 30b,40b of the lower ring 8 comprise, in correspondence to their respective internal sides 32b,42b, i.e. the sides not facing each other of the two lower end terminal portions 30b,40b, a respective cavity 36a,46a.

[0045] As stated above for the two cavities 32a,42a, also the two cavities 36a,46a face each other, so that, as a whole, they define a lower passing opening 5b extended parallel to the axial direction Y-Y.

[0046] As the upper ring 7 and the lower ring 8 are axially aligned to each other, the opening 5 and the lower opening 5b are at least partially superposed to each other.

[0047] Therefore, as it can be seen in Figures 5 and 7, the opening 5 and the opening 5b of the jaws 3,4, the passing opening 12 of the first engaging element 11 and the holes 16,16a of the second engaging element 15 are at least partially superposed to each other.

[0048] Thanks to this configuration, the first part 21 of the clamping means 20 extends through the opening 5b of the jaws 3,4, the hole 16a of the second engaging element 15, the passing opening 12 of the first engaging element 11, the hole 16 of the second engaging element 15 and the opening 5 of the jaws 3,4. Thereby, since the screw 21 is firmly tied to the second engaging element 15 and the latter is coupled about against the second jaw 4 and furthermore, since the nut 22 thrustly acts on the receiving countersink 12b of the first clamping element 11, the second jaw 4 is driven in the clamping direction X-X toward the opposed jaw 3 thus realising an extremely effective tightening of the clamp 1 on a battery terminal.

[0049] An assembly mode of the clamp 1 according to a preferred embodiment will be described hereinafter.

[0050] Starting from an initial configuration wherein the jaws 3,4 are in rest position (Figures 5 and 6), i.e. in a configuration of substantially maximum distance between the jaws, the assembly of the clamp 1 includes a first step wherein the second engaging element 15 is inserted into the housing 6 along the clamping direction X-X of the jaws 3,4 and a second step wherein the first engaging element 11 is inserted into the tubular body 17a of the second engaging element 15.

[0051] Subsequently, the assembly of the clamp 1 implies a third step wherein the screw 21 is inserted through: the opening 5b of the jaws 3,4, the hole 16a of the second engaging element 15, the passing opening 12 of the first engaging element 11, the hole 16 of the second engaging element 15 and the opening 5 of the jaws 3,4.

[0052] Starting from this latter configuration, the tightening of the clamp 1 is carried out coupling the nut 22 on the screw 21.

[0053] The screwing of the nut 22 on the threaded shank of the screw 21 determines the desired tightening of the clamping ring 2 on a battery male terminal according to the procedure described hereinafter.

[0054] Referring to Figures 5 and 6, the clamp 1 is in a first clamping configuration wherein the jaws 3,4 are in an open or rest position and the nut 22 is at a first level of rotation on the screw 21.

[0055] In this first configuration, the first jaw 3 and the second jaw 4 are mutually separated by a first distance d_1 .

[0056] Upon a further screwing rotation of the nut 22 on the screw 21, the nut 22 thrustly acts on the receiving countersink 12b of the first engaging element 11 to drive the first jaw 3 toward the second jaw 4 so as to tighten the clamping ring 2 on the male terminal. The clamp 1 is therefore placed in the second clamping configuration as shown in Figures 7 and 8.

[0057] The screwing of the nut 22 determines a relative movement of the nut 22 with respect to the screw 21

along its axis and a corresponding relevant movement of the first clamping element 11 with respect to the clamping screw 21. Since the second clamping element 15 is kept abut against the jaw 4 by the screw 21 and the jaw 3 is guided by the first clamping element 11 which allows it to move only along the clamping direction X-X, the jaw 3 moves from the open position (Figs 5-6) to the close position (Figs 7-8) to tighten the clamping ring 2 on the battery terminal. In this second configuration, the first jaw 3 and the second jaw 4 are mutually separated by a second distance d_2 smaller than said first distance d_1 as defined in the first clamping configuration of the clamp 1.

[0058] Of course, in one embodiment not shown in the annexed Figures, the jaw 4 can be movable while the jaw 3 remains fixed. In this case, the jaw 4 is movable from and toward the jaw 3.

[0059] Furthermore, the two jaws 3,4 can be both movable.

[0060] As it can be appreciated from the above description, the clamp according to the present invention allows to meet the needs and to overcome the drawbacks referred to in the introduction of the present description with reference to the known art.

[0061] In particular, thanks to the fact that the second engaging element abuts against the second jaw and the screw is tied to the second engaging element, it is possible to advantageously manufacture a clamp allowing an effective tightening action on a battery male terminal.

[0062] Furthermore, the particular structural configuration allows for an extremely simple assembly resulting in time saving for the operators.

[0063] Obviously, those skilled in the art, in order to meet contingent and specific needs, will be able to make many changes and alterations to the clamp for male terminal according to the invention described hereinbefore, all however falling within the protection scope of the invention as defined by the following claims.

[0064] Therefore, for example, according to a simplified embodiment not illustrated by the present invention, the clamp according to the present invention, starting from a non-folded plate, can include a single clamping ring comprising two end terminal portions of the jaws. In such a configuration, each end terminal portion has opposed sides and, in correspondence to the respective internal sides, i.e. the sides not facing each other, a respective cavity. Thereby, the two cavities of the jaws define as a whole a single passing opening extended parallel to the axial direction. By means of two appropriate engaging elements equipped with respective openings and each having a folding to be coupled abut with the side of each end portion of the jaws, and wherein one of said two engaging elements is properly shaped so as to define, in its opening, a receiving countersink, it is possible to produce a simplified clamp tightening the clamping ring on the male terminal by applying appropriate screw-nut clamping means or of a different kind.

Claims

1. A clamp (1) for male terminal comprising:

- a clamping ring (2) having an axis (Y-Y) and capable of inserting on a male terminal in an insertion direction extended along said axis (Y-Y), said clamping ring (2) having a first (3) and a second jaw (4) opposed to each other and mutually approachable along a clamping direction (X-X) to tighten the clamping ring (2) on the male terminal,
- a first engaging element (11) coupled abut against said first jaw (3) to drive said first jaw (3) toward the opposed jaw (4), said first engaging element (11) comprising a substantially eccentric portion (12),
- a second engaging element (15) coupled to said second jaw (4),
- clamping means (20) acting on said first (11) and second engaging element (15) to determine a movement of said jaws (3,4) along said clamping direction (X-X) between an open position and a close position wherein they ensure the tightening on the male terminal, said clamping means (20) comprising a first (21) and a second part (22) movably coupled in a complementary way to make a mutual tightening approaching movement along a direction substantially parallel to the axis (Y-Y) of said clamping ring (2),

characterized in that:

- said second engaging element (15) is coupled abut against said second jaw (4) to drive said second jaw (4) toward the opposed jaw (3), and
- said first part (21) of the clamping means (20) is tied to said second engaging element (15), wherein
- said second part (22), during the tightening approaching movement toward said first part (21), acts on the substantially eccentric portion (12) of the first engaging element (11) to drive the first jaw (3) toward the second jaw (4) so as to tighten the clamping ring (2) on the male terminal.

2. A clamp (1) according to claim 1, wherein said second engaging element (15) is coupled abut against said second jaw (4) to drive said second jaw (4) in the clamping direction (X-X) toward the opposed jaw (3).
3. A clamp (1) according to claim 1 or 2, wherein said substantially eccentric portion (12) has a passing opening (12a) extended parallel to said axial direction (Y-Y), said passing opening (12a) comprising a receiving countersink (12b) facing the second part

(22) of the clamping means (20), and wherein said second part (22) thrustly acts on said receiving countersink (12b) of the first engaging element (11) to drive the first jaw (3) toward the second jaw (4) during the tightening approaching movement of the clamping means (20).

4. A clamp (1) according to claim 3, wherein said first part (21) of said clamping means (20) extends through said passing opening (12a) of said first engaging element (11).

5. A clamp (1) according to anyone of claims 1 to 4, wherein said second engaging element (15) has a through hole (16) extended parallel to said axial direction (Y-Y) and said first part (21) of said clamping means (20) is inserted into said through hole (16) to be tied to said second engaging element (15).

6. A clamp (1) according to anyone of claims 1 to 5, wherein said jaws (3,4) comprise respective end terminal portions (30,40) each defining respective opposed sides (31,32,41,42) oriented in such a way as to be transverse to said clamping direction (X-X), said end terminal portions (30,40) comprising, in correspondence to their respective internal sides (32,42) a respective cavity (32,42).

7. A clamp (1) according to claim 6, wherein said cavities (32,42) of said jaws (3,4) face each other so that, as a whole, they define a passing opening (5) extended parallel to the axial direction (Y-Y), said first part (21) of said clamping means (20) extending through said opening (5), said passing opening (12a) and said through hole (16) of said clamp (1).

8. A clamp (1) according to claim 7, wherein said opening (5) is at least partially superposed to the through hole (16) of said second element (15).

9. A clamp (1) according to anyone of claims 3 to 8, wherein said through hole (16) of said second element (15) is at least partially superposed to said passing opening (12a) of said first element (11).

10. A clamp (1) according to anyone of claims 1 to 9, wherein said jaws (3,4) comprise a housing (6) wherein said second engaging element (15) slidingly inserts along said clamping direction (X-X).

11. A clamp (1) according to anyone of claims 3, 5 and 7, wherein said first (11) and second engaging elements (15) comprise each a body (13,17) substantially extended along said clamping direction (X-X) and a head (14,18), wherein:

- said head (14,18) is tied to said body (13,17) and defines an abut surface extended in a di-

rection substantially perpendicular to said clamping direction (X-X), said head (14,18) being coupled about against the sides (31,41) of each jaw (3,4),

- said body (13) of said first engaging element (11) comprises said substantially eccentric portion (12a), and

- said body (17) of said second engaging element (15) comprises said through hole (16).

12. A clamp (1) according to claim 11, wherein said body (17) of said second engaging element (15) comprises a tubular body (17a) defining a housing (19) wherein the body (13) of said first engaging element (11) slidingly inserts, and wherein said bodies (13,17) cooperate to produce a sliding along said clamping direction (X-X).

13. A clamp (1) according to anyone of claims 3 to 12, wherein said first part (21) of the clamping means (20) comprises a screw and said second part (22) of the clamping means (20) comprises a nut threadably engaged with said screw, said nut having a substantially rounded profile to smoothly cooperate with said receiving countersink (12b) so that said nut thrustly acts on the receiving countersink (12b) of the first engaging element (11) to drive the first jaw (3) toward the second jaw (4) during the tightening approaching movement of the clamping means (20).

14. A clamp (1) according to anyone of claims 1 to 13, wherein said first (11) and second engaging elements (15) are mutually coupled in a slidingly way along the clamping direction (X-X) of said jaws (3,4) to guide said jaws (3,4) in the clamping direction (X-X).

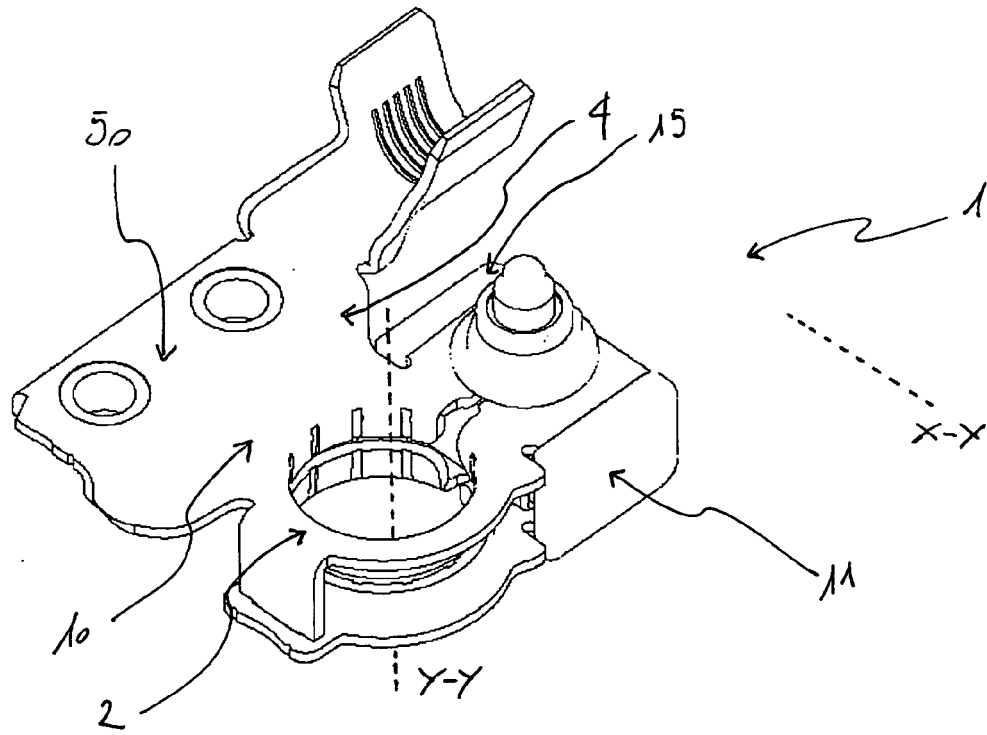


FIG. 1

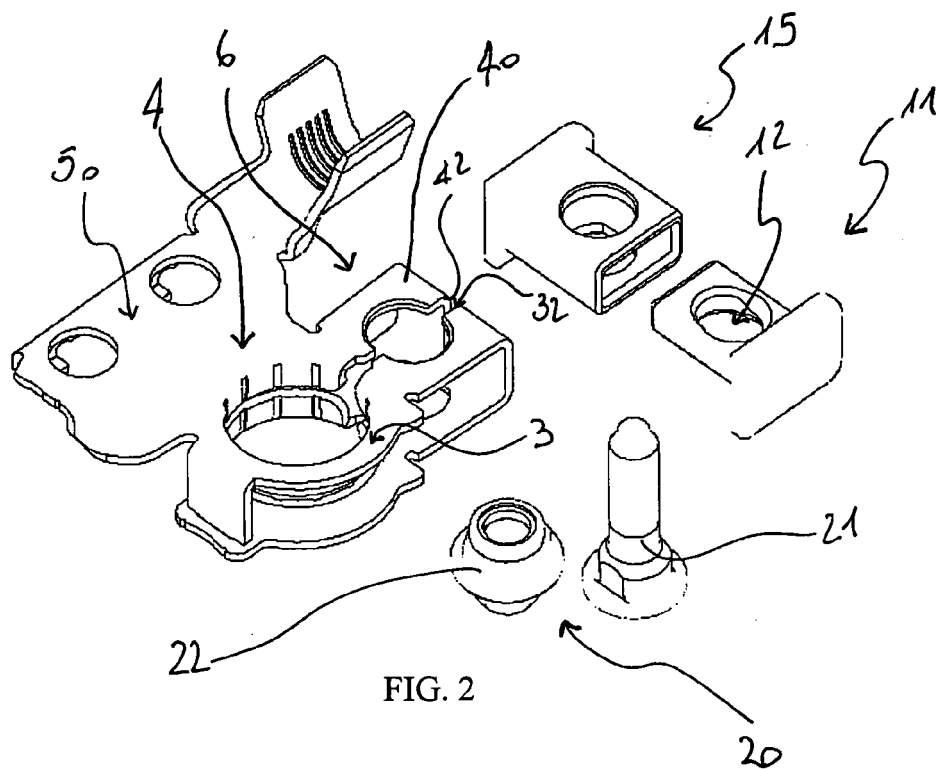


FIG. 2

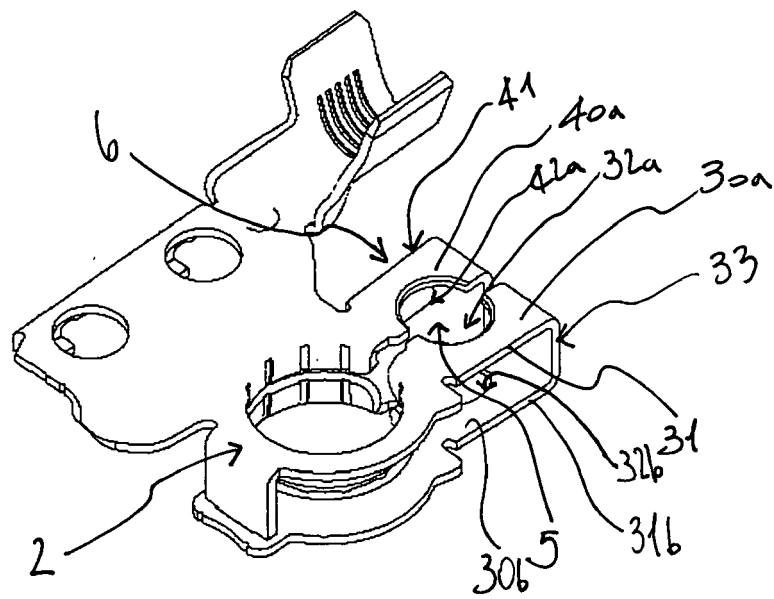


FIG. 3

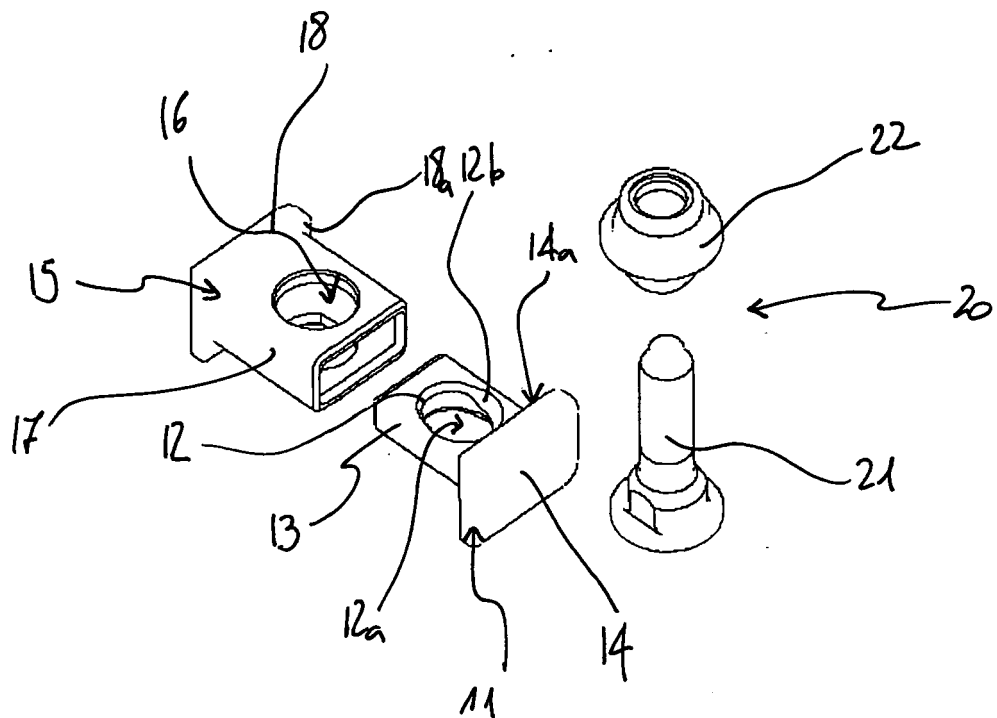


FIG. 4

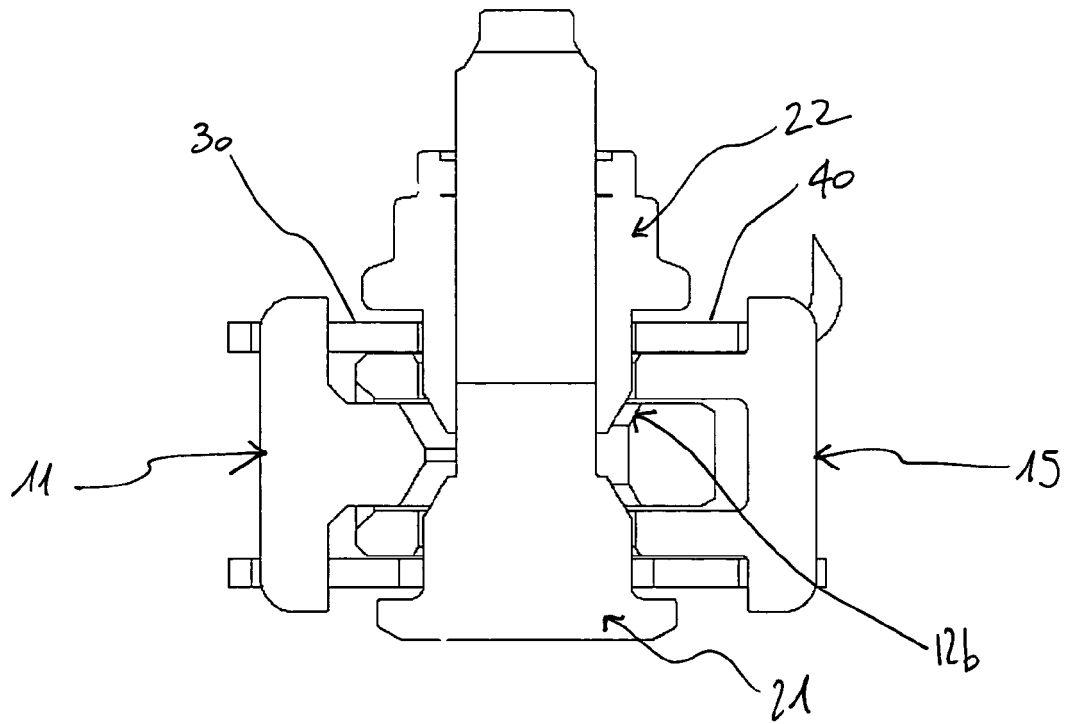


FIG. 5

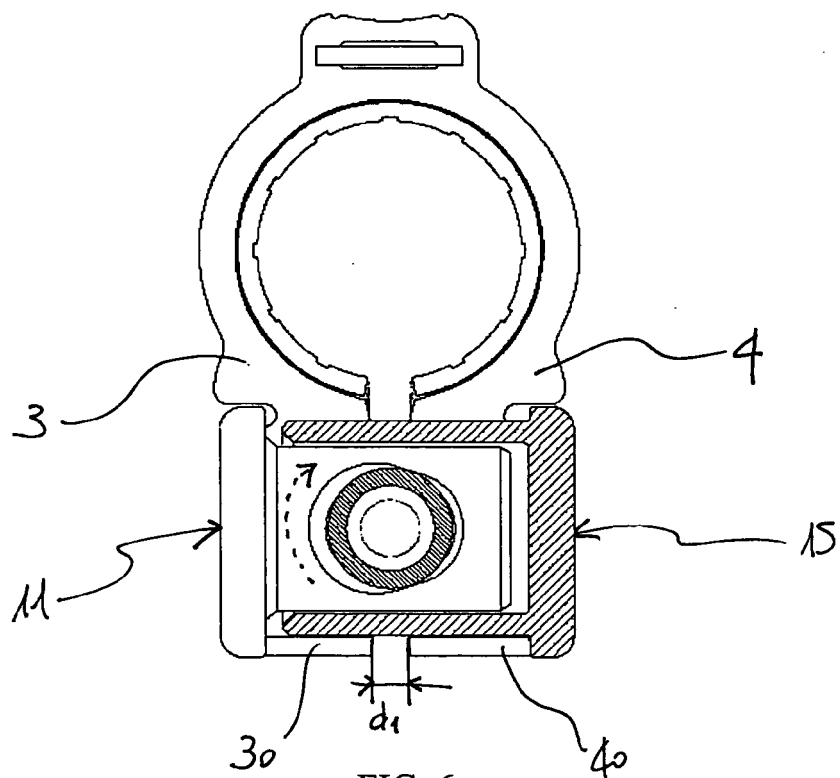
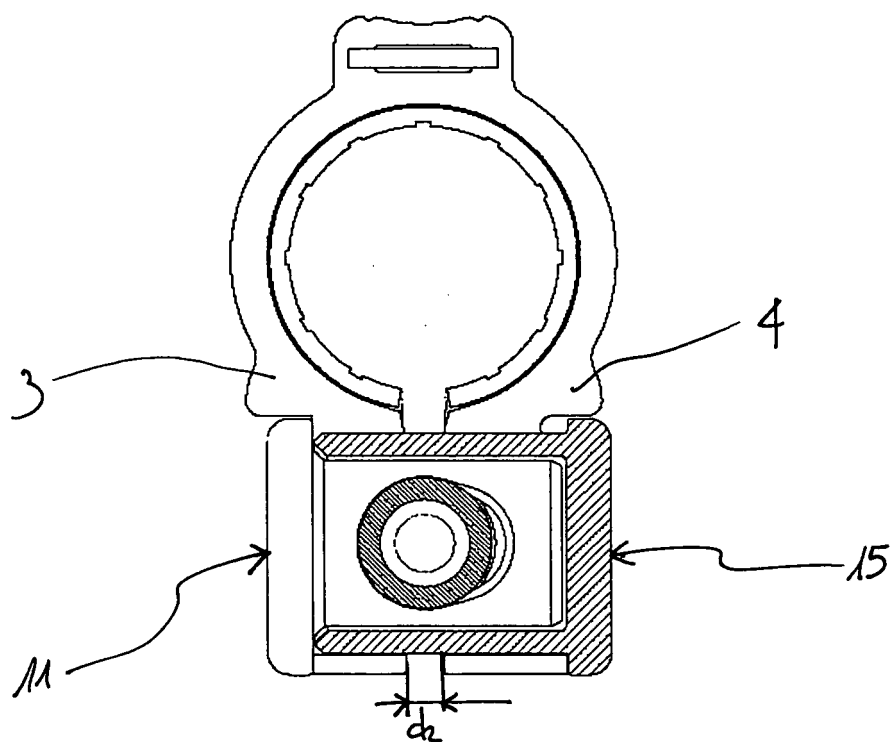
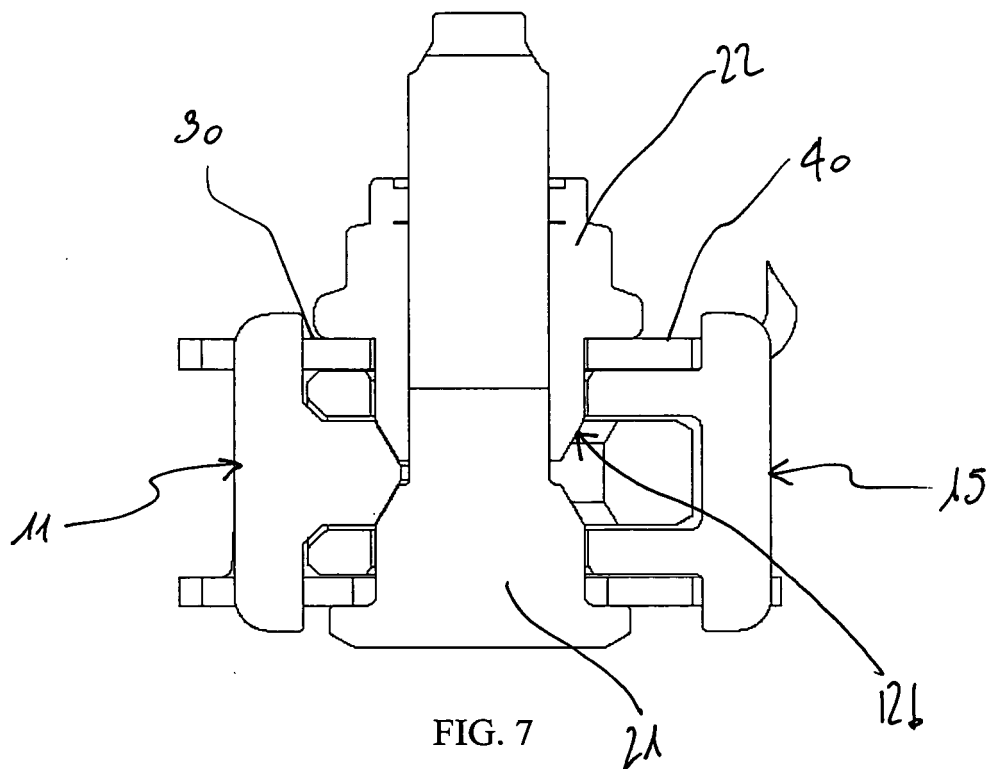


FIG. 6



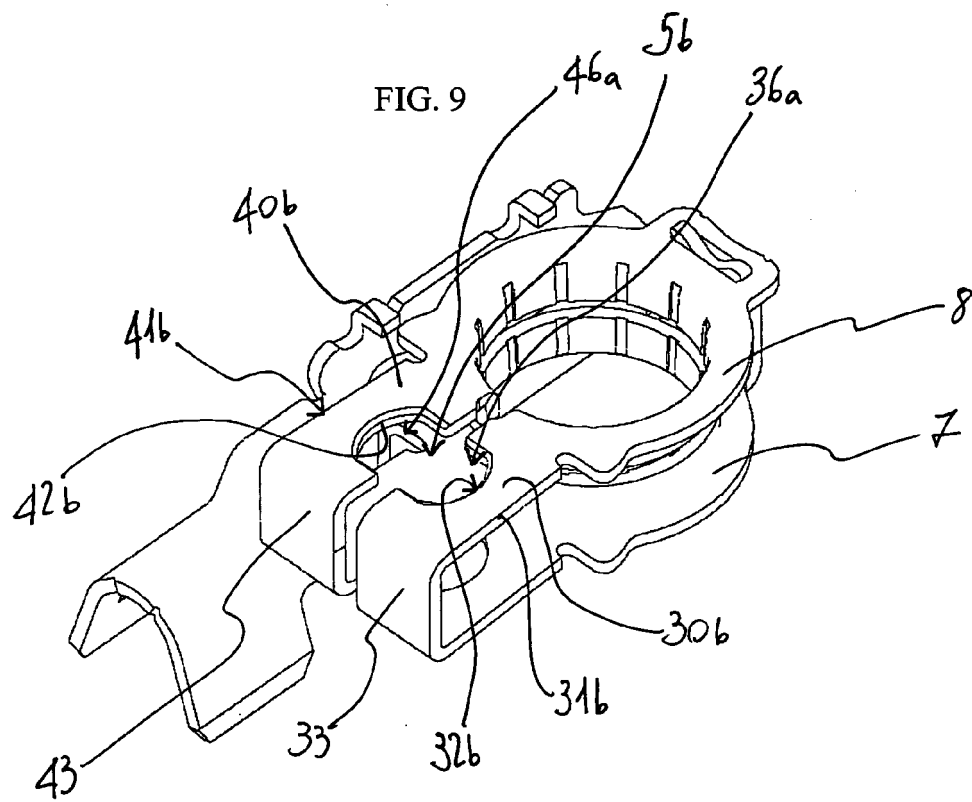
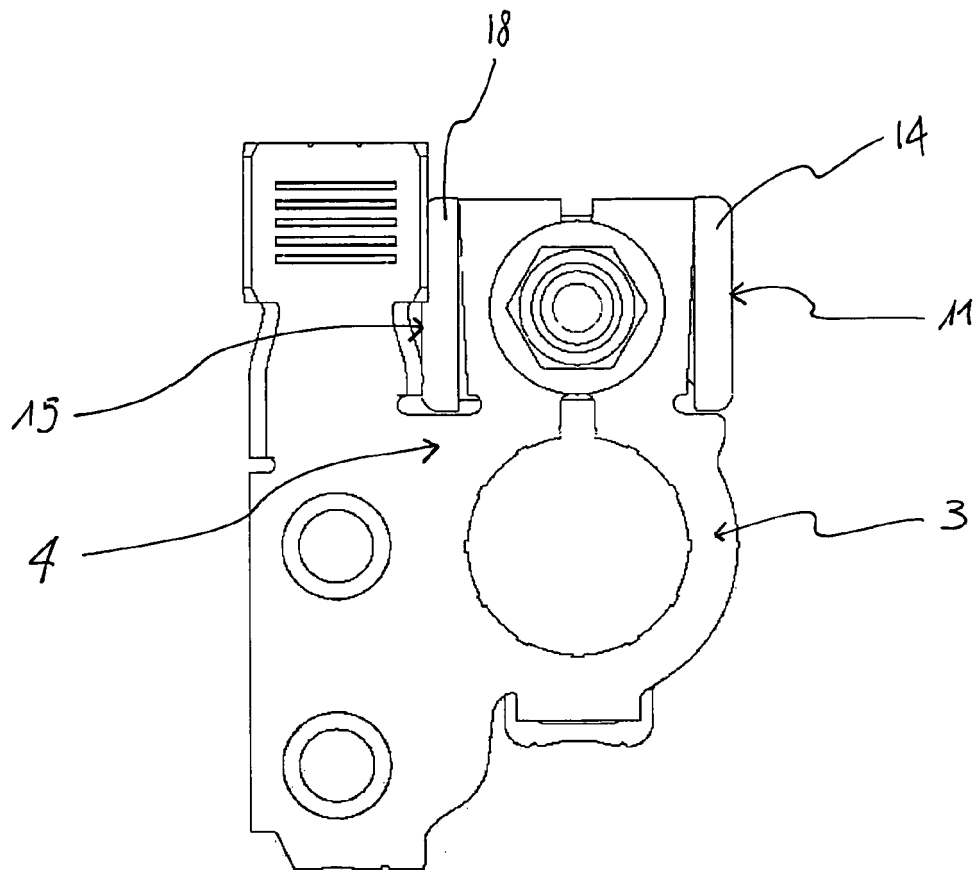


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5765

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 6 817 908 B2 (FREITAG ERIK [US]) 16 November 2004 (2004-11-16)	1	INV. H01R11/28
A	* column 2, lines 48-67; figures 1-8 * * column 3, lines 1-67 * * column 3, lines 1-67 *	2-14	
A	----- US 6 561 855 B1 (CRET GAVRIL [US]) 13 May 2003 (2003-05-13)	1-14	
A,D	* column 4, lines 32-67; figures 1-8 * * column 2, line 1 * * column 5, lines 1-67 * * column 6, lines 1-49 *	1-14	
A	----- US 5 879 202 A (ZHAO WEIPING [US]) 9 March 1999 (1999-03-09)	1-14	
A	* claims; figures 1,22-26 *	1-12	TECHNICAL FIELDS SEARCHED (IPC) H01R
A	----- EP 0 786 829 A (WHITAKER CORP [US]) 30 July 1997 (1997-07-30)	1-12	
A	* columns 1,2; figures 1-7 *	1-12	
A	----- US 1 746 514 A (AUGUST BAUNACH) 11 February 1930 (1930-02-11)	1-12	
A	* figures 1-3 *		

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 April 2009	Examiner Durand, François
CATEGORY OF CITED DOCUMENTS		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	
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			

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EPO FORM 1503 03.82 (P04C01)

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

EP 08 42 5765

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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28-04-2009

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