(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 826 395 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.08.2007 Bulletin 2007/35

(51) Int Cl.:
F02M 55/02 *(2006.01)* ***F02M 55/00*** *(2006.01)*

(21) Application number: **06003609.2**

(22) Date of filing: **22.02.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

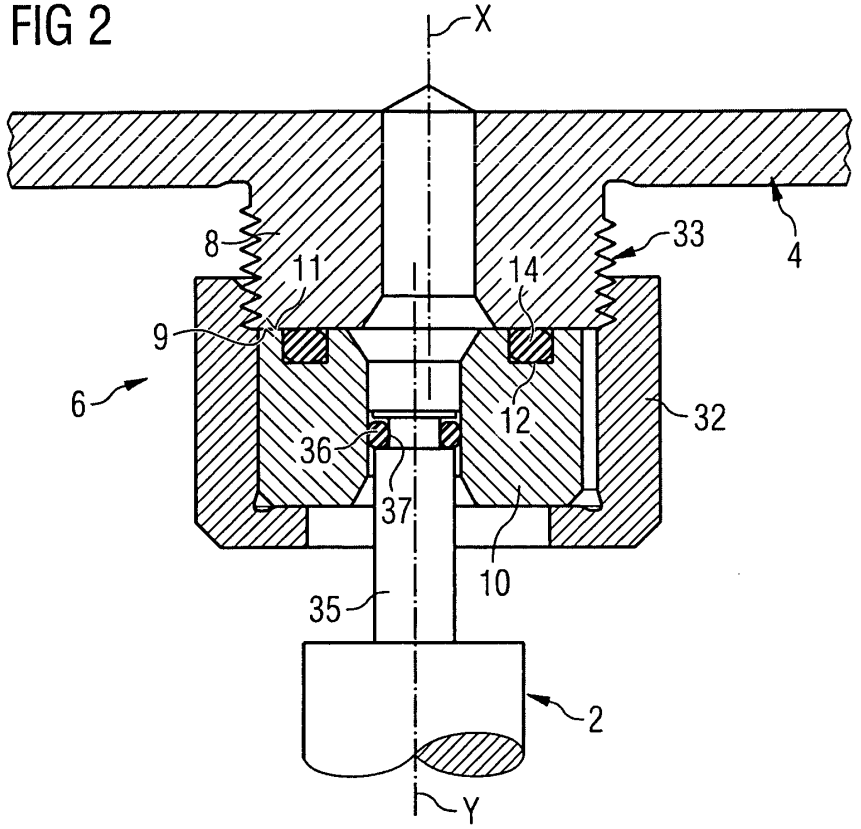
(71) Applicant: **SIEMENS AKTIENGESELLSCHAFT**
80333 München (DE)

(72) Inventors:
- **Ricci, Roberto**
  57121 Livorno (IT)
- **Viggiani, Domenico**
  deceased (IT)

(54) **Coupling device for connecting an injector to a fluid supply**

(57) A Coupling device (6) for connecting an injector (2) to a fluid supply (4) comprises a pipe (8), an adjusting element (10), and a coupling body. The pipe (8) communicates with the fluid supply (4) and has a plane end face (9). The adjusting element (10) has a first plane side (11) facing to the plane end face (9) and is coupled to the plane end face (9). Further, the adjusting element (10) is movable rectangular to an axis (X) of the pipe (8) and has a recess. The recess penetrates the adjusting element (10) in axial direction and communicates with the pipe (8). The coupling body has a side portion and a bottom portion. The side portion is fixed to the pipe (8) and radially surrounds the adjusting element (10). The bottom portion is axially coupled to the adjusting element (10) and has a recess for coupling the adjusting element (10) to the injector.

FIG 2



EP 1 826 395 A1

Description

[0001] The invention relates to a coupling device for connecting an injector to a fluid supply. The coupling device comprises a pipe and a coupling body.

[0002] EP 0 969 203 A1 discloses a coupling system between an engine head, an injector and a fuel manifold. The engine head has a seating which is designed to house the injector. The fuel manifold extends above the engine head. The fuel manifold is connected to the injector through a bush which projects from the fuel manifold. The injector is coupled to the seating by means of a ball coupling. The fuel manifold is wretchedly secured to the engine head. An opposing spring is interposed between the fuel manifold and the injector to compress the injector inside the seat.

[0003] It is an object of the invention to create a coupling device for connecting an injector to a fluid supply which enables a proper flexible coupling of the injector to the fluid supply.

[0004] The object is achieved by the independent claim 1. Advantageous embodiments of the invention are given in the sub claims.

[0005] The invention is distinguished by a coupling device for connecting an injector to a fluid supply. The coupling device comprises a pipe, an adjusting element, and a coupling body. The pipe communicates with the fluid supply and has a plane end face. The adjusting element has a first plane side facing to the plane end face of the pipe. The first plane side of the adjusting element is coupled to the plane end face of the pipe. The adjusting element is moveable rectangular to an axis of the pipe. Further, the adjusting element has a recess which penetrates the adjusting element in axial direction and which communicates with the pipe. The coupling body has a side portion and a bottom portion. The side portion is fixed to the pipe and the side portion radially surrounds the adjusting element. The bottom portion is axially coupled to the adjusting element and has a recess for coupling the adjusting element to the injector.

[0006] If the injector does not fit to the pipe, in particular, if an axis of the injector does not correspond to the axis of the pipe, the adjusting element may be moved rectangular to the axis of the pipe. So, the coupling device enables to fix the injector to the pipe although the position of the injector is shifted relative to its given position. This contributes to a proper flexible coupling of the injector to the pipe and via the pipe to the fluid supply.

[0007] In an advantageous embodiment of the coupling device, the coupling body comprises a coupling nut. The pipe has a corresponding thread for the coupling nut. The coupling nut is screwed onto the pipe at the thread of a pipe. This contributes to the proper coupling of the injector to the pipe.

[0008] In a further advantageous embodiment of the coupling device, the plane end face of the pipe and/or the first plane side of the adjusting element, which is coupled to the plane end face, comprise a coupling groove. The coupling groove is formed circumferential an axis of the adjusting element and/or, respectively, circumferential the axis of the pipe. The coupling device comprises a first O-ring seal which is arranged in the coupling groove. This contributes to a proper sealed coupling of the adjusting element to the pipe.

[0009] In a further advantageous embodiment of the coupling device, the coupling device comprises a tube. The tube takes in an axial section of the coupling body and an axial section of the pipe. Further, the tube is coupled to the coupling body and the axial section of the pipe by a press-fit. This contributes to a proper fixation of the coupling body.

[0010] In a further advantageous embodiment of the coupling device, the pipe has a circumferential groove at an outer shell of the pipe. If the tube is crimped partly into the circumferential groove of the pipe, the circumferential groove contributes to a proper fixation of the tube.

[0011] In a further advantageous embodiment of the coupling device the recess of the adjusting element has an inner diameter which increases away from the pipe. This contributes to a wide flexibility of the coupling device.

[0012] The invention is explained in the following with the help of schematic drawings.

[0013] These are as follows:

Figure 1 an injector and a fluid supply,

Figure 2 a first embodiment of a coupling device,

Figure 3 a second embodiment of the coupling device.

[0014] Elements with the same design or function that appear in the different illustrations are identified by the same reference characters.

[0015] An injector 2 (figure 1) is connected to a fluid supply 4 by a coupling device 6. The injector 2 is suited for injecting fluid. Preferably, the injector 2 is used for injecting fuel into a combustion chamber of an internal combustion engine.

[0016] A pipe 8 (figure 2) is connected to the fluid supply 4. Preferably, an axis of the fluid supply 4 is rectangular to an axis X of the pipe 8. The pipe 8 has a plane end face 9.

[0017] An adjusting element 10 has a first plane side 11. The first plane side 11 is coupled to the plane end face 9 of the pipe 8. The adjusting element 10 has a recess which penetrates the adjusting element 10 in direction of an axis Y of the adjusting element 10. The recess of the adjusting element 10 communicates with the pipe 8.

[0018] Preferably, the adjusting element 10 comprises a coupling groove 12 which is formed in the first plane side 11 of the adjusting element 10 circumferential the axis Y of of the adjusting element 10. A first O-ring seal 14 is arranged in the coupling groove 12 of the adjusting element 10. The first O-ring seal 14 contributes to a prop-

er sealed coupling between the adjusting element 10 and the pipe 8. Alternatively or additionally the coupling groove 12 may be formed in the plane end face 9 of the pipe 8 which then preferably is formed circumferential the axis X of the pipe 8 and which then takes in the first O-ring seal 14.

[0019] The adjusting element 10 is fixed to the pipe 8 by a coupling body. The coupling body takes in the adjusting element 10 and an end area of the pipe 8 which comprises the plane end face 9. Further, the coupling body has a side portion which radially surrounds the adjusting element 10 and a bottom portion which has a recess through which an inlet tube 35 of the injector 2 may be stuck into the adjusting element 10. Preferably, the coupling body comprises a coupling nut 32. Then, the pipe 8 comprises a corresponding thread 33 for screwing the coupling nut 32 onto the pipe 8.

[0020] The coupling nut 32 is screwed on to the pipe 8 in such a way, that the adjusting element 10 is moveable rectangular to the axis X of the pipe 8. So, the axis Y of the adjusting element 10 and the axis X of the pipe 8 are shiftable relative to each other. This enables to compensate system tolerances of the internal combustion engine which lead to an incorrect position of the injector 2 relative to the fluid supply 4. For example, the system tolerances may relate to a position of the fluid supply 4 and/or to the position of the pipe 8 at the fluid supply 4 and/or to dimensions of the fluid supply 4 and/or the pipe 8 and/or to a cylinder head of the internal combustion engine in which the injector 2 is arranged, and/or to further system tolerances which lead to a shifting of an axis of the inlet tube 35 of the injector 2 relative to the axis X of the pipe 8.

[0021] Preferably, an inner diameter of the recess of the adjusting element 10 increases towards the injector 2. This enables a slight tilting of the injector 2 relative to the axis Y of the adjusting element 10. This contributes to the proper flexible coupling of the injector 2 to the fluid supply 4.

[0022] Additionally, there may be arranged a tube 34 at the outside of the coupling device 6. The tube 34 takes in an axial section of the coupling nut 32 and an axial section of the pipe 8. The Tube 34 may comprise aluminum or stainless steel. After screwing the coupling nut 32 onto the pipe 8, the tube 34 may be sticked onto the coupling nut 32 and the pipe 8. Preferably, the tube 34 is fixed to the pipe 8 and to the coupling nut 32 by a press-fit. If the tube 34 is fixed to the pipe 8 by the press-fit the pipe 8 preferably comprises a circumferential groove 38 at an outer shell of the pipe 8. Then, the tube 34 is crimped into the groove 38 circumferential groove 38 at the outer shell of the pipe 8. So, the tube 34 holds the coupling nut 32 in its position.

[0023] Preferably, the inlet tube 35 of the injector 2 comprises a diminution 37 of the inlet tube 35. An O-ring seal 36 of the injector 2 is arranged in the diminution 37 of the inlet tube 35. The O-ring seal 36 of the inlet tube 35 contributes to a proper sealing between the injector 2 and the pipe 8.

Claims

1. Coupling device (6) for connecting an injector (2) to a fluid supply (4) comprising

   - a pipe (8) which communicates with the fluid supply (4) and which has a plane end face (9),
   - an adjusting element (10), which has a first plane side (11) facing to the plane end face (9) and being coupled to the plane end face (9), and which is movable rectangular to an axis (X) of the pipe (8), and which has a recess, with the recess penetrating the adjusting element (10) in axial direction and with the recess communicating with the pipe (8),
   - a coupling body having a side portion, which is fixed to the pipe (8) and which radially surrounds the adjusting element (10), and having a bottom portion, which is axially coupled to the adjusting element (10) and which has a recess for coupling the adjusting element (10) to the injector.

2. Coupling device (6) in accordance with claim 1 with the coupling body comprising a coupling nut (32) and with the pipe (8) having a corresponding thread (33) for the coupling nut (32) and with the coupling nut (32) being screwed onto the pipe (8) at the thread (33) of the pipe (8).

3. Coupling device (6) in accordance with one of the preceding claims with the plane end face (9) of the pipe (8) and/or with the first plane side (11) of the adjusting element (10), which is coupled to the plane end face (9), comprising a coupling groove (12) which is formed circumferential the axis (X) of the pipe and/or, respectively, circumferential an axis (Y) of the adjusting element (10) and with the coupling device (6) comprising an O-ring seal (14) which is arranged in the coupling groove (12).

4. Coupling device (6) in accordance with one of the preceding claims comprising a tube (34) which takes in an axial section of the coupling body and an axial section of the pipe (8) and which is coupled to the coupling body and the axial section of the pipe (8) by a press fit.

5. Coupling device (6) in accordance with claim 4 with the pipe (8) having a circumferential groove (38) at an outer shell of the pipe (8).

6. Coupling device (6) in accordance with one of the preceding claims with the recess of the adjusting element (10) having an inner diameter which increases away from the pipe (8).

FIG 1

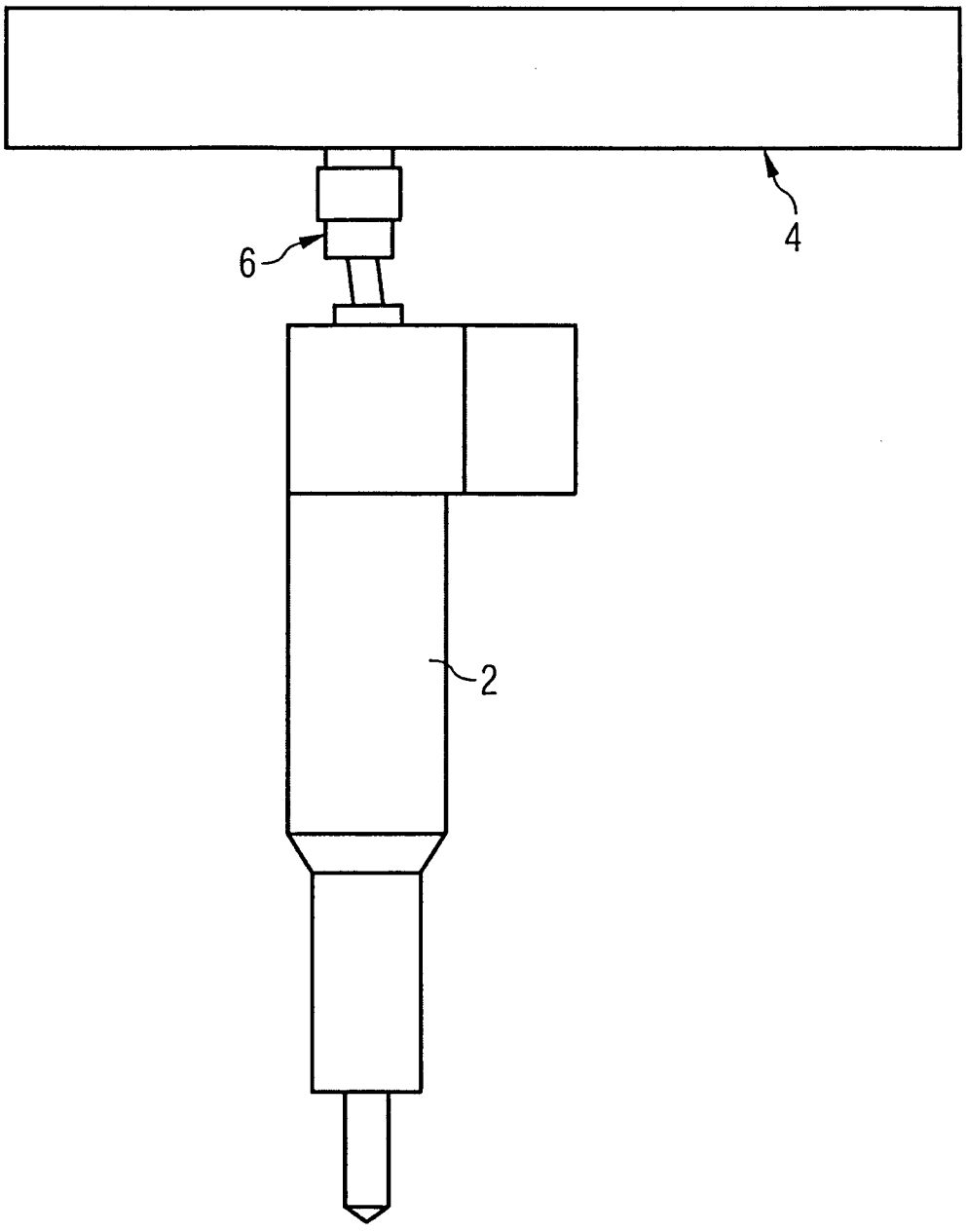


FIG 2

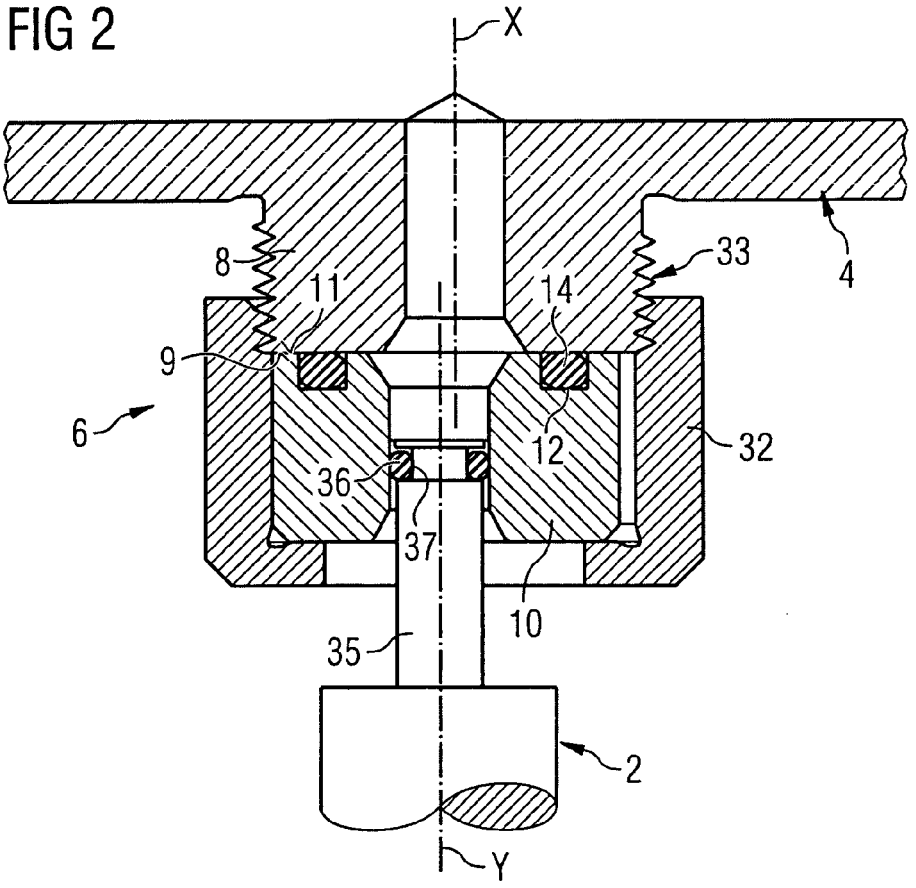
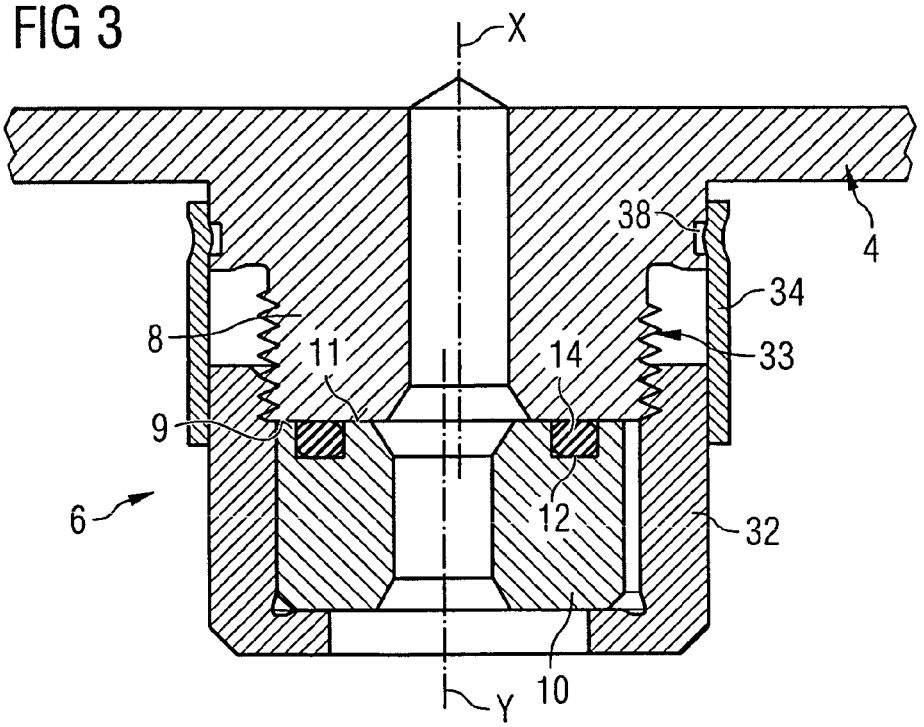


FIG 3



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 00 3609

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 A	US 5 033 435 A (OSTARELLO ET AL) 23 July 1991 (1991-07-23) * column 2, line 33 - column 4, line 32; figure 2 *	1-3 4,5	INV. F02M55/02 F02M55/00
A A	EP 1 467 084 A (DENSO CORPORATION) 13 October 2004 (2004-10-13) * paragraphs [0071] - [0076]; figure 10 * * figure 9 *	1-3 6	
A	WO 99/28617 A (ROBERT BOSCH GMBH; HOFMANN, KARL) 10 June 1999 (1999-06-10) * page 7, paragraph 4 - page 8, paragraph 3; figures 2,3 *	1-3	
A	EP 1 048 882 A (MOELLER FEINMECHANIK GMBH & CO. KG) 2 November 2000 (2000-11-02) * abstract; figure 1 *	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 August 2006	Kolland, U

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 00 3609

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-08-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5033435 A	23-07-1991	NONE	
EP 1467084 A	13-10-2004	CN 1536218 A	13-10-2004
		JP 2005009672 A	13-01-2005
		US 2004195837 A1	07-10-2004
WO 9928617 A	10-06-1999	DE 19753518 A1	10-06-1999
		EP 0960273 A1	01-12-1999
		JP 2001510529 T	31-07-2001
		US 6318339 B1	20-11-2001
EP 1048882 A	02-11-2000	AT 311565 T	15-12-2005
		DE 59912865 D1	05-01-2006

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0969203 A1 **[0002]**