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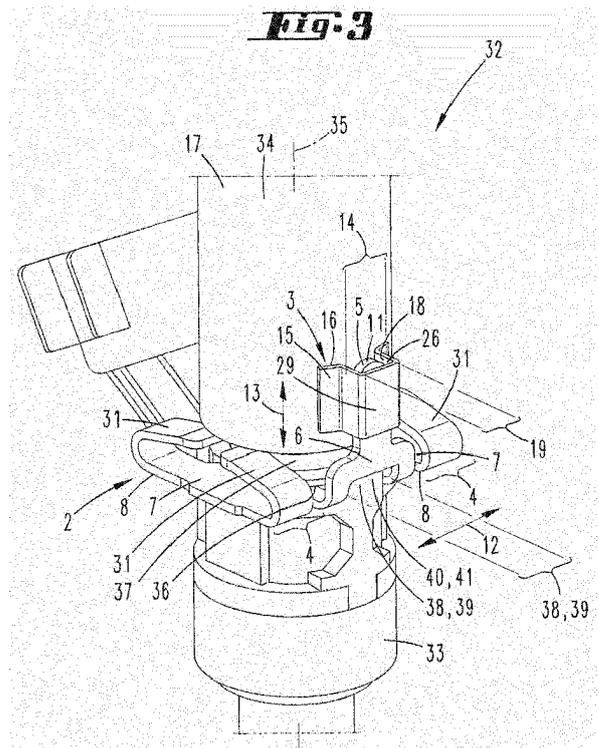
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**(54) COMBINATION OF A CLIP AND AN ALIGNING ELEMENT AND FLUID INJECTION ASSEMBLY**

(57) According to a first aspect the invention refers to a combination of a clip 2 and an aligning member 3, wherein the clip 2 comprises two legs 4, a tab 5 and a connecting portion 6, wherein the legs 4 extend alongside and are spaced from each other in a first lateral direction, wherein each of the legs 4 comprises a basis section 7 having a basis surface 8, wherein the basis surfaces 8 of the legs extend along a clip reference plane or are at least tangent to a clip reference plane, wherein each leg 4 is connected to the connecting portion 6, wherein the tab 5 is connected to the connecting portion 6 and extends from the connecting portion 6 toward a free tab end 11 in a direction 13 away from the clip reference plane, in particular orthogonally with regard to the clip reference plane, wherein the aligning member 3 comprises a receiving section 14 and connected thereto at least one mounting section 15 having a contact surface 16, in particular for contacting a fuel rail injector cup 17, wherein the receiving section 14 comprises two lateral inner surfaces 18 which are facing each other and which are spaced from each other for providing a clearance 19 therebetween, wherein said clearance 19 between the lateral inner surfaces 18 and a width of the tab 5 are adapted to each other. According to another aspect the invention refers to a modification of the above-mentioned combination. Further, the invention refers to fluid injection assemblies.



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## Description

### Technical Field

**[0001]** The present invention according to a first aspect and to a second aspect relates to a combination of a clip and an aligning member, wherein the combination in particular is for a fluid injection assembly for an internal combustion engine.

**[0002]** The present invention according to a third aspect and a fourth aspect relates to a fluid injection assembly for an internal combustion engine, wherein the fluid injection assembly comprises an injector and a fuel rail injector cup which has an external surface.

### Background Art

**[0003]** There are fluid injection assemblies known to persons skilled in the art which comprise a fuel rail and a number of injectors which are connected to the fuel rail by respective fuel rail injector cups. The angular position of the injector towards the fuel rail is a key characteristic to be respected in order to guarantee a proper spray of the injector into the combustion chamber and, as a consequence, to guarantee the respect of legislative regulations in terms of particle emissions.

**[0004]** In order to guarantee an intended angular position of an injector towards its fuel rail currently it is known that an indexing of the injector to the fuel rail is achieved by a snapping of an indexing device provided by the clip into a dedicated slot on the injector cup. However, this is currently possible only on an injector cup which has been made by deep drawn, where the dedicated slot can be obtained during the manufacturing process of the injector cup. However, this is not possible or very difficult to be obtained on a cylindrical injector cup which has been made by a turning operation, since this would require a very complex milling operation, which would have a significant cost impact.

### Summary of Invention

**[0005]** Regarding a first aspect of the invention and a second aspect of the invention it is an underlying object to provide simple means which may be used for providing a certain angular orientation of an injector with respect to a fuel rail of a fluid injection assembly. In particular, it is an object that these means enable its easy and cheap manufacturing. Further, in particular, it is an object that these means can be used together with cylindrical turned fuel rail injector cups.

**[0006]** Regarding a third and a fourth aspect of the invention it is an underlying object to improve a fluid injection assembly comprising a fuel rail injector cup which has an external surface. In particular, it is an object to provide a functionality for enabling a certain angular orientation of the injector with respect to a fuel rail by simple means which are easy and cheap to manufacture.

**[0007]** According to the first aspect in order to solve the object the invention suggests a combination of a clip and an aligning member, wherein the clip comprises two legs, a tab and a connecting portion, wherein the legs extend alongside and are spaced from each other in a first lateral direction, wherein each of the legs comprises a basis section having a basis surface, wherein the basis surfaces of the legs extend along a clip reference plane or are at least tangent to a clip reference plane, wherein each leg is connected to the connecting portion, wherein the tab is connected to the connecting portion and extends from the connecting portion toward a free tab end in a direction away from the clip reference plane, in particular orthogonally with regard to the clip reference plane, wherein the aligning member comprises a receiving section and connected thereto at least one mounting section having a contact surface, in particular for contacting a fuel rail injector cup, wherein the receiving section comprises two lateral inner surfaces which are facing each other and which are spaced from each other for providing a clearance therebetween, wherein said clearance between the lateral inner surfaces and a width of the tab are adapted to each other.

**[0008]** The clip and the aligning member can be mounted at a fluid injection assembly of an internal combustion engine preferably as described below. Accordingly, the aligning member may be fixed at a fuel rail injector cup (which is connected to a fuel rail), the clip may be disposed at an injector in a determined angular position so that the injector is indexed with respect to the clip and no or limited rotational movement relative to the injector is possible and the tab of the clip may be inserted or snapped into the receiving section of the aligning member. Hence, by the clip and the aligning member according to the invention an intended angular orientation of an injector with respect to a fuel rail can be ensured by indexing the injector with respect to a fuel rail injector cup. Hence, according to the invention an indexing of an injector with respect to a fuel rail injector cup can be achieved by simple indexing features. Because during operation the fuel rail injector cup is fixed to a fuel rail, according to the invention an indexing of an injector with respect to a fuel rail is achieved by simple indexing means. The tab of the clip and the aligning member are indexing features (means for indexing) which are easy and cheap to produce. In an assembled state the tab is for indexing into a space provided by the receiving section of the aligning member. The aligning member may be easily fixed, for example by welding and/or brazing, on an external surface (like for example on a cylindrical or block/flat surface) of a fuel rail injector cup even if the external surface has been made by turning or milling. The indexing of the injector on a turned cylindrical injector cup can be obtained by fixing through welding and/or brazing the aligning member, which may be a shaped metal sheet, which will engage an indexing feature (i.e. preferably one, two or more tabs) on the clip to index the injector to the fuel rail injector cup.

**[0009]** There are many further possibilities for performing preferred modifications:

**[0010]** Preferably the clearance between the lateral inner surfaces of the clip and the width of the tab are adapted to each other for providing a medium fit or a loose fit between the tab and the lateral inner surfaces. The width of the tab may be taken preferably along a direction which is parallel to the above mentioned first lateral direction. The clip can be snapped on the injector itself prior to further assembly. The tab of the clip can have a very simple shape to minimize costs and to obtain also tight tolerances. Also the aligning member which can be fixed on a fuel rail injector cup can have a very simple design, preferably by comprising a section which has a U-shape, and can for example be obtained by stamping. In this way, the tolerances of the internal U-shape, which has the function to engage with the tab of the clip and hence is responsible of the indexing tolerance performances, can be very tight. Hence, very precise injector indexing can be provided.

**[0011]** It is preferred that the receiving section comprises a rear wall and two side walls, wherein the rear wall has a first edge and a second edge which are parallel to each other, wherein at each of the first and second edges a respective side wall adjoins the rear wall and extends angularly to the rear wall for providing a groove.

**[0012]** There is the possibility that the aligning member comprises two mounting sections each having a contact surface, in particular for contacting a fuel rail injector cup, wherein each side wall has a first rim which adjoins the rear wall and has a second rim which adjoins one of the mounting sections, wherein each mounting section extends angularly with regard to its neighbouring side wall and away from the receiving section. Preferably the or each contact surface has or have a concave shape which is adapted to a shape of a reference cylinder wherein the axis of the reference cylinder is parallel to the lateral inner surfaces. The concave shape may be adapted to an outer shape of a fuel rail injector cup. These features facilitate mounting of the aligning element in a manner that the central axis of the fuel rail injector cup extends parallel to the lateral inner surfaces.

**[0013]** According to the second aspect in order to solve the underlying object the invention provides a combination of a clip and an aligning member, wherein the clip comprises two legs, two tabs and a connecting portion, wherein the legs extend alongside and are spaced from each other in a first lateral direction, wherein each of the legs comprises a basis section having a basis surface, wherein the basis surfaces of the legs extend along a clip reference plane or are at least tangent to a clip reference plane, wherein each leg is connected to the connecting portion, wherein the tabs extend alongside and are spaced from each other in a second lateral direction which is parallel to the first lateral direction so that a clearance is provided, each tab is connected to the connecting portion and extends from the connecting portion toward a respective free tab end in a direction away from the clip

reference plane, in particular orthogonally with regard to the clip reference plane, wherein the aligning member comprises a mounting section having a contact surface, in particular for contacting a fuel rail injector cup, and having two lateral outer surfaces, wherein the lateral outer surfaces extend angularly with regard to the contact surface and are situated on opposite sides of the mounting section, and wherein said clearance and a distance between the lateral outer surfaces of the aligning member are adapted to each other. Also such an inventive combination provides a functionality to provide an angular orientation of the injector with respect to a fuel rail of a fluid injection assembly for an internal combustion engine. The suggested aligning member can be used for example by welding and/or brazing with a fuel rail injector cup also if the latter has an external surface which for example is cylindrical or flat and provides an easy and cheap solution for this purpose.

**[0014]** Also regarding the second aspect of the invention there are many possibilities to perform preferred modifications:

**[0015]** Preferably the clearance between the tabs of the clip and the distance between the lateral outer surfaces of the aligning member are adapted to each other for providing a medium fit or a loose fit between the tabs and the lateral outer surfaces.

**[0016]** Preferably the contact surface has a concave shape which is adapted to a shape of a reference cylinder wherein the axis of the reference cylinder is parallel to the lateral outer surfaces. The concave shape may be adapted to an external shape of a fuel rail injector cup. These features facilitate mounting of the aligning element in a manner that the central axis of the fuel rail injector cup extends parallel to the lateral outer surfaces. The mounting section in a cross section may have a shape like an U-profile. Compared to the first aspect of the invention it may be denoted as a reverse U-shape design.

**[0017]** There is the possibility that the aligning member comprises two protrusions, wherein each of the lateral outer surfaces has a first edge and a second edge which are opposite to each other, wherein the first edge adjoins the contact surface and wherein each of the second edges adjoins one of the protrusions which extends angularly with regard to its adjoining lateral outer surfaces and outwardly with regard to the mounting section. It is preferred that each tab extends along a direction, that with regard to a direction of thickness which is orthogonal with regard to the direction and with regard to the second lateral direction a tab has a thickness and that a distance between the first edge and the second edge of a lateral outer surface and said thickness are adapted to each other, in particular for providing a medium fit or a loose fit.

**[0018]** Furthermore, there are possibilities to make preferred modifications regarding the first aspect and the second aspect:

**[0019]** It is preferred that the aligning member is made from a metal sheet by bending the metal sheet. Regarding the first aspect of the invention the metal sheet may

be bent so that the receiving section may have a cross section corresponding or similar to an U-profile. Regarding the second aspect of the invention the metal sheet may be bent so that the metal sheet forms a central section, two end sections and two intermediate sections, wherein between the central section and a respective one of the end sections it is situated a respective one of said intermediate sections, and wherein the contact surface is formed by the central section, the outer later surfaces are formed by the intermediate sections and the protrusions are formed by the end sections.

**[0020]** There is the possibility that each basis section has two longitudinal ends and that each basis section is connected at one of its longitudinal ends to a spring section which extends curved or tilted away from the clip reference plane or that each basis section is connected at each of its longitudinal ends to a respective spring section which extends curved or tilted away from the clip reference plane. It is preferred that the clip is an one-piece clip and/or that the aligning member is an integrally formed one-piece aligning member.

**[0021]** Regarding the third aspect in order to solve the underlying object the invention suggests that the fluid injection assembly comprises a combination according to the first aspect of the invention, wherein the aligning member is fixed, in particular by welding and/or brazing, at the external surface of the fuel rail injector cup, wherein at two sides of the fluid injection assembly which are opposite to each other at the injector a groove is formed and between the injector and the fuel rail injector cup a space is formed, wherein the clip is mounted so that at each of said sides one of the basis sections of the clip projects into the groove and so that the spring section which is connected to said basis section or the spring sections which are connected to said basis section projects or project into the space, and wherein the tab projects into the receiving section between the lateral inner surfaces of the receiving section.

**[0022]** Regarding the fourth aspect in order to solve the underlying object the invention suggests that the fluid injection assembly comprises a combination according to the second aspect of the invention, wherein the aligning member is fixed, in particular by welding and/or brazing, at the external surface of the fuel rail injector cup, wherein at two sides of the fluid injection assembly which are opposite to each other at the injector a groove is formed and between the injector and the fuel rail injector cup a space is formed, wherein the clip is mounted so that at each of said sides one of the basis sections of the clip projects into the groove and so that the spring section which is connected to said basis section or the spring sections which are connected to said basis section projects or project into the space, and wherein the tabs of the clip encompass the two lateral outer surfaces of the mounting section of the aligning member.

**[0023]** Regarding the third and fourth aspects of the invention there are many possibilities for performing preferred modifications of the fluid injection assembly. It is

preferred that the fuel rail injector cup is made by turning, in particular by forming an external surface of the fuel rail injector cup by turning. There is the possibility that the clip comprises first locking means, in particular a recess, and the injector comprises second locking means, in particular a protrusion, wherein the first locking means and the second locking means together provide a rotational positive locking for preventing a rotational movement of the clip and the injector relative to each other. According to a preferred embodiment it is provided that the fuel rail injector cup is attached to a fuel rail, in particular to a main gallery of a fuel rail, and is in fluid communication with the fuel rail, in particular with the main gallery of the fuel rail, wherein the injector is indexed with regard to the fuel gallery, in particular with regard to the main gallery, because the tab of the clip projects into the receiving section of the aligning member or because the tabs of the clip encompass the two lateral outer surfaces of the mounting section of the aligning member.

**[0024]** It is possible that the basis sections of the clip are in contact with, and in particular pressed against, a surface of the injector or surfaces of the injector. It is possible that the spring sections of the clip are in contact with, and in particular pressed against, a surface of the fuel rail injector cup or surfaces of the fuel rail injector cup. It is possible that each of the legs of the clip is compressed in the space formed between the injector and the fuel rail injector cup by bending the spring section or the spring sections towards the basis section of the leg.

**[0025]** Alternative solutions within the scope of the invention could be designed by those skilled in the art by varying the way the metal sheet is bended/folded, regarding the interface with the fuel rail and regarding the dimension of the receiving section. Also features of the clip can be made by a different design depending on the application requirements.

#### Brief Description of Drawings

**[0026]** Exemplary embodiments of the invention will now be described with reference to the accompanying drawings. These are as follows:

Fig. 1 is a perspectival view of an inventive combination of a clip and an aligning member according to the first aspect of the invention in a preferred embodiment;

Fig. 2 is a perspectival view to components of an inventive fluid injection assembly according to the third aspect of the invention in a preferred embodiment;

Fig. 3 is another perspectival view to components of an inventive fluid injection assembly according to the preferred embodiment shown by Fig. 2;

Fig. 4 is a top view to the fuel rail injector cup of the

preferred embodiment also shown by Figs. 2 and 3;

Fig. 5 is a perspectival view of an inventive combination comprising a clip and an aligning member according to a second aspect of the invention in a preferred embodiment;

Fig. 6 is a partial sectional view of a fuel rail injector cup of an inventive fluid injection assembly according to a fourth aspect of the invention in a preferred embodiment, as further depicted by Figs. 7 and 8;

Fig. 7 is a perspectival view to components of an inventive fluid injection assembly according to a fourth aspect of the invention in a preferred embodiment and

Fig. 8 is a side view to the components shown by Fig. 7 according to a viewing direction VIII in Fig. 7.

#### Description of Embodiments

**[0027]** In Figs. 1 - 8 corresponding or similar elements appearing in different illustrations and with regard to different aspects of the invention or with regard to different preferred embodiments are identified by the same reference numbers.

**[0028]** With reference to Fig. 1 it is described by way of example a preferred embodiment of an inventive combination 1 of a clip 2 and an aligning member 3 according to the first aspect of the invention. The clip 2 comprises two legs 4, one tab 5 and a connecting portion 6. The legs 4 extend alongside and are spaced from each other in a first lateral direction 12. Each leg 4 comprises a flat section 7 forming a basis surface 8. The basis surfaces 8 of the legs 4 extend along an imaginary clip reference plane 9. Each leg 4 is connected to the connecting portion 6 by a branch connection 10 and is connected by the connecting portion 6 to the tab 5. The tab 5 extends from the connecting portion 6 toward its free tab end 11 in a direction 13 which is orthogonal with respect to the clip reference plane 9 away from the clip reference plane 9.

**[0029]** The aligning member 3 comprises a receiving section 14 (please again see Fig. 4) and two mounting sections 15 which are integrally connected to opposing sides of the receiving section 14. Each mounting section 15 has a contact surface 16 for contacting a fuel rail injector cup 17 as shown for example by Fig. 4. The receiving section 14 comprises two lateral inner (i.e. inwardly directed) surfaces 18 which are facing each other and which are spaced from each other for providing a clearance 19 therebetween. A width 20 of the tab 5 which is taken along a direction 21 which is parallel to the first lateral direction 12 and the clearance 19 are adapted to each other in the example for providing a medium fit with respect to the direction 21 in an assembled state.

**[0030]** In the shown embodiment, the receiving section 14 comprises a rear wall 22 and two side walls 23. The rear wall 22 has a first edge 24 and a second edge 25 which are parallel to each other. At each of the first and second edges 24, 25 a respective side wall 23 adjoins the rear wall 22 and extends angularly to the rear wall 22 for providing a groove 26 including a hollow space. In the example, the aligning member 3 comprises two mounting sections 15 each having a contact surface 16. Each contact surface 16 has a concave shape defined by a curvature which is adapted to the outer diameter of the fuel rail injector cup 17 as depicted by Fig. 4. Each side wall 23 has a first rim 27 which adjoins the rear wall 22 and has a second rim 28 which adjoins one of the mounting sections 15. Each mounting section 15 extends angularly with respect to its neighbouring side wall 23 and away from the receiving section 14.

**[0031]** In the preferred embodiment, as shown by Fig. 4, the aligning member 3 has been made by bending a metal sheet 29. As further depicted by Fig. 1 with regard to the legs 4 each of the basis sections 7 has two longitudinal ends 30. Each basis section 7 is connected at each of its longitudinal ends 30 to a respective spring section 31 which extends tilted away from the clip reference plane 9. In the described example the clip 2 is an integrally formed one-piece clip 2 and the aligning member 3 is an integrally formed one-piece aligning member 3.

**[0032]** Figs. 2 - 4 show components of a preferred embodiment of a fluid injection assembly 32 according to the third aspect of the present invention. The fluid injection assembly 32 maybe part of an internal combustion engine. It comprises an injector 33 and a fuel rail injector cup 17 which is made by turning. In more detail, the fuel rail injector cup 17 has an external surface 34 which in the example is an external surface of revolution. In more detail, in the example (i.e. not necessarily) the external surface 34 is a cylindrical surface. Furthermore, the fluid injection assembly 32 comprises the clip 2 and the aligning member 3 of the combination 1 as depicted by Fig. 1. The aligning member 3 is fixed in the example by welding at the external surface 34 although no welding seams are shown in the figures. The orientation of the alignment member 3 with regard to the fuel rail injector cup 17 is such that the groove 26 extends parallel to a central longitudinal axis 35 of the fuel rail injector cup 17. At two sides of the fluid injection assembly 32 which are opposite to each other at the injector 33 a groove 36 is formed and between the injector 33 and the fuel rail injector cup 17 a space 37 is formed. The clip 2 is mounted so that at each of said both sides one of the basis sections 7 of the clip 2 projects into the formed groove 36 and so that the both spring sections 31 which are connected to the considered basis section 7 project into the formed space 37. In the state of assembly shown by Fig. 3 a longitudinal section of the tab 5 is disposed between the lateral inner surfaces 18 of the receiving section 14, i.e. the tab 5 projects into the groove 26 of the receiving section 14 for

indexing the injector 32 with respect to the fuel rail injector cup 17.

**[0033]** In the embodiment shown by Figs. 2 - 4 the clip 2 comprises first locking means 38 which are provided in the example by a recess 39. The injector 33 comprises second locking means 40 which in the example are provided by a protrusion 41. The recess 39 has two lateral surfaces 42 facing each other which are formed by the branch connections 10 (please also see Fig. 1). These lateral surfaces 42 encompass the protrusion 41 of the injector 33 in order to provide a rotational positive locking for preventing a relative rotational movement between the clip 2 and the injector 33.

**[0034]** In the described embodiment the injector 33 has a circular groove 43 which surrounds a central longitudinal axis 44 of the injector 33. A central opening at the head of the injector 33 for fluid communication with the inner space of the fuel rail injector cup 17 is denoted by a reference sign 48.

**[0035]** In the example the fuel rail injector cup 17 is attached to a fuel rail (in particular to a main gallery of a fuel rail - not shown by the figures -) and is in fluid communication with the fuel rail. Because the injector 33 is indexed to the fuel rail injector cup 17 by the aligning member 3, the injector 33 as a consequence is also indexed with regard to the fuel gallery. Because the tab 5 of the clip 2 projects into the receiving section 14 of the aligning member 3 a determined angular orientation of the injector 33 with respect to the fuel rail is ensured by the invention. The fixation of a fuel rail injector cup to a fuel rail, in particular to a main gallery of a fuel rail, itself is known to those skilled in the art and hence no figure or description is required for understanding.

**[0036]** A method for assembling a fluid injection assembly 32 according to a fifth aspect of the present invention in a preferred embodiment may include the following steps: fixing the aligning member 3 by (for example) welding at the external surface 34 of the fuel rail injector cup 17, disposing the clip 2 at the injector 33 as described above and snapping the tab 5 of the clip 2 into the receiving section 14 of the aligning device 3.

**[0037]** Fig. 5 shows a preferred embodiment of a combination 1 including a clip 2 and an aligning member 3 according to a second aspect of the present invention. Features which are identical or similar compared to Figs. 1 - 4 are denoted by corresponding reference numbers and regarding its function reference is made to the above description. Differing from the embodiment of Fig. 1, the clip 2 comprises two tabs 5 which extend alongside and which are spaced from each other in a second lateral direction 49 which is parallel to the first lateral direction 12 so that a clearance 50 is provided. Each tab 5 extends from the connecting portion 6 towards a respective free tab end 11 along a direction 13 which is orthogonal to the clip reference plane 9 away from the clip reference plane 9. The aligning member 3 comprises a central mounting section 15 which has a contact surface 16 for contacting the fuel rail injector cup 17 as depicted by

Figs. 6 - 8. The mounting section 15 has two lateral outer surfaces 51 which extend angularly with regard to the mounting section 15 and away from the mounting section 15 in opposite directions. The clearance 50 and a distance 52 between the lateral outer surfaces 51 are adapted in the example for providing a loose fit which is achieved in the assembled state when the tabs 5 encompass the lateral outer surfaces 51.

**[0038]** In the example, the aligning member 3 has two protrusions 53. Each of the lateral outer surfaces 51 has a first edge 54 and a second edge 55 which are opposite to each other, wherein the first edge 54 adjoins the contact surface 16 and wherein each of the second edges 55 adjoins one of the protrusions 53 which extends angularly with regard to its adjoining lateral outer surface 51 and outwardly with regard to the mounting section 15. Fig. 1 shows that each tab 5 extends along the direction 13. With regard to a direction of thickness which is orthogonal with regard to the direction 13 and with regard to the second lateral direction 49 each tab has a thickness 56. A distance 57 between the first edge 54 and the second edge 55 of the lateral outer surface 51 and the thickness 56 are adapted to each other in the example for providing a loose fit.

**[0039]** Figs. 6 - 8 show a preferred embodiment of components of a fluid injection assembly 32 according to the fourth aspect of the present invention. Again, features which are identical or similar to features described before with regard to another embodiment are denoted with corresponding reference numbers. Differing from the embodiment depicted by Figs. 2 - 4 in the assembled state as shown by Figs. 6 - 8 the clip 2 is mounted so that its tabs 5 encompass the two lateral outer surfaces 51 of the mounting section 15 of the aligning member 3. By such registering of the injector 33 with respect to the fuel rail injector cup 17 an intended angular orientation of the injector 33 with respect to the fuel rail injector cup 17 is ensured by the invention. The aligning member 3 is fixed at the fuel rail injector cup 17 by welding, although no welding seams are shown by the figures. Preferably, the fuel rail injector cup 17 is rigidly fixed to a main gallery of a fuel rail (not shown in the figures) and hence the intended angular orientation of the injector 33 is guaranteed also with respect to the fuel rail.

**[0040]** A method for assembling a fluid injection assembly 32 which has been described above with regard to Figs. 6 - 8 preferably comprises the following steps: fixing the aligning member 3 preferably by welding and/or bracing at the external surface 34 of the fuel rail injector cup 17, disposing the clip 2 at the injector 33 in the above described manner and encompassing the outer lateral surfaces 51 of the aligning member 3 by the tabs 5 of the clip 2.

**[0041]** All disclosed features are (for its own, but also in combination) relevant for the invention. The features of the dependent claims characterize also independent inventive improvements of the prior art, in particular for filing divisional applications on a basis of these claims.

## Reference Signs List

**[0042]**

1	combination
2	clip
3	alignment member
4	leg
5	tab
6	connecting portion
7	basis section
8	basis surface
9	clip reference plane
10	branch connection
11	free tab end
12	first lateral direction
13	direction
14	receiving section
15	mounting section
16	contact surface
17	fuel rail injector cup
18	lateral inner surface
19	clearance
20	width
21	direction
22	rear wall
23	side wall
24	first edge
25	second edge
26	groove
27	first rim
28	second rim
29	metal sheet
30	longitudinal end
31	spring section
32	fluid injection assembly
33	injector
34	external surface
35	central longitudinal axis
36	groove
37	space
38	first locking means
39	recess
40	second locking means
41	protrusion
42	lateral surface
43	circular groove
44	central longitudinal axis
48	opening
49	second lateral direction
50	clearance
51	lateral outer surface
52	distance
53	protrusion
54	first edge
55	second edge
56	thickness
57	distance

58 direction of thickness

**Claims**

- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- Combination (1) of a clip (2) and an aligning member (3), wherein the combination (1) in particular is for a fluid injection assembly (32) for an internal combustion engine, wherein the clip (2) comprises two legs (4), a tab (5) and a connecting portion (6), wherein the legs (4) extend alongside and are spaced from each other in a first lateral direction (12), wherein each of the legs (4) comprises a basis section (7) having a basis surface (8), wherein the basis surfaces (8) of the legs extend along a clip reference plane (9) or are at least tangent to a clip reference plane (9), wherein each leg (4) is connected to the connecting portion (6), wherein the tab (5) is connected to the connecting portion (6) and extends from the connecting portion (6) toward a free tab end (11) in a direction (13) away from the clip reference plane (9), in particular orthogonally with regard to the clip reference plane (9), wherein the aligning member (3) comprises a receiving section (14) and connected thereto at least one mounting section (15) having a contact surface (16), in particular for contacting a fuel rail injector cup (17), wherein the receiving section (14) comprises two lateral inner surfaces (18) which are facing each other and which are spaced from each other for providing a clearance (19) therebetween, wherein said clearance (19) between the lateral inner surfaces (18) and a width (20) of the tab (5) are adapted to each other.
  - Combination (1) according to claim 1, **characterized in that** the receiving section (14) comprises a rear wall (22) and two side walls (23), wherein the rear wall (22) has a first edge (24) and a second edge (25) which are parallel to each other, wherein at each of the first and second edges a respective side wall (23) adjoins the rear wall (22) and extends angularly to the rear wall (22) for providing a groove (26).
  - Combination (1) according to any of claims 1 - 2, **characterized in that** the aligning member (3) comprises two mounting sections (15) each having a contact surface (16), in particular for contacting a fuel rail injector cup (17), wherein each side wall (23) has a first rim (27) which adjoins the rear wall (22) and has a second rim (28) which adjoins one of the mounting sections (15), wherein each mounting section (15) extends angularly with respect to its neighbouring side wall (23) and away from the receiving section 14.
  - Combination (1) of a clip (2) and an aligning member (3), wherein the combination (1) in particular is for a fluid injection assembly (32) for an internal combus-

- tion engine, wherein the clip (2) comprises two legs (4), two tabs (5) and a connecting portion (6), wherein the legs (4) extend alongside and are spaced from each other in a first lateral direction (12), wherein each of the legs (4) comprises a basis section (7) having a basis surface (8), wherein the basis surfaces (8) of the legs (4) extend along a clip reference plane (9) or are at least tangent to a clip reference plane (9), wherein each leg (4) is connected to the connecting portion (6), wherein the tabs (5) extend alongside and are spaced from each other in a second lateral direction (49) which is parallel to the first lateral direction (12) so that a clearance (50) is provided, each tab (5) is connected to the connecting portion (6) and extends from the connecting portion (6) toward a respective free tab end (11) in a direction away from the clip reference plane (9), in particular orthogonally with regard to the clip reference plane (9), wherein the aligning member (3) comprises a mounting section (15) having a contact surface (16), in particular for contacting a fuel rail injector cup (17), and having two lateral outer surfaces (51), wherein the lateral outer surfaces (51) extend angularly with regard to the contact surface (16) and are situated on opposite sides of the mounting section (15), and wherein said clearance (50) and a distance (52) between the lateral outer surfaces (51) of the aligning member (3) are adapted to each other.
5. Combination (1) according to claim 4, **characterized in that** the aligning member (3) comprises two protrusions (53), wherein each of the lateral outer surfaces (51) has a first edge (54) and a second edge (55) which are opposite to each other, wherein the first edge (54) adjoins the contact surface (16) and wherein each of the second edges (55) adjoins one of the protrusions (53) which extends angularly with regard to its adjoining lateral outer surface (51) and outwardly with regard to the mounting section (15).
6. Combination (1) according to any of claims 4 - 5, **characterized in that** each tab (5) extends along a direction (13), that with regard to a direction (55) of thickness which is orthogonal with regard to the direction (13) and with regard to the second lateral direction (49) a tab (5) has a thickness (56) and that a distance (57) between the first edge (54) and the second edge (55) of a lateral outer surface (51) and said thickness (56) are adapted to each other, in particular for providing a medium fit or a loose fit.
7. Combination (1) according to any of claims 1 - 6, **characterized in that** the aligning member (3) is made from a metal sheet (29) by bending the metal sheet (29).
8. Combination (1) according to any of claims 1 - 7, **characterized in that** each basis section (7) has two longitudinal ends (30) and that each basis section is connected at one of its longitudinal ends to a spring section which extends curved or tilted away from the clip reference plane (9) or that each basis section (7) is connected at each of its longitudinal ends (30) to a respective spring section (31) which extends curved or tilted away from the clip reference plane (9).
9. Combination (1) according to any of claims 1 - 8, **characterized in that** the clip (2) is an integrally formed one-piece clip (2) and/or that the aligning member (3) is an integrally formed one-piece aligning member (3).
10. Fluid injection assembly (32) for an internal combustion engine, comprising an injector (33) and a fuel rail injector cup (17) which has an external surface (34), which in particular is a cylindrical surface, **characterized in that** the fluid injection assembly (32) comprises a combination (1) according to any of claims 1 - 3, 7 - 9, wherein the aligning member (3) is fixed, in particular by welding and/or brazing, at the external surface (34) of the fuel rail injector cup (17), wherein at two sides of the fluid injection assembly (32) which are opposite to each other at the injector (33) a groove (36) is formed and between the injector (33) and the fuel rail injector cup (17) a space (37) is formed, wherein the clip (2) is mounted so that at each of said sides one of the basis sections (7) of the clip (2) projects into the groove (36) and so that the spring section (31) which is connected to said basis section (7) or the spring sections (31) which are connected to said basis section (7) projects or project into the space (37), and wherein the tab (5) projects into the receiving section (14) between the lateral inner surfaces (18) of the receiving section (14).
11. Fluid injection assembly (32) for an internal combustion engine, comprising an injector (33) and a fuel rail injector cup (17) which has an external surface (34), which in particular is a cylindrical surface, **characterized in that** the fluid injection assembly (32) comprises a combination (1) according to any of claims 4 - 9, wherein the aligning member (3) is fixed, in particular by welding and/or brazing, at the external surface (34) of the fuel rail injector cup (17), wherein at two sides of the fluid injection assembly (32) which are opposite to each other at the injector (33) a groove (36) is formed and between the injector (33) and the fuel rail injector cup (17) a space (37) is formed, wherein the clip (2) is mounted so that at each of said sides one of the basis sections (7) of the clip (2) projects into the groove (36) and so that the spring section (31) which is connected to said basis section (7) or the spring sections (31) which are connected to said basis section (7) projects or

project into the space (37), and wherein the tabs (5) of the clip (2) encompass the two lateral outer surfaces (51) of the mounting section (15) of the aligning member (3).

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12. Fluid injection assembly (32) according to any of claims 10 - 11, **characterized in that** the fuel rail injector cup (17) is made by turning, in particular by forming the external surface (34) of the fuel rail injector cup (17) by turning.

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13. Fluid injection assembly (32) according to any of claim 10 - 12, **characterized in that** the clip (2) comprises first locking means (38), in particular a recess (39), and the injector (33) comprises second locking means (40), in particular a protrusion (41), wherein the first locking means (38) and the second locking means (40) together provide a rotational positive locking for preventing a rotational movement of the clip (2) and the injector (33) relative to each other.

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14. Fluid injection assembly (32) according to any of claims 10 - 13, **characterized in that** the fuel rail injector cup (17) is attached to a fuel rail, in particular to a main gallery of a fuel rail, and is in fluid communication with the fuel rail, in particular with the main gallery of the fuel rail, wherein the injector (33) is indexed with regard to the fuel gallery, in particular with regard to the main gallery, because the tab (5) of the clip (2) projects into the receiving section (14) of the aligning member (3) or because the tabs (5) of the clip (2) encompass the two lateral outer surfaces (51) of the mounting section (15) of the aligning member (3) .

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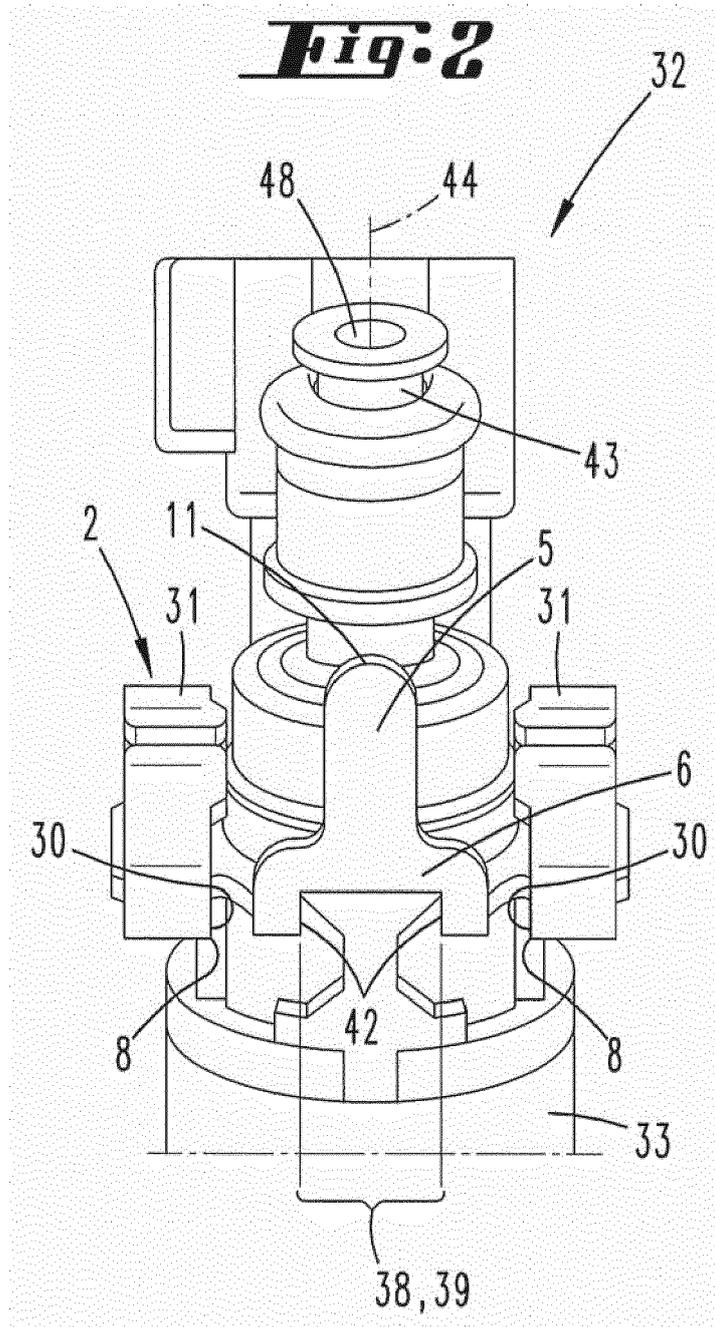
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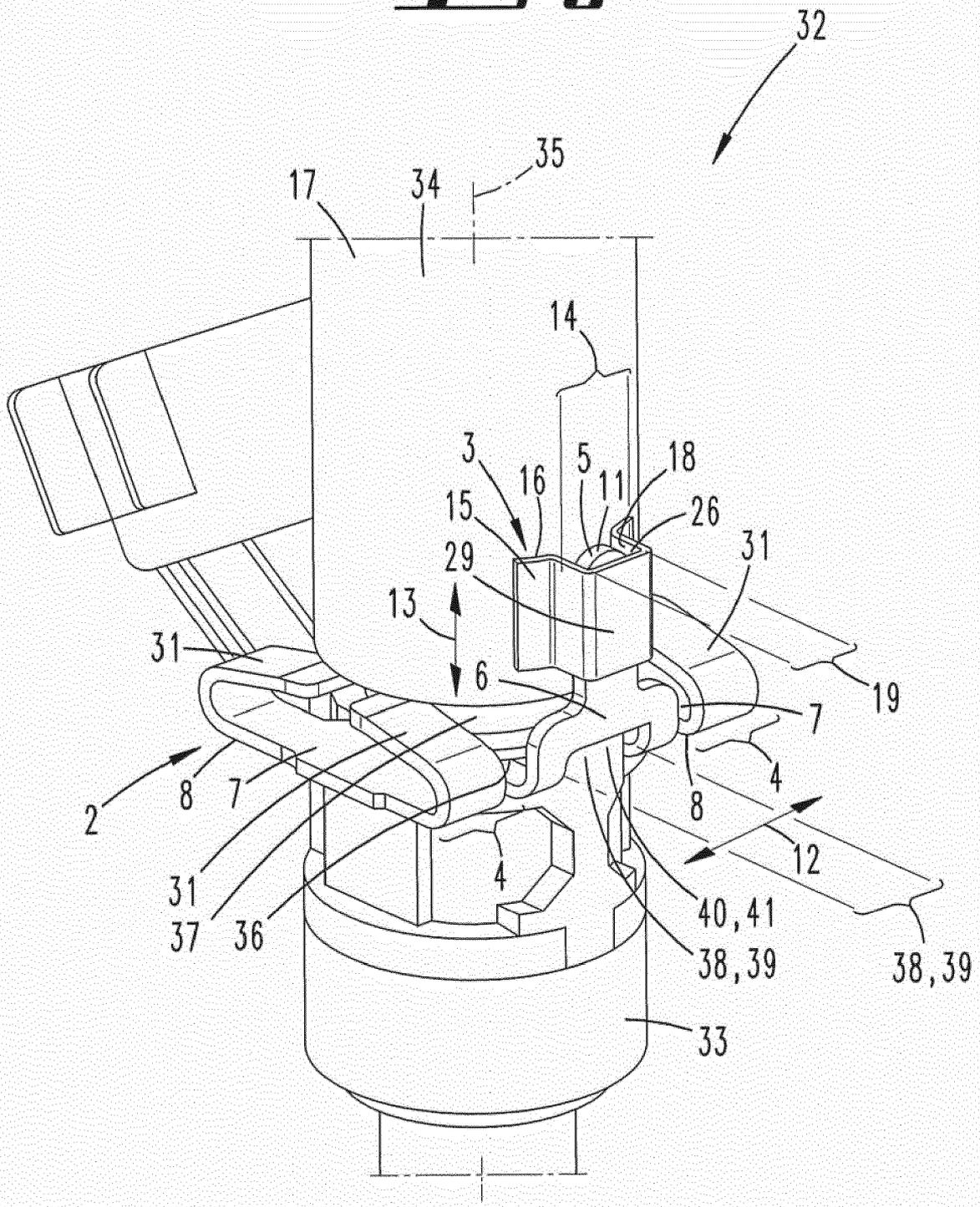
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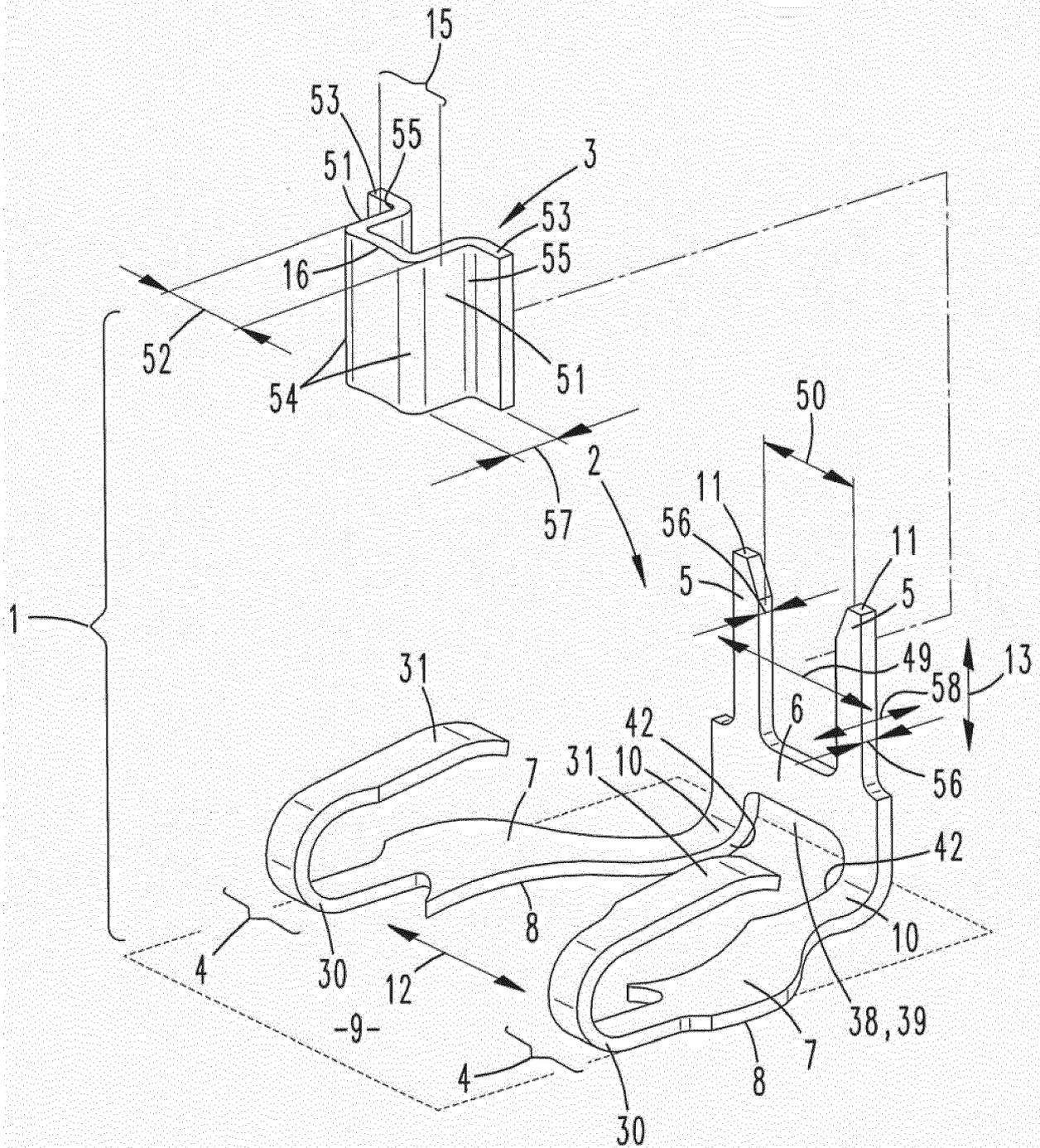


**Fig. 3**

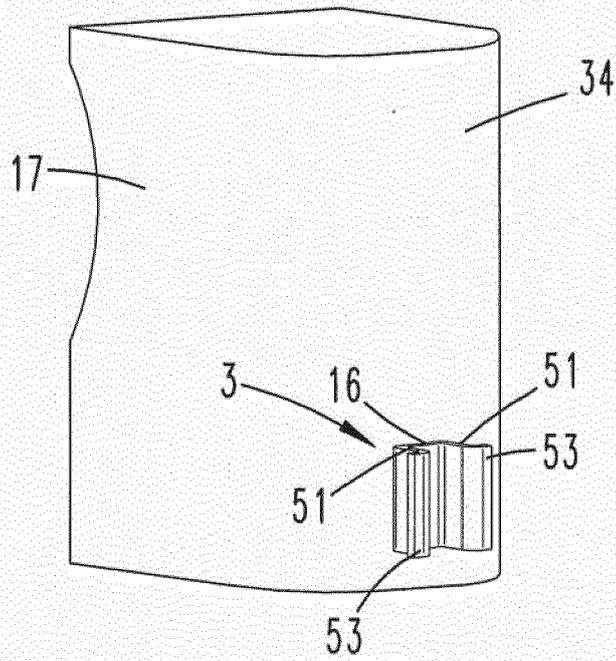




**Fig. 5**

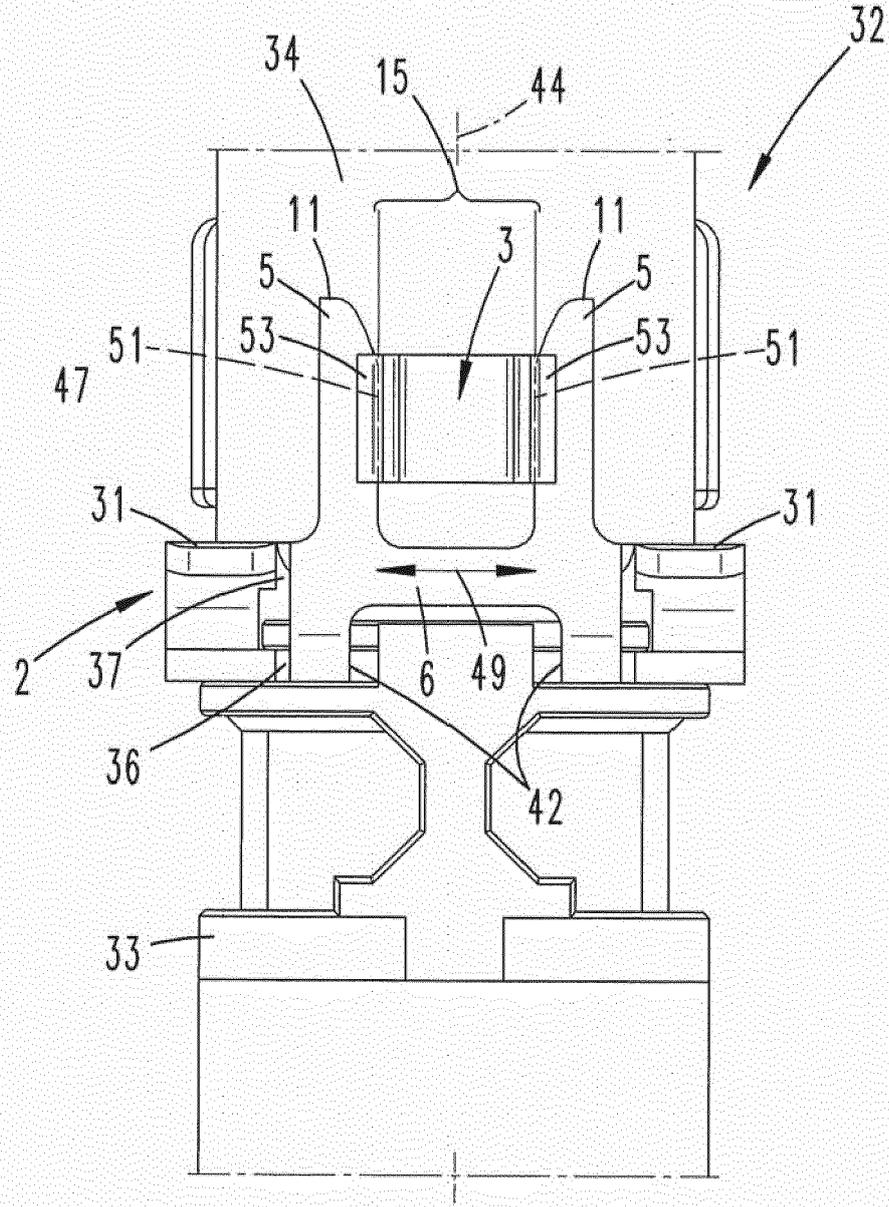


**Fig. 6**





**Fig. 8**





EUROPEAN SEARCH REPORT

Application Number  
EP 18 15 0791

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Place of search		Date of completion of the search	Examiner
The Hague		8 June 2018	Morales Gonzalez, M
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