

(51) International Patent Classification:
F16B 21/08 (2006.01) *F16B 5/06* (2006.01)(21) International Application Number:
PCT/EP2010/057126(22) International Filing Date:
25 May 2010 (25.05.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK,

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(54) Title: FASTENER

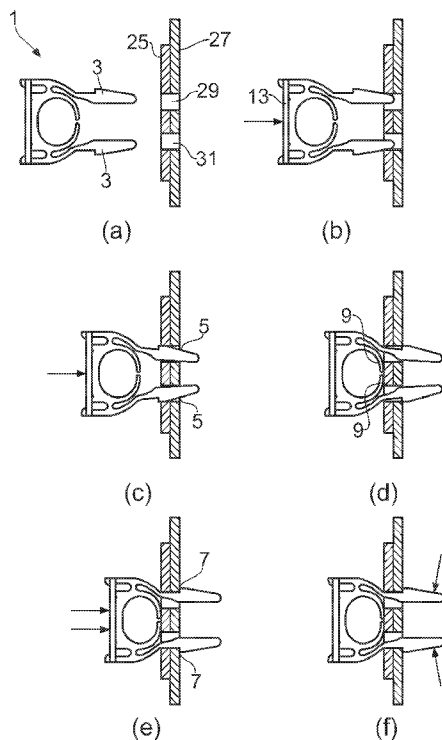


FIG. 2

(57) Abstract: A fastener (1) is provided for clamping a first component (25) to a second component (27). The fastener has at least one resiliently deformable snap-fit member (5) which, in use, is inserted from a first side of the components through a channel (29, 31) extending thereacross. The snap-fit (5) member has an abutment surface (7) which, on emerging from the channel (29, 31), enters into snap-fit engagement with an opposing second side of the components to prevent retraction of the snap-fit member (5). The fastener (1) further has a spring arrangement which presses on the first side of the components on the insertion of the snap-fit member (5) to apply a compressive clamping force across the components between the spring arrangement and the abutment surface (7).

WO 2010/142524 A1



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, **Published:**
GW, ML, MR, NE, SN, TD, TG).

— *with international search report (Art. 21(3))*

FASTENER

The present invention relates to a fastener for clamping a first component to a second component.

There are many known devices that are used to retain
5 or join components together in either a temporary or
permanent cohesion. Rivets and other types of deformable
clipping devices (plastic or metal) are typical of
permanent retainers. Threaded fasteners and spring-clips
(e.g. circlip types) can be used as temporary, semi-
10 permanent or permanent retainers dependent on their
application. Temporary or semi-permanent retainers have
retaining mechanisms that can be easily reversed.

Threaded fasteners, whether or not they require simple
tools to operate them, take time and effort to generate
15 their (axial) retention capabilities. They can also be
awkward to assemble correctly in confined spaces.

Spring-clips, and circlips in particular, can ensure
that two or more components are not able to be separated,
but do not necessarily guarantee that the components are in
20 a fixed static relationship. Also, spring-clips usually
require simple tools for insertion and removal.

Thus a first aspect of the present invention provides
a fastener for clamping a first component to a second
component, the fastener having:

25 at least one resiliently deformable snap-fit member
which, in use, is inserted from a first side of the
components through a channel extending thereacross, the
snap-fit member having an abutment surface which, on
emerging from the channel, enters into snap-fit engagement

with an opposing second side of the components to prevent retraction of the snap-fit member, and

a spring arrangement which presses on the first side of the components on the insertion of the snap-fit member
5 to apply a compressive clamping force across the components between the spring arrangement and the abutment surface.

Advantageously, the fastener applies a compressive clamping force in the manner of a threaded fastener, but the use of one or more snap-fit members allows the fastener
10 to be more easily deployed, i.e. typically by simply pushing the fastener into the components in a single action. Further, the use of tooling to deploy the fastener can be avoided.

The fastener may have any one or any combination of
15 the following optional features.

Preferably, the fastener has a thumb pad which facilitates manual insertion of the snap fit member. The thumb pad can provide a convenient location for an operator to push on the fastener.

20 More preferably, the thumb pad is detachable from the fastener. This allows the thumb pad to be removed after deployment of the fastener.

Typically, the snap-fit member has a ramp surface which presses against a side of the channel to laterally
25 deflect the snap-fit member during its insertion, the snap-fit member returning to its pre-deflected configuration when the abutment surface emerges from the channel. For example, the snap-fit member can be a tine with the ramp surface formed along at least a portion of an edge of the
30 tine.

Preferably, the snap-fit member is configured to facilitate manual release of the abutment surface from engagement with the second side of the components. This allows the fastener to be removed from the components.

5 Indeed, the fastener can be repeatably deployed and released. For example, the snap-fit member can be shaped so that after deployment of the fastener, the member projects a significant distance beyond the second side of the components, giving an operator a finger-hold on the

10 member which allows the operator to apply a force sufficient to reverse the snap-fit engagement of the abutment surface.

Preferably, the fastener has two or more snap-fit members. More preferably, the fastener has only two snap-

15 fit members. Conveniently, two side-by-side snap-fit members can be configured to allow an operator to manually and simultaneously release both of their abutment surfaces from engagement with the second side of the components, e.g. by pushing the two members together.

20 The spring arrangement may comprise one or more spring arms which press on the first side of the components. However, the spring arrangement can take many other forms. For example, the spring arrangement may comprise a helical compression spring, or a body of elastically compressible

25 material.

A further aspect of the invention provides the combination of a fastener according to the previous aspect (optionally having any one or any combination of the optional features of that fastener) and a side plate having

30 one or more holes for forming the ends of respective channels across the components, in use, the side plate being located at the first or second side of the components

to respectively provide a surface on which the spring arrangement presses, or a surface which enters into snap-fit engagement with the abutment surface.

For example, the channel across the components may be too wide at its exit at the second side to provide a surface against which the abutment surface of the snap-fit member can engage. This difficulty can, however, be overcome by locating the side plate at the second side. Likewise, if the channel is too wide at its entrance at the first side to provide a suitable surface on which the spring arrangement can press, this difficulty can be overcome by locating the side plate at the first side. The side plate can also help to spread the compressive load exerted by the fastener e.g. to avoid causing surface damage on the components.

The combination may further include a second side plate which, in use, is located at the other of the first and second sides of the components.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figures 1 shows perspective views of a fastener according to an embodiment of the present invention (a) before attachment of a thumb pad to the fastener, and (b) after attachment of the thumb pad ;

Figure 2 shows schematically side views of the fastener of Figure 1 to illustrate stages (a) to (f) in the deployment and removal of the fastener;

Figures 3(a) to (d) show perspective views of the fastener of Figure 1 to illustrate stages in its deployment through two such side plates; and

Figure 4 shows schematically a side view of a further embodiment of a fastener according to the present invention.

Figures 1(a) shows a perspective view of a fastener according to an embodiment of the present invention before attachment of a thumb pad to the fastener.

10 The fastener 1 is a type of spring-clip which advantageously possesses attributes usually associated with a threaded fastener, such as compression clamping and positive location resulting in two or more separate components being retained in a fixed static relationship.

15 The fastener has three different types of spring members.

Firstly, a pair of side-by-side, resiliently deformable snap-fit tines 3 extend forward from fastener. In use, the tines are pushed into the components along
20 respective channels which cross from one side to another of the components (for example, the components, when positioned in readiness to receive the fastener, may each have a through-hole or through-holes into which the tines can be inserted, the through-hole(s) of one component being
25 aligned with the through-hole(s) of the other). Each tine has an outwardly-facing lead-in ramp 5 which presses against a side of the channel so that the tines are both deflected inwardly during the insertion. The lead-in ramps end in respective abutment surfaces 7. When these surfaces
30 exit from the channel on the far side of the components, the tines spring outwardly to recover their pre-deflected

configuration, and the abutment surfaces move into snap-fit engagement with the far side of the components to prevent retraction of the fastener.

Secondly, a pair of spring arms 9 extend inwardly from
5 opposing sides of the fastener. When the tines 3 are pushed into the channel, the end portions of the arms make contact with the side of the components having the entrance to the channel and begin to apply a compressive force to that side. This force progressively increases until the
10 abutment surfaces 7 of the tines move into snap-fit engagement, at which point the fastener is fully deployed. A compressive clamping force is thus applied between the spring arms and the abutment surfaces urging the components to come together. The distance along the line of insertion
15 between the end portions of the spring arms and the abutment surfaces, relative to the thickness of the components, as well as the compliance of the spring arms, determines the strength of the clamping force. As the fastener provides little or no mechanical advantage, this
20 force is also the resistance which an operator must overcome in order to deploy the fastener.

Thirdly, a further pair of spring arms 11 extend rearwardly from the fastener to allow removable attachment of a thumb pad 13. The further spring arms end in tabs 15
25 which reversibly clip around corresponding recesses 17 in the pad. A central projection 19 extending rearwardly from the fastener fits into a corresponding central cavity 21 of the pad, the projection having shoulders 23 to support the pad. The pad provides a comfortable pressure-distribution
30 area for manual deployment of the fastener. The arrow in Figure 1(a) indicates the direction of attachment of the thumb pad onto the fastener. Figures 1(b) shows a

perspective view of the fastener after attachment of the thumb pad.

Figure 2 shows schematically side views of the fastener of Figure 1 to illustrate stages (a) to (f) in the deployment and removal of the fastener. In Figure 2(a) the fastener 1 is offered-up to the two components 25, 27, the tines 3 of the fastener being aligned with the entrances to channels 29, 31 across the components, each channel itself being formed by aligned through-holes in the components.

10 In Figure 2(b) the fastener is engaged with the components by inserting the forward ends of the tines into the channels, pressure (indicated by the arrow) being exerted on the thumb pad 13. In Figure 2(c) the tines are pushed through the channels by further pressure on the thumb pad, the tines bending together under a sideways force exerted

15 on lead-in ramps 5. In Figure 2(d) the insertion continues and the end portions of the spring arms 9 make first contact with a side of the components. In Figure 2(e) further pressure on the thumb pad (indicated by the double arrows) results in the abutment surfaces 7 exiting the channels, whereupon the tines spring outwardly, and the abutment surfaces enter into snap-fit engagement with the far side of the components. The components are now held together by a compressive clamping-force exerted between

20 the spring arms 9 and the abutment surfaces 7. Finally, as shown in Figure 2(f), to remove the fastener, a sideways force (indicated by the arrows) can be exerted on the ends of the tines 1, which extend a distance beyond the far side of the components. This moves the abutment surfaces out of engagement with the side of the component and allows the

30 fastener to be retracted. As there is little or no load generated in the tines in a direction perpendicular to the action of the spring arms 9, rapid release of the fastener

is easily administered by manually pinching or squeezing the tines together.

If the channels through the components are poorly shaped to apply a force to the lead-in ramps 5, do not have surfaces suitably located to engage with the abutment surfaces 7 or spring arms 9, or have surfaces that might be damaged by direct contact with the fastener, then side plates having holes for receiving the tines can be located at the sides of the components. Figures 3(a) to (d) show perspective views of the fastener 1 of Figure 1 to illustrate stages in its deployment through two such side plates 29, 31. Evidently, two components to be held together can be sandwiched between the plates, the components having a through channel or channels aligned with the holes 33 of the side plates. In Figures 3(a) to (c) the fastener 1 is viewed from one side of the side plates 29, 31, and in Figure 3(d) from the other side of the side plates. The side plate 29 provides a surface on which the spring arms 9 can press, and the side plate 31 provides a surface on which the abutment surfaces 7 can enter into snap-fit engagement. The holes of the side plates are spaced an appropriate distance apart such that the lead-in ramps 5 press against the sides of the holes as the fastener is inserted to squeeze the tines together.

The configuration of the fastener can be varied to a large degree depending on the particular application. For example, just some of the variables are:

- overall size of fastener
- shape and rate of spring arms which apply the compressive clamping force
- overall clamping length

- size and shape abutment surfaces
- length of tines

Further, although the fastener of the embodiment described above is suitable for direct manual deployment, in other embodiments, the fastener may be configured such that the force needed to deploy the fastener e.g. requires the fastener to be struck by a percussive instrument such as a hammer or mallet. Possibly then also a tool will be required to squeeze the tines together to remove the fastener. However, such a configuration allows a greater clamping force to be applied by the fastener. Figure 4 shows schematically a side view of a further embodiment of a fastener 41 according to the present invention. Like the fastener of the first embodiment, the fastener of the further embodiment has tines 43, lead-in ramps 45, abutment surfaces 47, and spring arms 49. However, the fastener now has a percussion surface 51 for receiving the strike of a percussive instrument. Further the tines are longer and of different lengths to accommodate wider components of non-constant width. Also the fastener may have locator projections 53 to create specific (e.g. sprung) location points that not only locate the fastener in a specifically required position but also act as lateral locators to prevent lateral displacement of the fastener during a percussive insertion.

While the invention has been described in conjunction with the exemplary embodiments described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments of the invention set forth above are considered to be illustrative and not limiting. Various changes to the described embodiments may

be made without departing from the spirit and scope of the invention.

CLAIMS

1. A fastener (1, 41) for clamping a first component (25) to a second component (27), the fastener having:
at least one resiliently deformable snap-fit member
5 (3, 43) which, in use, is inserted from a first side of the components through a channel (29, 31) extending thereacross, the snap-fit member having an abutment surface (7, 47) which, on emerging from the channel, enters into snap-fit engagement with an opposing second side of the
10 components to prevent retraction of the snap-fit member, and
a spring arrangement which presses on the first side of the components on the insertion of the snap-fit member to apply a compressive clamping force across the components
15 between the spring arrangement and the abutment surface.
2. A fastener according to claim 1, having a thumb pad (13) which facilitates manual insertion of the snap fit member.
3. A fastener according to claim 2, wherein the thumb pad
20 is detachable from the fastener.
4. A fastener according to any one of the previous claims, wherein the snap-fit member has a ramp surface (5, 45) which presses against a side of the channel to laterally deflect the snap-fit member during its insertion,
25 the snap-fit member returning to its pre-deflected configuration when the abutment surface emerges from the channel.
5. A fastener according to any one of the previous claims, wherein the snap-fit member is configured to
30 facilitate manual release of the abutment surface from

engagement with the second side of the components, whereupon the fastener can be removed from the components.

6. A fastener according to any one of the previous claims, having two or more snap-fit members.

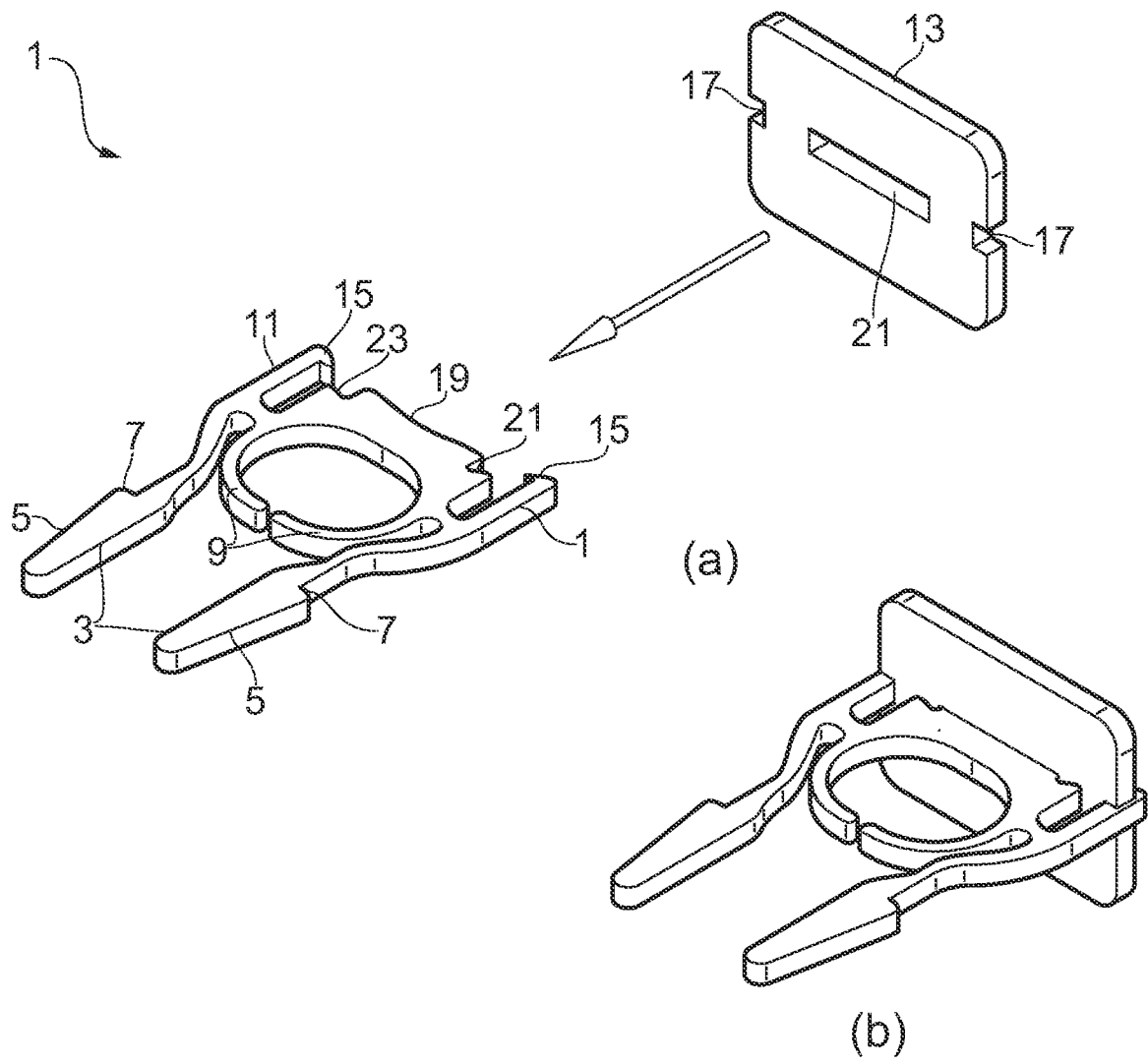
5 7. A fastener according to any one of the previous claims, wherein the spring arrangement comprises one or more spring arms (9, 49) which press on the first side of the components.

8. The combination of a fastener according to any one of
10 the previous claims and a side plate (29), the side plate having one or more holes (33) for receiving the or each snap-fit member, and, in use, being located at the first or second side of the components to respectively provide a surface on which the spring arrangement presses, or a
15 surface which enters into snap-fit engagement with the abutment surface.

9. The combination according to claim 9, further including a second side plate (31) which, in use, is located at the other of the first and second sides of the
20 components.

10. The combination of a fastener and one or more side plates as any one herein disclosed with reference to and/or as shown in the accompanying drawings.

1/4



2/4

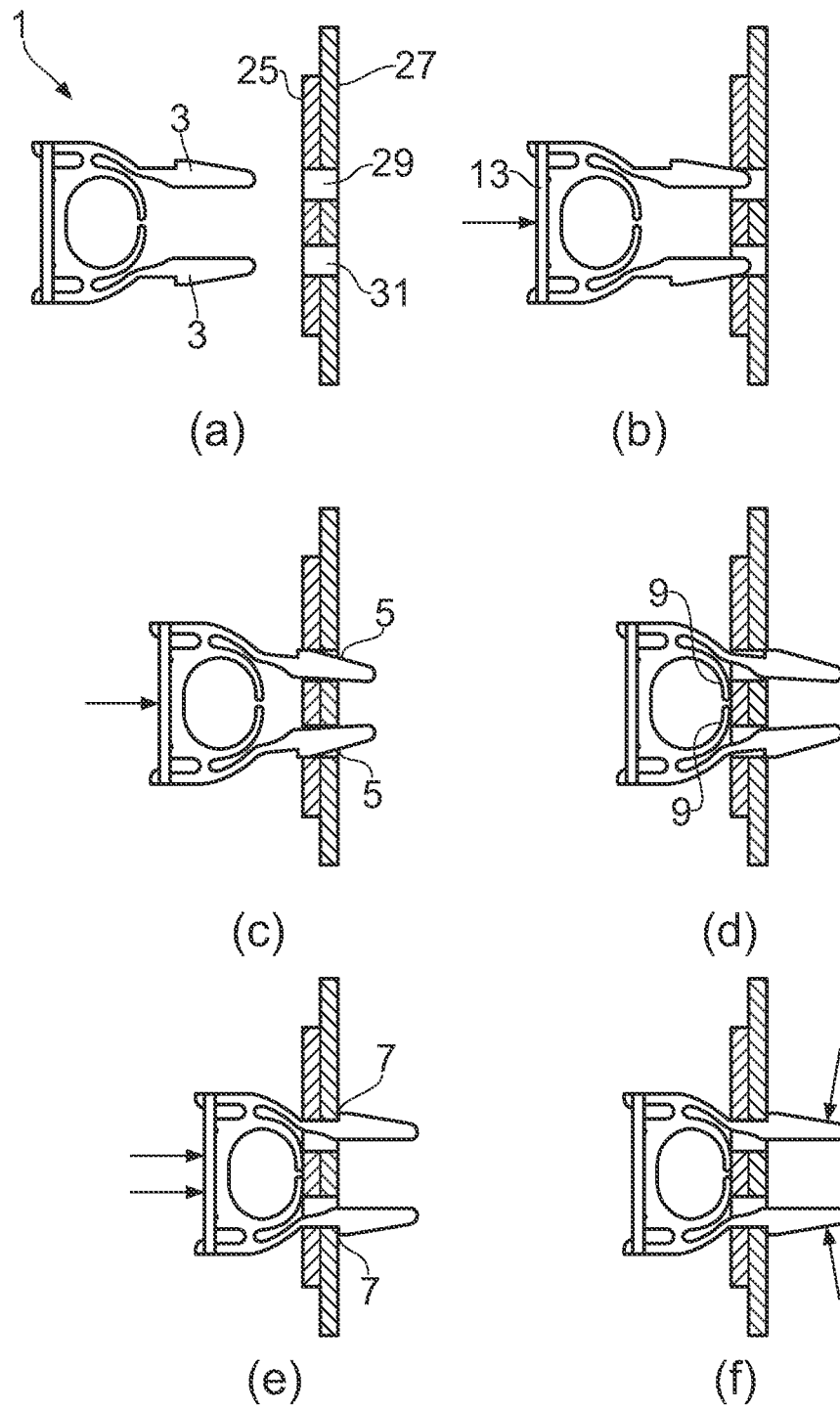


FIG. 2

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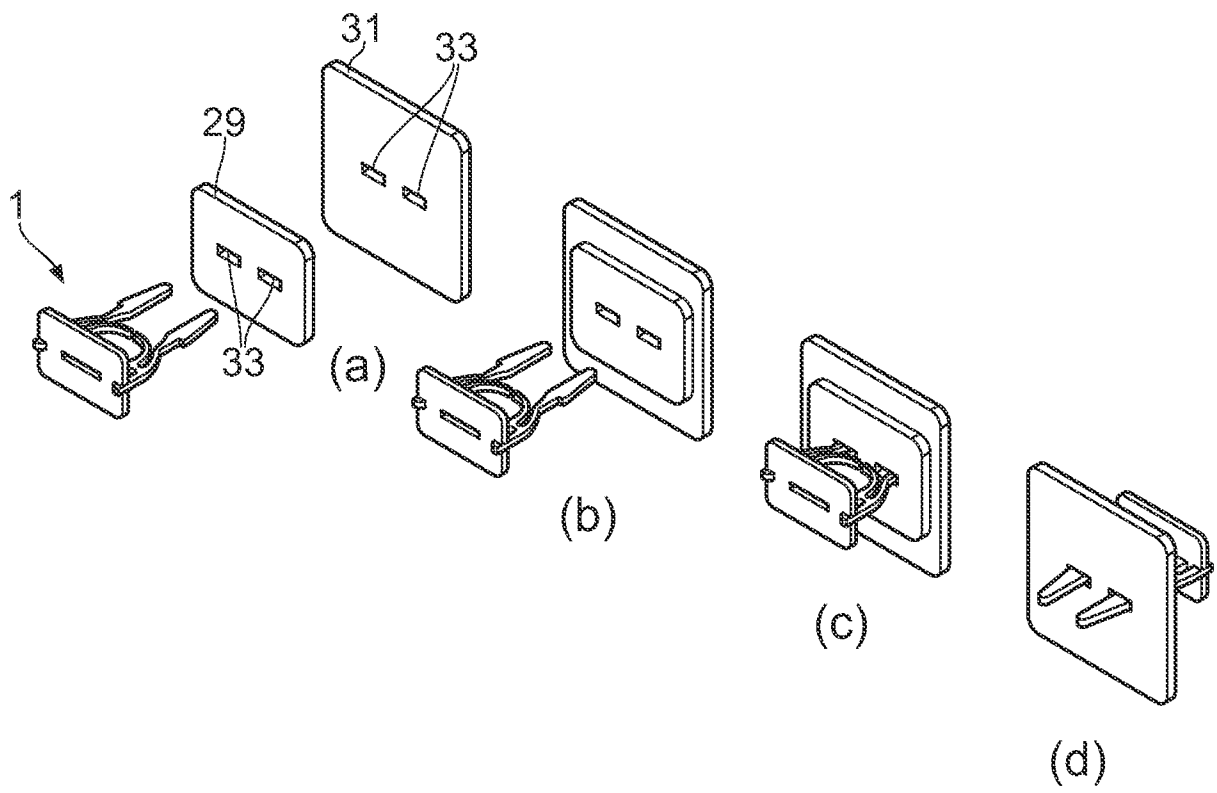


FIG. 3

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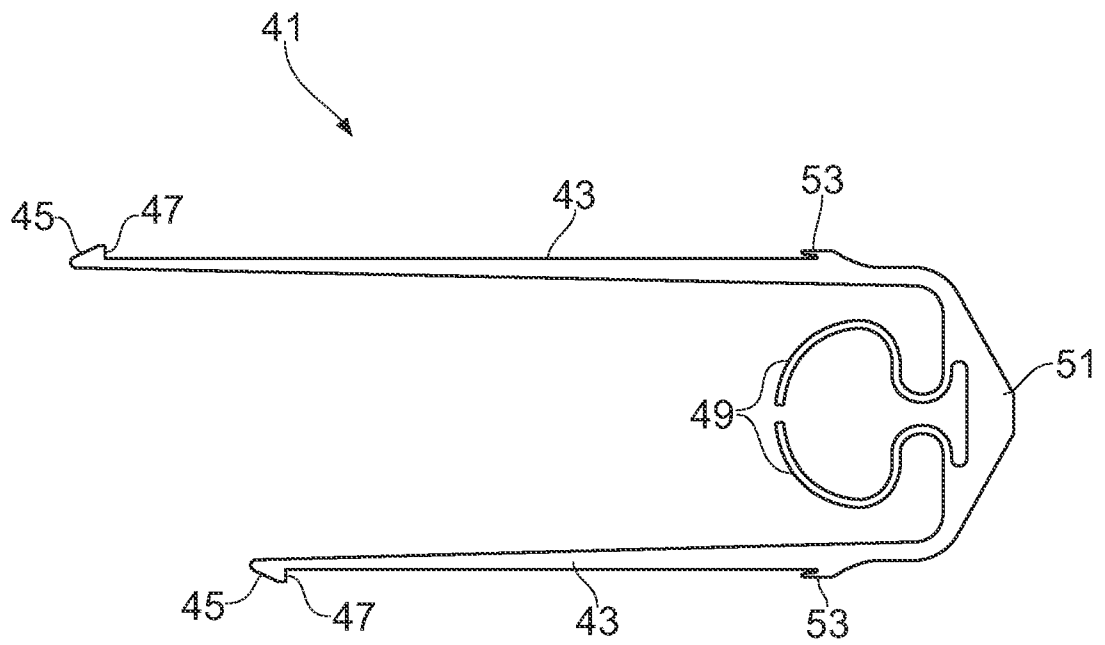


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2010/057126

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F16B21/08 F16B5/06
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 444 729 A (L & L PRODUCTS INC [US]) 18 June 2008 (2008-06-18) page 5; figures 1,2	1,2,4-9
X	US 4 973 212 A (JACOBS DAVID [US]) 27 November 1990 (1990-11-27) column 4, line 55 - column 5, line 14; figures 6,7	1-3
X	WO 02/35105 A1 (RIVIER ARMAND [CH]) 2 May 2002 (2002-05-02) page 1, line 17 - page 3, line 3; figures 1,2	1,2,4-9
X	US 4 112 815 A (TANAKA TOSHIE) 12 September 1978 (1978-09-12) column 2, line 39 - column 4, line 45; figures 1-3	1,2,4-9
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

3 September 2010

Date of mailing of the international search report

14/09/2010

Name and mailing address of the ISA/

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Authorized officer

Comel, Ezio

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2010/057126

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 887 231 A1 (LISI AUTOMOTIVE RAPID [FR]) 13 February 2008 (2008-02-13) paragraph [0016] - paragraph [0018]; figure 1 -----	1,2
X	US 5 762 397 A (VENUTO DENNIS [US] ET AL) 9 June 1998 (1998-06-09) column 3, line 3 - line 50; figures 3-5 -----	1,2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2010/057126

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 10
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 10

Claim 10 contains a reference to the description and drawings. According to Rule 6.2 a) PCT such a claim is allowable only where the reference is absolutely necessary (e. g. the invention can be only described in form of a chemical formula). Such is, however, not the case here.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2010/057126

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