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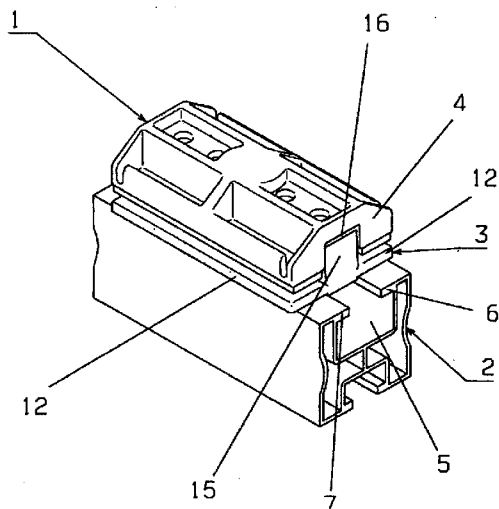
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(54) Title: CLAMP CONNECTION FOR THE ATTACHMENT OF PLATE-SHAPED COMPONENTS, PARTICULARLY SOLAR MODULES

Fig. 1



(57) Abstract: A clamp connection (1) for the attachment of solar modules, on rail-shaped carriers (2) provided with guide grooves (5) with margins (6, 7) that protrude inwards into the groove (5), includes a support (3) with at least one support surface (12) present on its upper side, for a component. A T-shaped counter bearing (9) present on its lower side, where a crossbar (11) of the counter bearing can be inserted and engages behind the protruding margins (6, 7) of the guide groove (5), and of a clamping cap (4) with clamping surface (13) covering the support surface (12), and a longitudinal groove (16) which grips the upper part of the supporting brace (5), where the clamping cap (40) and the support (3) are attached to each other via a latching connection (18, 19, 20, 28, 48).

CLAMP CONNECTION FOR THE ATTACHMENT OF PLATE-SHAPED COMPONENTS, PARTICULARLY SOLAR MODULES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a PCT International Application of European Patent Application No. EP11 001 119.4, filed on February 11, 2011. The entire disclosure of the above application is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a clamp connection for the attachment of plate-shaped components, particularly solar modules, on rail-shaped carriers provided with guide grooves with margins that protrude inwards into the groove, consisting of a support with at least one support surface present on its upper side, for a component, and with a supporting brace which delimits the support surface, as well as with a T-shaped counter bearing present on its lower side, where the crossbars of said counter bearing can be inserted with alignment in the longitudinal direction of the guide groove in the guide groove, and after a rotation by 90° it engages behind the protruding margins of the guide groove, and of a clamping cap, with a clamping surface covering the support surface, and a longitudinal groove which grips the upper part of the supporting brace.

[0003] Clamp connections for the attachment of plate-shaped components are generally known. However, recently clamp connections for solar modules have reached a special position. With these clamp connections, it is especially important that they should be very stable, with a view to very high mechanical loads generated, for example, due to wind or snowfall, or the size and the weight of the module. The solar modules should be firmly anchored via the clamp connections. At the same time, there is the requirement that no warping due to the clamping should occur on the modules, which can lead to crack formations on the very sensitive surfaces of the modules.

BACKGROUND

[0004] For the state of the art, reference is made to DE 20 2008 002 264 U1 and US 2009/0200443 A1. These known clamp connections are not satisfactory, particularly because they are made up of plurality of individual parts which make the required on-site installation expensive. Due to the multitude of individual parts, the handling during assembly is difficult, particularly also because the assembly is made as a rule on carriers that are in an inclined position. The inclined orientation of the carriers leads to the individual parts slipping with respect to each other in an unintended manner, requiring constant readjustment.

[0005] In our prior Patent Application EP 09 012 682, an improved clamp connection has been represented, whose design is simple, and which allows a facilitated installation. This clamp connection consists substantially of three parts: namely a clamp support, a clamping cap, and an attachment screw. The support has a T-shaped counter bearing on its bottom side, whose base protrudes from the lower side of the support, and has a crossbar which, inserted in the guide groove of the carrier, engages behind the protruding margins of the guide groove. In this way, a simplified installation of the clamp support on the carrier is possible. The clamping cap is placed on the clamp support, and screwed to said support by means of the attachment screw. The marginal sides of the modules are gripped and pressed on the support by the clamping cap. On the upper side of the support, a supporting brace oriented longitudinally with respect to the carrier is present, against which the module margin is applied and which is provided at the same time as a spacer for the applied modules.

SUMMARY

[0006] The present disclosure is based on the problem of further improving the clamp connection described in the prior patent application, for the purpose of further simplifying its installation, where, at the same time, a thief-proof attachment is to be achieved.

[0007] As starting point for the present disclosure, the clamp connection described in the above-mentioned prior application is used. This

clamp connection consists substantially of a support with at least one support surface present on its upper side, for a component, particularly a solar module, and of a supporting brace delimiting the support surface or surfaces and oriented in the longitudinal direction of the support. On its bottom side, the support has the T-shaped counter bearing, which is inserted with its crossbar in the guide groove of the carrier. The clamping cap has one or more clamping surfaces, which face the support surfaces on the support, and a longitudinal groove which enclose the upper part of the supporting brace. With regard to the support, the clamping surfaces are provided laterally with respect to the supporting brace, namely one on each side, if two solar modules are to be gripped by the clamp connection. One clamping surface is provided, if the clamp connection is to grip only one solar module, which is the case when the solar module is arranged as an end piece in a row. According to the present disclosure, the clamping cap and the support is connected via a latching connection to each other. Thus, for the clamp connection, only two individual parts are provided, namely the support and the clamping cap. On the clamping cap, the latching pin is arranged, preferably by connecting the clamping cap and the latching pin rigidly to form a unit. In the support, a bore is provided, into which the latching pin is pushed. Both on the latching pin, and also in the bore in the support, sawteeth oriented in opposite directions are arranged, which allow pushing the latching pin into the bore, while opposing the pulling of the latching pin out of the bore. A screw connection of the parts is not needed; the latching pin needs only to be pressed into the bore, to attach the clamping cap to the support, and thus simultaneously grip the margin of the adjacent solar module. The formation of the latching pin and of the bore with sawteeth has the additional advantage that different thicknesses of solar modules can be gripped by the clamp connection. The sawteeth in the bore and on the pin, allow the latching pin to be pushed at different depths into the bore, so that modules of different thicknesses can be clamped.

[0008] In many cases it is advantageous if the clamp connection is manufactured from a plastic and the support from an elastomer. This allows a certain elasticity of the clamp connection during the clamping in of the solar module. In support of said elasticity, the support surfaces can be provided with

longitudinal notches. The clamping surfaces of the clamping cap are preferably provided with a silicone coating, which also has some elasticity.

[0009] To achieve a strong anti-theft device with the clamp connection, it is advantageous if in the bore of the support, an insert, made of a plastic, for example, is inserted. The latching pin made of plastic and the insert made of plastic prevent, to an increased extent, a removal of the clamping cap. In this connection, it is also advantageous if the insert is provided with lateral brackets, which are applied against the lower side of the crossbar of the counter bearing. Finally, it is advantageous if the insert is applied with its lower margin on the bottom of the guide groove, and thus generates a resistance of the support when the latching pin is pushed in.

[0010] For the case where the clamp connection is provided for modules of constant thickness, it is advantageous if the latching connection consists of a latching pin, which has latching lugs at its end, which engage in cuts at the lower margin of the bore, or at an undercut in the bore.

[0011] To facilitate the pressing in of the latching pin into the bore of the support, the latching pin is provided with at least one longitudinal slot over the length of the sawteeth or the latching lugs. By a slight compression of the parts of the latching pin which are divided by the longitudinal slots, its introduction into the bore is facilitated.

[0012] An additional securing of the clamping cap on the support is achieved by the fact that the clamping cap on its lower side has longitudinal notches with back cuts, behind which barbed hooks present on the upper part of the supporting brace can be clipped in. These barbed hooks extend preferably over the entire length of the longitudinal notches.

[0013] To reinforce the strength of the support, the latter can be provided with a supporting plate, which extends both in the area of the support surfaces and also in the area of the supporting brace, and which is embedded in the support itself. Both the support plate and also the insert can be inserted in the support in a vulcanization process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In the appended drawing, the present disclosure is represented diagrammatically in several embodiments. The figures show:

[0015] Figure 1 is an oblique view of the clamp connection attached to a carrier;

[0016] Figure 2 is a cross section through the clamp connection, with a latching connection via a latching toothing;

[0017] Figure 3 is a cross section through a latching connection by means of a latching pin with latching lugs at its lower end;

[0018] Figure 4 is an enlarged detail of the latching connection according to Figure 3; and

[0019] Figure 5 is an enlarged representation of a section of the clamping cap with the arrangement of the longitudinal notches and the barbed hooks.

EMBODIMENT OF THE INVENTION

[0020] Figure 1 shows, in the oblique view, the clamp connection 1 arranged on a partial section of a carrier 2. In the known manner, solar modules can be inserted in the clamp connection 1, and clamped therein. The solar modules are not shown here in further detail. The clamp connection 1 itself consists of the support 3 and the clamping cap 4. The carriers 2 are extruded profiles with a guide groove 5, which has margins 6 and 7 that protrude inwards. The support 3 has support surfaces 12 that protrude laterally, and the supporting brace 15. The supporting brace 15, with its upper part, lies in the longitudinal groove 16 of the clamping cap 4.

[0021] In Figure 2, a cross section through the middle of the clamp connection 1 is shown. Here, one can see the support 3 with the support surfaces 12, the supporting brace 15, the counter bearing 9, and the insert 24, as well as the clamping cap 4 with the latching pin 18. The latching pin 18 is pressed into the bore 17 located in the center in the support 3. The latching pin 18 has the latching toothing 19, while the latching toothing 20 is provided in the bore 17. The latter latching toothing in the present case is located in the insert

24. The two latching toothings 19 and 20 are compatible, and consist of sawteeth oriented in opposite directions. The latching pin 18 is provided, over the length that is gripped by the latching toothings, with two longitudinal slots 21, which are preferably oriented at a mutual angle of 90°. The longitudinal slots 21 allow a radial compression of the hook arms 22 formed by the longitudinal slots 21. In the embodiment example, the sawtooth section in the bore 17 of the support is formed from an insert 24 made of plastic. The counter bearing 9 which is present on the lower side of the support 3 has a T-shaped design. The base 10 of the counter bearing 9 comes to be applied beneath the margins 6 and 7 of the carrier 2, when the T-shaped crossbar 11 lies in the guide groove 5.

[0022] When the support 3 is applied on the carrier 2, the clamping cap 4 is at first oriented transversely to the carrier 2, so that the crossbar 11 can be inserted in the longitudinal direction into the guide groove 5. After the introduction of the counter bearing 9 into the guide groove 5, the clamping cap 4, and thus also the crossbar 11, is rotated by 90°, so that the clamping cap 4 is oriented in the longitudinal direction of the carrier 2. The clamping cap 4 itself is made of a plastic. Its clamping surfaces 13 are provided with a silicon coating 14. On the surfaces of the support 3, the longitudinal notches 25 are provided. These longitudinal notches 25, together with the silicon coatings 14 on the clamping cap 4, result in a highly resilient, secure clamping in of the solar modules. The solar modules are thus held in a nondestructive manner between the clamping cap 4 and the support 3.

[0023] The support 3 is provided in addition with a support plate 41, which reinforces the strength of the support 3. The support plate 41 and also the insert 24 are attached by vulcanization in or on the support 3. The insert 24 has lateral brackets 26 which are adapted in terms of their shape to the crossbars 11. They are applied on the lower side of the crossbar 11 of the counter bearing 9, and they are enveloped on their outer sides by the elastomer of the support 3. The insert 24 is braced with its lower margin on the bottom of the guide groove 5.

[0024] The clamp connection according to Figure 3, in terms of its fundamental design, is similar to Figure 2. The latching connection is different

here; it consists of a latching pin 48, which is provided with latching lugs 28 at its lower end, instead of the sawteeth. In the area of the latching lugs 28, the slots 21 are provided here too in the shape of a cross. These latching lugs 28 engage, when the latching pin 48 is pressed into the bore 47, into cuts at the lower margin of the bore 47 or at a back cut in the bore 47. This has the result that this ratchet connection is suitable only for a certain thickness of a solar module. This thickness is given by the gap, which is predetermined after the engagement of the latching lugs 28, between the clamping surfaces 13 on the clamping cap 40, and the support 3. The clamping cap 40 is provided on its lower side with the longitudinal notches 46 with the back cuts 43. Behind these back cuts 43, the barbed hooks 44 present on the insert 42 engage, when the clamping cap 40, and thus the latching pin 48, is pressed into the bore 47.

[0025] For a secure attachment, in this embodiment, the insert 42 is extended over the entire length of the bore 47, so that the barbed hooks 44 also consist of plastic. At the same time, brackets 50 are present laterally on the insert 42, which contribute to the strength of the support 3. A support plate is not required here.

[0026] Enlarged detail embodiments from Figure 3 are represented in Figures 4 and 5. In Figure 4, one can see the hooking of a latching lug 28 on a back cut 43 on the insert 42.

[0027] Figure 5 shows in an enlargement the cross-sectional shape of a longitudinal notch 46. A ledge-like extension 49, which is present on the insert 42, can be inserted into these longitudinal notches 46. This extension 49 is provided with the barbed hooks 44, which engage in a manner so they clip in behind the back cut 43. As a result, the clamping cap 40 is further secured on the support 3. The ledge-like top part 49 can easily be deflected sideways onto the support 3, during the placement of the clamping cap 40.

CLAIMS

What is claimed is:

1. A clamp connection (1) for the attachment of plate-shaped components on rail-shaped carriers (2) provided with guide grooves (5) with margins (6, 7) that protrude inwards into the groove (5), comprising:

a support (3) with at least one support surface (12) present on its upper side, for a component, and with a supporting brace (15) which delimits the support surface (12), as well as a T-shaped counter bearing (9) present on its lower side, where said counter bearing includes a crossbar (11) which can be inserted with alignment in the longitudinal direction of the guide groove (5) in the guide groove (5), and after a rotation by 90° it engage behind the protruding margins (6, 7) of the guide groove (5), and of a clamping cap (4) with clamping surface (13) covering the support surface (12), and a longitudinal groove (16) which grips the upper part of the supporting brace (5), wherein the clamping cap (40) and the support (3) are attached to each other via a latching connection (18, 19, 20, 28, 48).

2. The clamp connection according to claim 1, wherein the latching connection (18, 19, 20, 28, 48) consists of a latching pin (18, 48), which is connected to the clamping cap (4, 40), and which is pressed into a bore (17, 47) in the support (3), and attached there.

3. The clamp connection according to claim 1, wherein the latching pin (18, 48) is rigidly connected to the clamping cap (4).

4. The clamp connection according to claim 1, wherein the latching pin (18) has a latching toothing (19), which engages in a compatible latching toothing (20) provided in the bore (17, 47).

5. The clamp connection according to claim 1, wherein the latching toothing (19, 20) have sawteeth oriented in opposite directions on the latching pin (18) and in the bore (17).

6. The clamp connection according to claim 1, wherein the latching pin (18), over the length of the sawteeth, has at least one longitudinal slot (21).

7. The clamp connection according to claim 1, wherein an insert (24, 42) is inserted into the bore (17) of the support (3).

8. The clamp connection according to claim 7, wherein the insert (24, 42) is made of a plastic.

9. The clamp connection according to claim 7, wherein the insert (24, 42) has lateral brackets (26), which are applied on the lower side of the crossbar (11) of the counter bearing (9).

10. The clamp connection according to claim 7, wherein the insert (24, 42) is applied with its lower margin on the bottom of the guide groove (5).

11. The clamp connection according to claim 1, wherein the latching connection consists of a latching pin (48), which has latching lugs (28) at its end, which engage in cuts at the lower margin of the bore (47) or on a back cut (43) in the bore (17).

12. The clamp connection according to claim 1, wherein the clamping cap (4, 40) is made of a plastic.

13. The clamp connection according to claim 12, wherein the clamping surface of the clamping cap (4, 40) has a silicon coating (14).

14. The clamp connection according to claim 1, wherein the clamping cap (40), on its lower side, has longitudinal notches (46) with back cuts (43),

behind which, on the supporting brace (48), barbed hooks (44) which are present on a ledge (49) engage by clipping in.

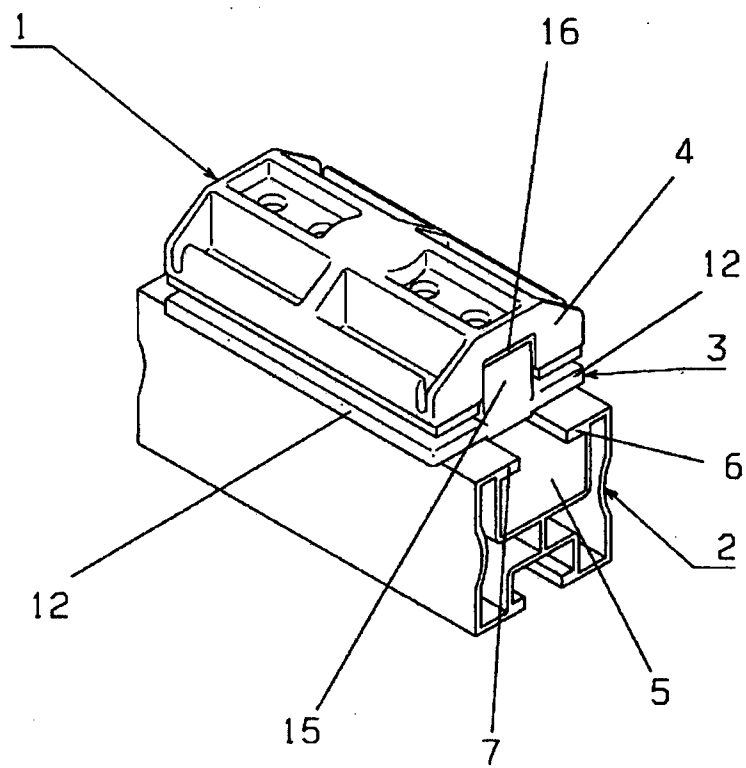
15. The clamp connection according to claim 1, wherein the support (3) is made of an elastomer.

16. The clamp connection according to claim 1, wherein the support (3) is aligned with a support plate (41).

17. The clamp connection according to claim 16, wherein the support plate (41) and the insert (24) are connected by vulcanization to the support (3).

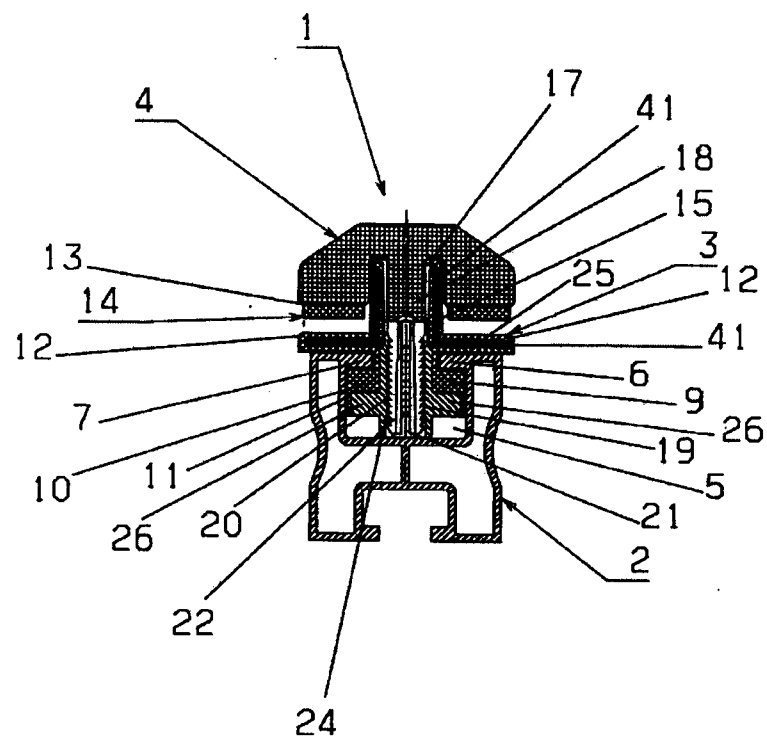
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Fig. 1



2/5

Fig. 2



3/5

Fig. 3

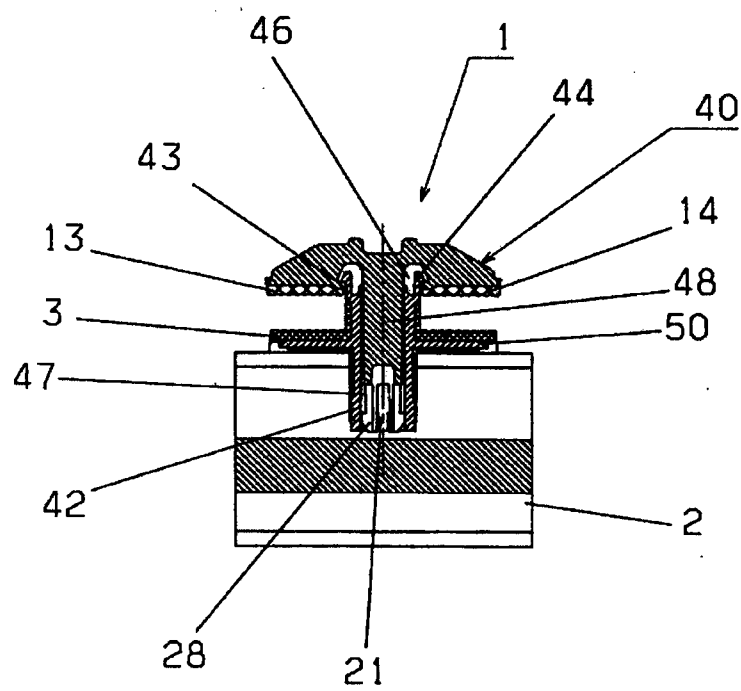
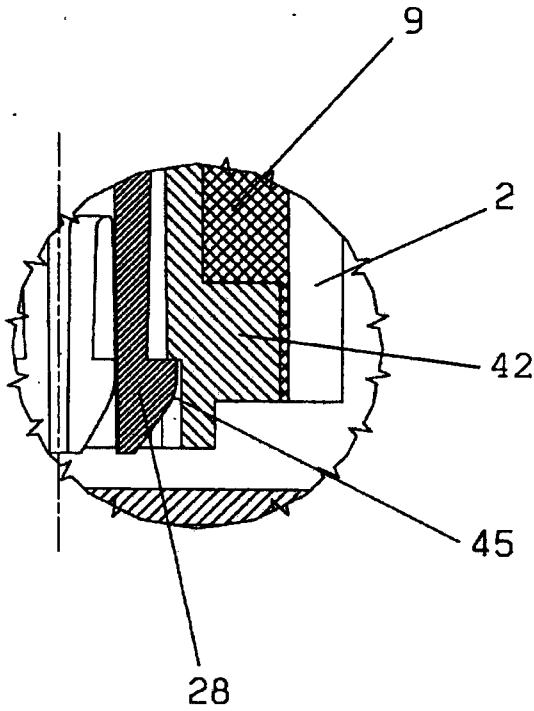
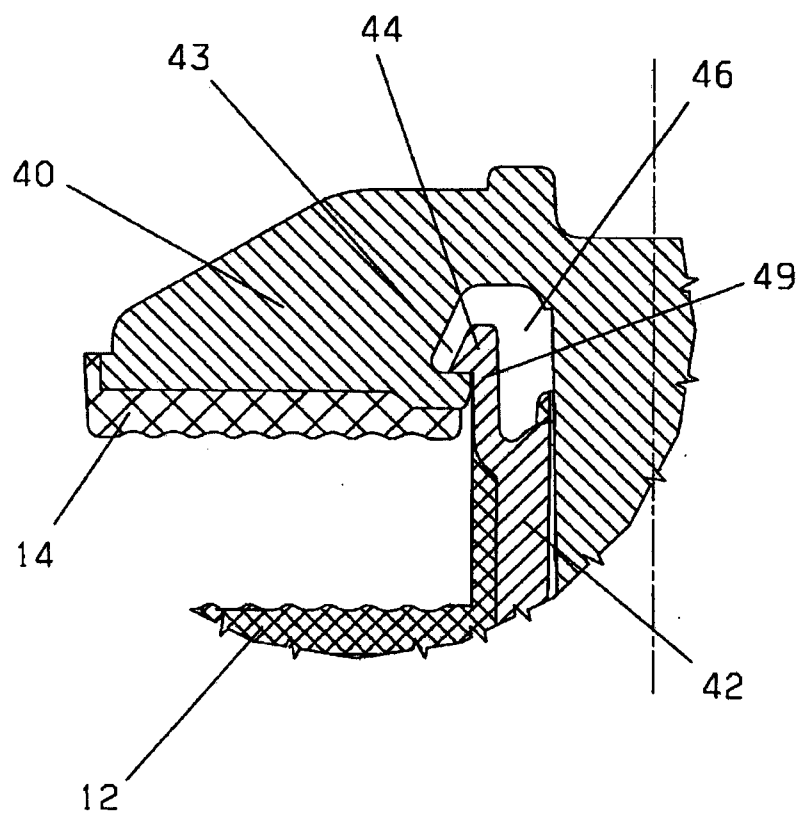


Fig. 4



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Fig. 5



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/001875

A. CLASSIFICATION OF SUBJECT MATTER
INV. F24J2/52
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)
F24J

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/200443 A1 (BURTSCHER NORBERT [AT] ET AL) 13 August 2009 (2009-08-13) cited in the application paragraphs [0028] - [0037]; figure 1 -----	1-17
A	DE 20 2010 000121 U1 (ALCOM INTERNAT GMBH [DE]) 10 June 2010 (2010-06-10) the whole document -----	1-17
A	DE 20 2009 013609 U1 (CLIMASOL SOLARANLAGEN GMBH [DE]) 22 April 2010 (2010-04-22) paragraphs [0089] - [0096]; figures 11-14 -----	1-17
A	FR 2 944 817 A1 (SURZUR ALAIN ROGER [FR]) 29 October 2010 (2010-10-29) the whole document ----- -/-	1-17



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Date of the actual completion of the international search

5 December 2011

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15/12/2011

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2011/001875

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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