



(51) International Patent Classification:
E04D 3/28 (2006.01)

(21) International Application Number:
PCT/IL2014/050866

(22) International Filing Date:
2 October 2014 (02.10.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/886,109 3 October 2013 (03.10.2013) US

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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, BN, 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, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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.

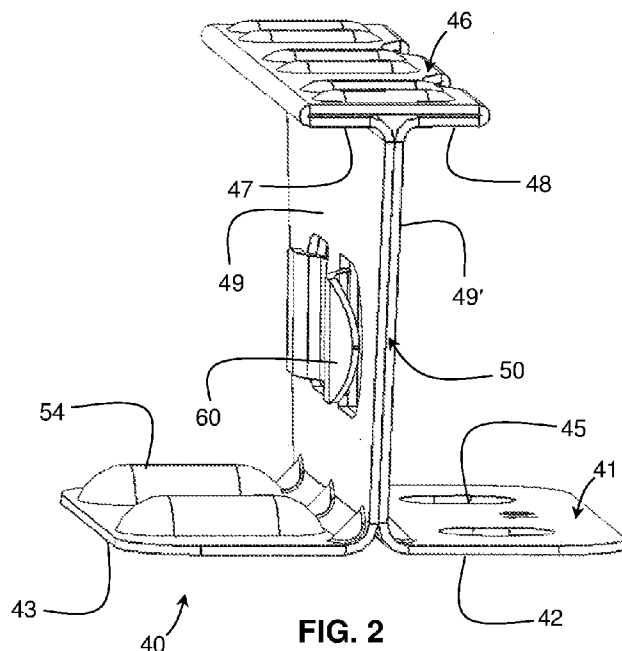
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

[Continued on next page]

(54) Title: THERMAL EXPANSION RETENTION CLIP



(57) Abstract: A retention clip (40) for use with a panel system (55) has a base plate (41) having a pair of opposing flanges (42, 43) at least one of which is configured for attaching to a support structure (44). An upright (50) extends between the base plate and a top plate (46) having a pair of opposing flanges (47, 48) and defines opposing first and second surfaces (49, 49') that in use are dimensioned to engage opposing first and second ends of a pair of first and second adjacent panels (51, 52). At least the first surface (49) supports a spacer element (60) that is configured to prevent mutual abutment of opposing ends of the first and second panels (51, 52) at least during construction of the panel system.



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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Thermal Expansion Retention Clip

FIELD OF THE INVENTION

The present invention relates to extruded, modular panel units for the construction of walls, ceilings, roofs, canopies and windows, particularly of light-transmitting sections. More specifically, the invention discloses a retention clip used to
5 fasten such systems to metal constructions (i.e. purlins) while allowing for thermal expansion of the panels.

BACKGROUND OF THE INVENTION

US Pat. No. 7,661,234 to Voegelé, Jr. is one of a large family of patents all directed to a panel assembly 10 as shown in Fig. 1 comprising a pair of juxtaposed
10 panels 11, 12 each having at a mating edge thereof a respective upright joining flange 13, 14 that support a sealing cap 15. The panel assembly 10 includes a retention clip 20 that serves both to fixedly attach the panel assembly 10 to a support structure 21 by means of a bolt 22 as well as separating the mating edges of the panels so as to allow for thermal expansion. The retention clip 20 employs a first generally Z-shaped plate 25
15 and a second generally C-shaped shape 26 which are co-operatively mounted to define a pair of webs or uprights 27 and 27' supported at their lower ends by a common base 29 and defining at their upper ends opposing flanges 30 and 31.

The uprights 27 and 27' define opposing first and second surfaces that engage opposing first and second ends of a pair of first and second adjacent panels, i.e. the
20 panels 11 and 12. Thus, the first and second ends of the adjacent panels are separated by the respective first and second surfaces 27 and 27', which themselves define an intervening gap 32. Thermal expansion of the panels exerts pressure on the respective first and second surfaces of the upright, thereby flexing them towards each other and narrowing the gap without causing the panels to buckle.

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The gap 32 between the panels is maintained by a spacer element 33, which ensures that the panels 11 and 12 do not bear tightly against the uprights 27 and 27'. The gap 32 is sufficient to allow longitudinal movement of the panels 11 and 12, such as may result from thermal expansion and contraction of the panels and the sealing cap 15, without causing significant frictional contact between the panels 11 and 12 and the uprights 27 and 27'.

US Pat. No. 7,788,869 also to Voegele, Jr. discloses a similar retention clip but wherein the gap may be maintained by an optional fin that projects downward from the sealing cap and splays apart the uprights 27 and 27'.

10 The retention or fastening clips taught by Voegele, Jr. are based on two-part constructions that require aligning prior to assembly.

US Pat. No. 6,164,024 to Konstantin shows various retention clips formed for the most part of a single molding. Typically clip is an integral extrusion and can take on a variety of forms in each of which the clip top flange extends continuously from one side of the web to the other so as to be resistant to being bent upward on either side of the web. The clip can be extruded with thickened portions to strength and its base can be integral with the lower supporting structure.

In use, the base of the clip is fastened usually with bolts to the purlin or rafter of the roof. The two juxtaposed panels are then assembled one on each side of the clip so as to be displaced from each other with their upwardly directed joining flanges being engaged by respective opposed flanges of the retention clip.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a retention clip for standing seam systems such as shown in US Pat. No. 4,573,300 that will allow free for expansion and contraction of polycarbonate panels upon the daily variation in temperature of these long flanged plastic sheets.

It is a further object to provide a retention clip that ensures that the desired gap between adjacent panels can be maintained at least during construction so as to ensure accurate fitting and avoid guesswork that is often required using known approaches.

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It is yet a further object to provide a retention clip where the gap is not retained between two spaced apart wall surfaces but is assured by means of a modification to a single wall surface only thus resulting in a simpler construction.

These objects are realized in accordance with the invention by a retention clip
5 characterized by claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

10 **Fig. 1a** shows pictorially a pair of juxtaposed panels joined via a prior art two-part retention clip;

Fig. 1b is a detail of the retention clip shown in Fig. 1a;

Fig. 2 shows a retention clip according to an embodiment of the invention;

Fig. 3 shows a pair of juxtaposed panels joined via a retention clip according to
15 an embodiment of the invention;

Figs. 4 and 5 show pictorially retention clips according to other embodiments of the invention; and

Figs. 6a and 6b show front and back views of a retention clip according to another embodiment of the invention.

20 DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 2 shows an isometric view of a retention clip 40 according to a first embodiment of the invention. The general structure of the retention clip 40 is similar to that disclosed in above-mentioned US Pat. No. 6,164,024 in that it comprises a base plate 41 having a pair of opposing flanges 42, 43 at least one of which 42 is configured
25 for attaching to a support structure 44 shown in Fig. 3. To this end, the flange 42 may be provided with apertures 45 constituting attachment means allowing the retention clip 40 to be bolted to the support structure 44 in known manner.

The retention clip 40 has a top plate 46 formed of a pair of opposing flanges 47 and 48 and is joined to the base plate 41 via an upright 50 extending between the base
30 plate 41 and the top plate 46. The upright 50 defines opposing first and second surfaces

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49 and 49', respectively, that engage opposing first and second ends of a pair of first and second adjacent panels 51 and 52 of a panel system 55 shown in Fig. 3 so as to allow mutual sliding of the panels relative to the retention clip 40, which is fixed to the structure 44. The panels 51 and 52 have respective upwardly projecting flanges 56, 57
5 that may be indented and support a sealing cap 58 that serves both to seal the joint between the two panels and secure them in interlocked engagement.

It will be apparent that, at least in form, the retention clip 40 as so far described shares much of the structure of the clips described in US Pat. No. 6,164,024 such as Fig. 7 thereof. We shall now explain wherein they differ.

10 The retention clip 40 according to the invention is characterized by one or more spacer elements 60 emerging from at least one of the first and second surfaces 49, 49' that prevent the first end of the first panel 51 from abutting the second panel 52 at least during construction of the panel system 55. The spacer elements 60 may be resilient fingers or springs and help to reduce friction in the panel system 55 as will be further
15 described below.

Upon installation, spacer elements 60 dictate a gap between the first panel 51 and the first surface 49 of the clip 40, so that the first panel 51 is free to expand thermally in the lateral direction 14 (as shown in Fig. 3) and thus not apply undue pressure on the first surface 49 of the clip 40 when the temperature of the panel rises.
20 Consequently there is little or no friction between the clip 40 and the panels 51, 52, which are now also free to expand longitudinally (i.e. in a direction normal to the paper in Fig. 3). In this arrangement, the problems of panel distortions and expansion rippling are greatly improved.

In all embodiments, the retention clip 40 may be bolted to a purlin or rafter
25 constituting the support structure 44 with bolts 53 through the apertures 45. Typically, the head of the bolt 53 projects above the support surface 44 so that the panel 52 supported on this side of the retention clip 40 i.e. on the flange 42 is lifted off the surface of the flange by a distance equal to the height of the bolt head. To compensate for this and ensure that the complementary panel 51 is level with the panel 52, at least
30 one spacer 54 is provided on the upper surface of the flange 43. The height of the spacer 54 is the same as that of the bolt head thus ensuring that the lower surfaces of the two panels are level.

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It should be stressed that the present invention is not limited to the structures illustrated in Figs. 2 and 3. For example, spacer elements 60 may be located in one or both surfaces 49, 49' of the retention clip 40, have various shapes, oriented vertically, horizontally or otherwise, as partially illustrated in the examples in Figs. 4 and 5. Thus, referring to Fig. 4 the retention clip 40 is a unitary construction formed of folded sheet metal such as stainless steel and spacer elements 60 are partially punched from the first wall surface 49 of the upright 50 and bent outward to form a pair of resilient fingers.

Fig. 5 shows a two-piece construction also formed of folded sheet metal, such as stainless steel, wherein an aperture 61 is formed in the first wall surface 49, typically by punching, and a single spacer element 60 in the form of a resilient finger is attached at a lateral edge to the retention clip 40. This may be done by crimping between the mating wall surfaces 49, 49' or soldering, welding, gluing etc. The resilient finger is bent outward to provide the required gap while being compressible upon thermal expansion of the juxtaposed panels.

It should be noted that in all embodiments the spacer element 60 must be sufficiently strong to withhold the attachment force applied by the person installing it and to resist the clamping pressure of the sealing cap 58. Yet it should also be compressible under the expansion forces applied by the heated panel. It may be elastic so that it resiliently springs back to its originally uncompressed form upon panel contraction.

It should also be noted that while in Figs. 4 and 5 the resilient fingers constituting the spacer elements 60 are oriented in a direction parallel to the base plate 41, they may equally be oriented in a direction normal to the base. In Fig. 5 only a single resilient finger is attached at its edge to an edge of the aperture. However, it will be appreciated that a pair of resilient fingers can be attached to opposing edges of the aperture, each spanning approximately half the length of the aperture. Also, more than one aperture may be provided each in association with one or more spacing elements.

Likewise, in all embodiments the retention clip 40 may be formed of folded sheet metal so as to form a unitary construction, to which the spacer elements 60 are then attached either fixedly or detachably. In some embodiments, such as shown in Fig. 5, the spacer elements 60 are also formed integrally to form a complete assembly of unitary construction.

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Figs. 6a and 6b show front and back views of an alternative retention clip 40 wherein the spacer elements 60 are detachable. To this end, opposite edges of the first wall surface 49 are provided with cutouts 62 for accommodating a peripheral groove 63 of a respective frangible tubular spacer element 60. During installation, the retention
5 clip 40 is bolted to the support surface 44 with bolts 54 through the apertures 45 as shown in Fig. 3. The first panel 51 is then mounted with its end abutting the second wall surface 49' after which the second panel 52 is installed with its end abutting the free ends of the spacer elements 60. The spacer elements 60 are then broken off leaving a gap between the second panel 52 and the retention clip 40 which allows for free thermal
10 expansion and contraction of the panels. The two panels 51 and 52 are then secured by snap-fitting the sealing cap 58 on the upwardly protruding flanges 56, 57, in known manner.

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CLAIMS:

1. A retention clip (40) for use with a panel system (55), said retention clip comprising:
 - a base plate (41) having a pair of opposing flanges (42, 43) at least one of which
 - 5 is configured for attaching to a support structure (44);
 - a top plate (46) having a pair of opposing flanges (47, 48); and
 - an upright (50) extending between the base plate and the top plate and defining opposing first and second surfaces (49, 49') that in use are dimensioned to engage opposing first and second ends of a pair of first and second adjacent panels (51, 52);
- 10 **characterized in that:**
 - at least said first surface (49) supports a spacer element (60) that is configured to prevent mutual abutment of opposing ends of the first and second panels (51, 52) at least during construction of the panel system.
2. The retention clip (40) according to claim 1, wherein the spacer element (60) is
- 15 configured for removal after securing the first panel so as to leave a gap between the first end of the first panel (51) and the first surface (49).
3. The retention clip (40) according to claim 2, wherein the spacer element (60) is frangibly attached to the upright (50).
4. The retention clip (40) according to claim 1, wherein the spacer element (60) is
- 20 resiliently supported by the first surface (49) of the upright (50) so as to protrude outwardly from the first surface, thereby defining a gap between the first end of the first panel and the first surface.
5. The retention clip (40) according to any one of claims 1 to 4, wherein:
 - the base plate (41) has a pair of opposing flanges (42, 43) at least one of which
 - 25 (42) is provided with attachment means (45) for attaching to the support structure; and
 - the respective flanges of the base plate and the top plate extend outwardly in mutually opposite directions from the upright.

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- 6.** The retention clip (40) according to claim 5 wherein:
the attachment means comprises one or more apertures (45) in only a first one (42) of said flanges of the base plate for accommodating therethrough respective bolts (53) each having a bolt head; and
5 a second one (43) of the flanges is provided on an upper surface thereof with at least one spacer (54) whose height is the same as that of the bolt head thus ensuring that the lower surfaces of the two panels (51, 52) are level when located on the respective flanges (42, 43) of the base plate (41).
- 7.** The retention clip (40) according to any one of claims 1 to 6, wherein at least the
10 base plate (41), the top plate (46) and the upright (50) are formed of a unitary construction.
- 8.** The retention clip (40) according to any one of claims 1 to 7, wherein the base plate (41), the top plate (46) and the upright (50) are formed of folded sheet metal.
- 9.** The retention clip (40) according to claim 8, wherein the spacer elements (60)
15 are partially punched from the first wall surface (49) of the upright (50) and bent outward to form a pair of resilient fingers.
- 10.** The retention clip (40) according to claim 8, wherein an aperture (61) is formed in the first wall surface (49) and the spacer element (60) is a resilient finger attached at an edge thereof to the retention clip (40) at an edge of the aperture.

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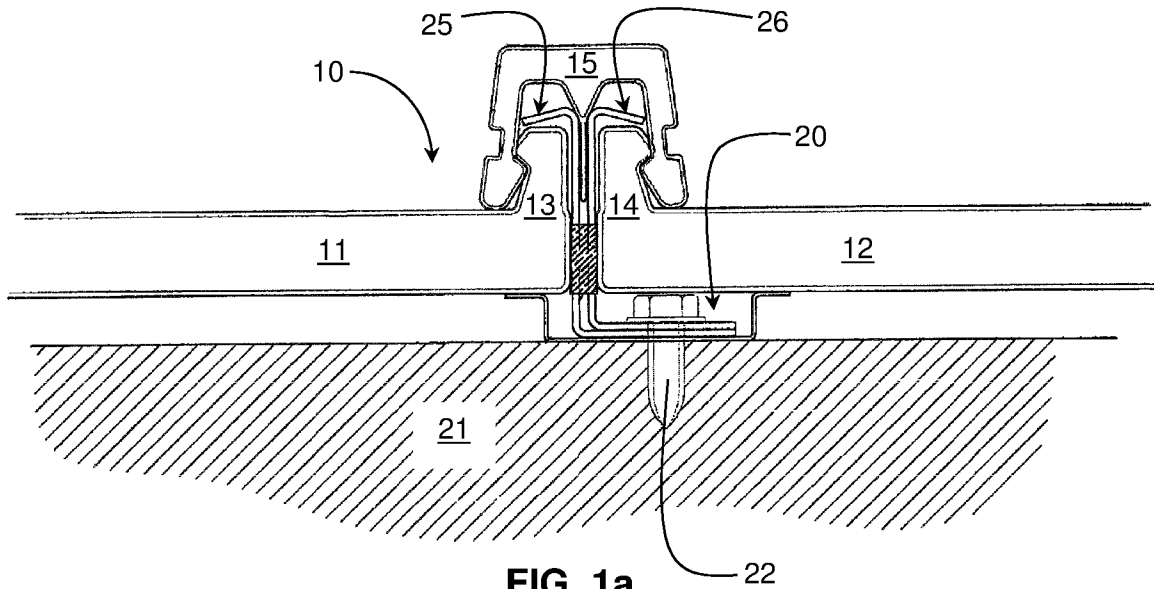


FIG. 1a
(PRIOR ART)

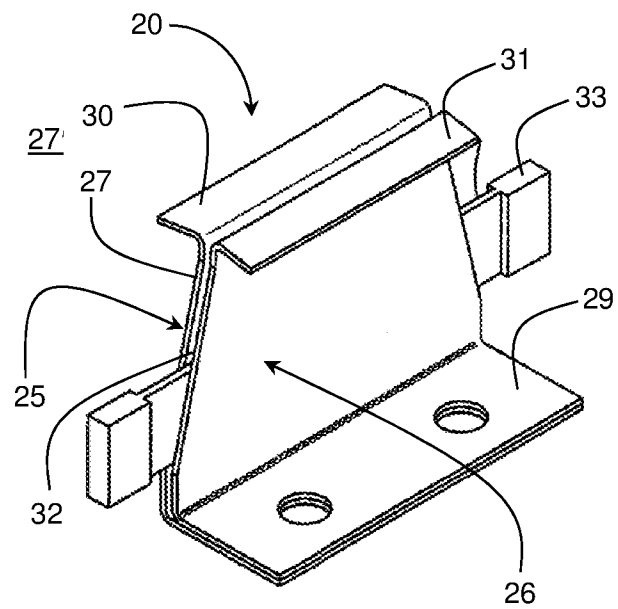
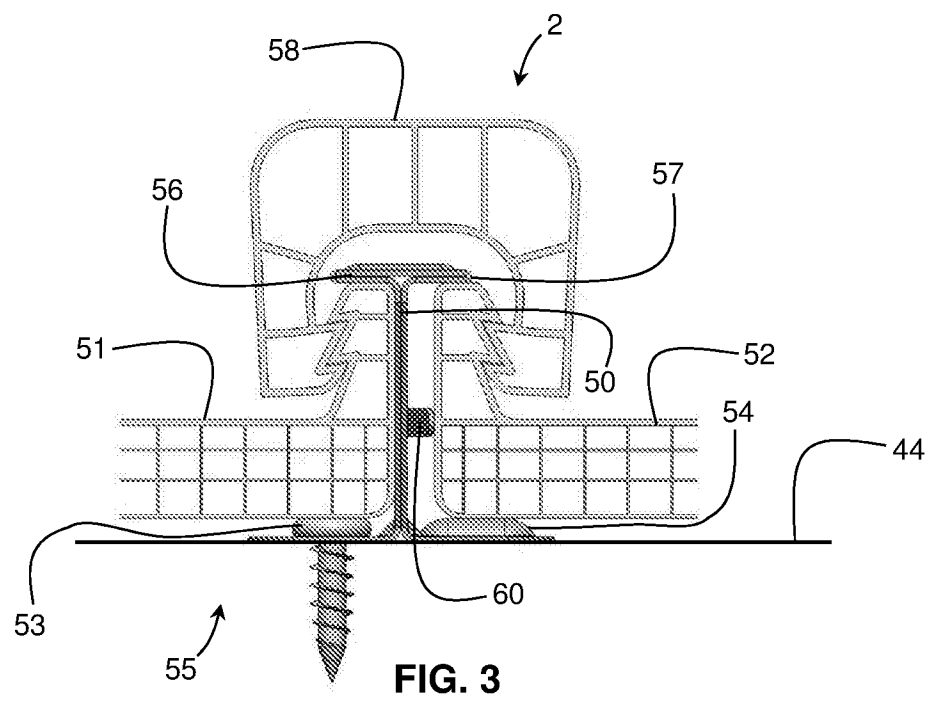
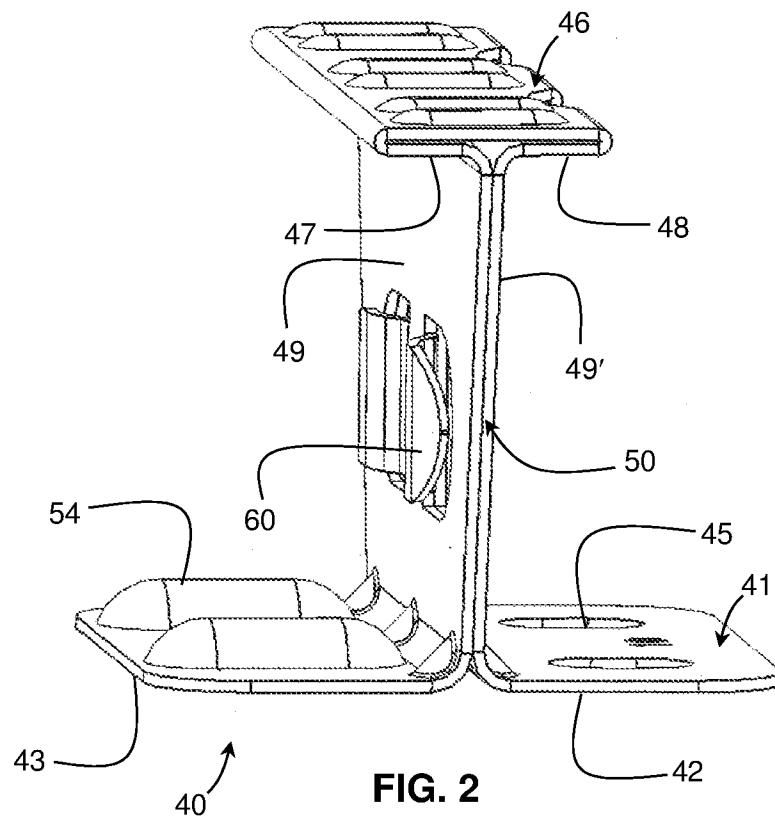


FIG. 1b
(PRIOR ART)

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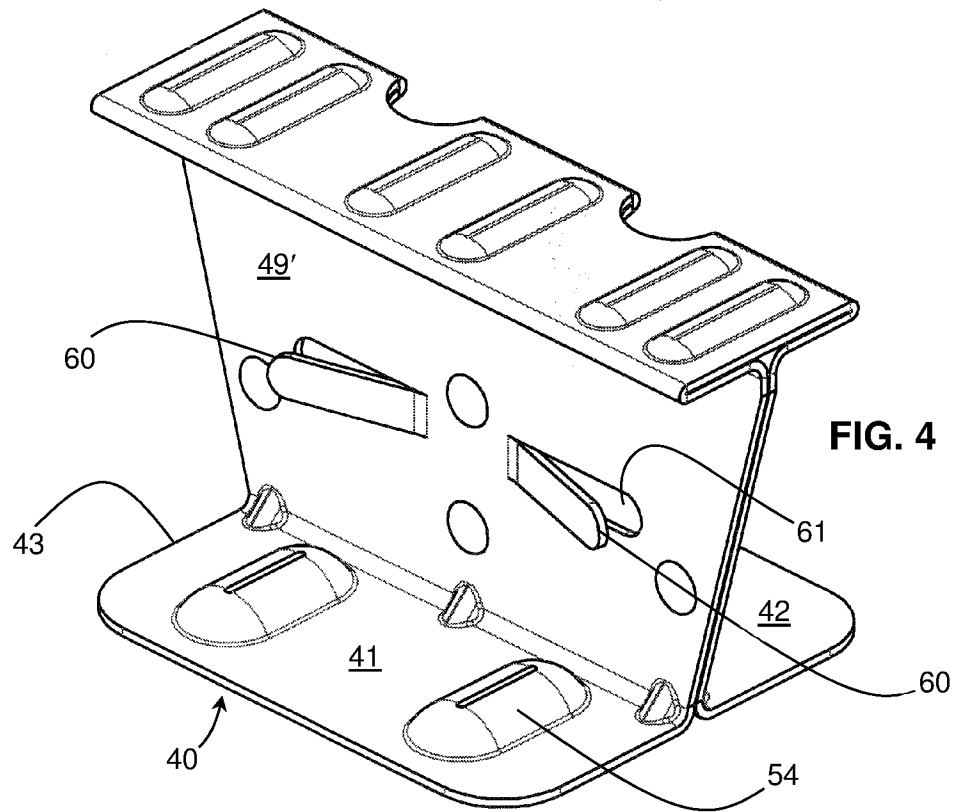


FIG. 4

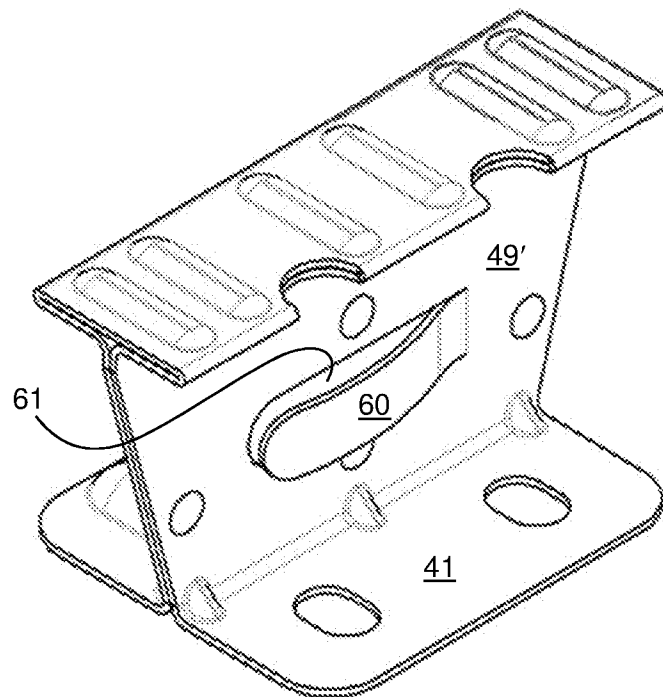
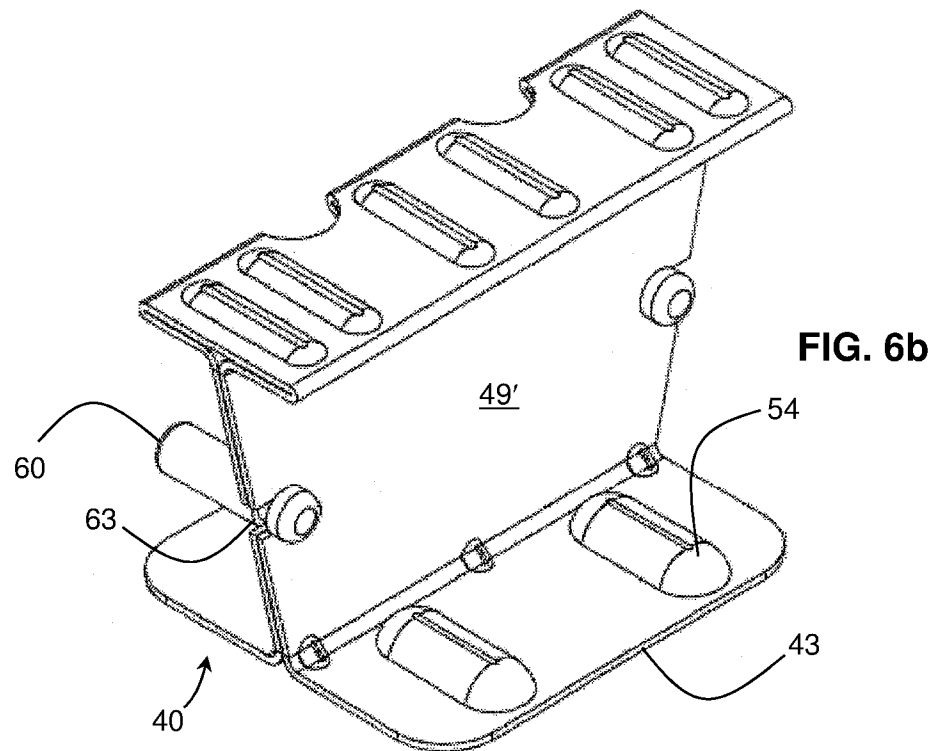
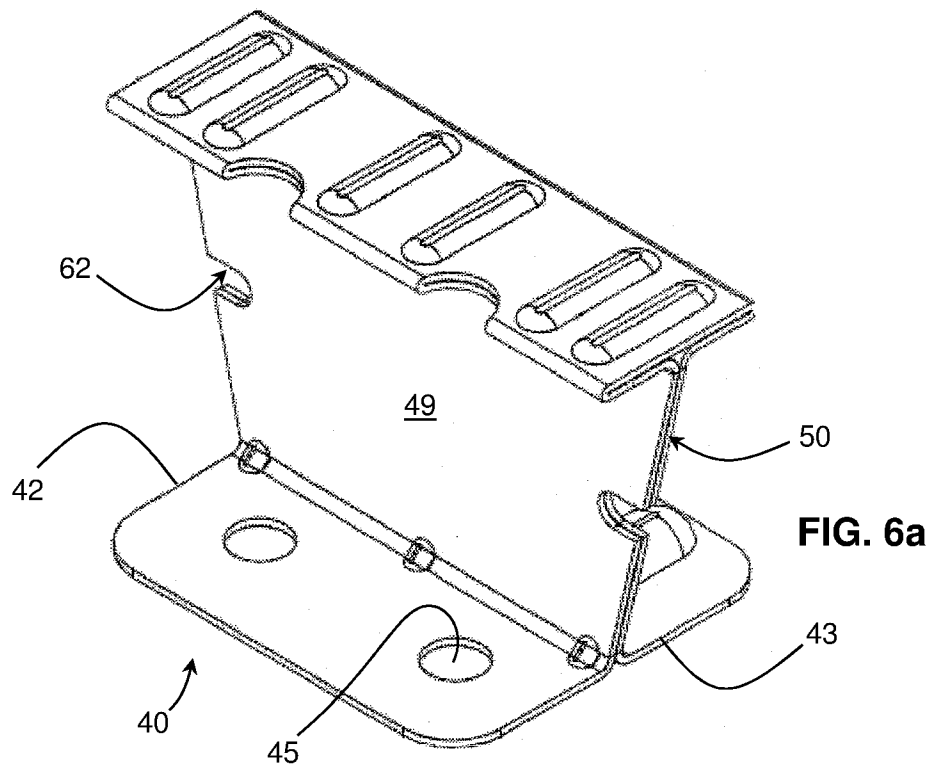


FIG. 5

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2014/050866

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04D3/28
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)
E04D

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 practicable, 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.
X	JP S59 24060 A (FUNAKI SHOJI KK) 7 February 1984 (1984-02-07) figures 2, 3a, 3b	1-5,7
X	----- US 2009/049771 A1 (KONSTANTIN MOSHE [US]) 26 February 2009 (2009-02-26) figure 22	1,5-7
X	----- JP S61 200250 A (SANKO METAL IND) 4 September 1986 (1986-09-04) figure 9	1-5,8
A	----- US 390 806 A (SAGENDORPH) 9 October 1888 (1888-10-09) figures 2-3	1,8
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

22 January 2015

Date of mailing of the international search report

29/01/2015

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2014/050866

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP S50 115416 U (UNKNOWN) 20 September 1975 (1975-09-20) figure 1 -----	1,8
A	JP S58 150652 A (SANKO KINZOKU KOGYO KK) 7 September 1983 (1983-09-07) figure 6 -----	1,8

INTERNATIONAL SEARCH REPORT

Information on patent family members

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