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(54) IMPROVED CONNECTOR ARRANGEMENT

(57) A connector arrangement for joining two chassis members in end-to-end alignment to form a continuous chassis member is described, said connector arrangement comprising:-
(i) a first chassis member (20) having a first end and a second end;
(ii) a second chassis member (30) having a first end and a second end, in use the first end of the first chassis member to be joined to the second end of the second chassis member;
(iii) a first connector assembly located substantially at or near the first end of the first chassis member, the first connector assembly incorporating a sliding sub-assembly (22), said sliding sub-assembly being slidable within the first chassis member between a retracted position and a connected or locked position;
(iv) a second connector assembly comprising a receiving section sub-assembly (23) located substantially at or near the second end of the second chassis member, the receiving section sub-assembly being adapted to receive the sliding sub-assembly;
(v) a latching mechanism adapted to latch the sliding sub-assembly to the receiving section sub-assembly such that the first and second chassis members become firmly mechanically joined together;
(vi) an unlatching mechanism adapted to unlatch the sliding sub-assembly from the receiving section sub-assembly;
wherein the latching and unlatching mechanism can be operated by hand, without the use of tools.

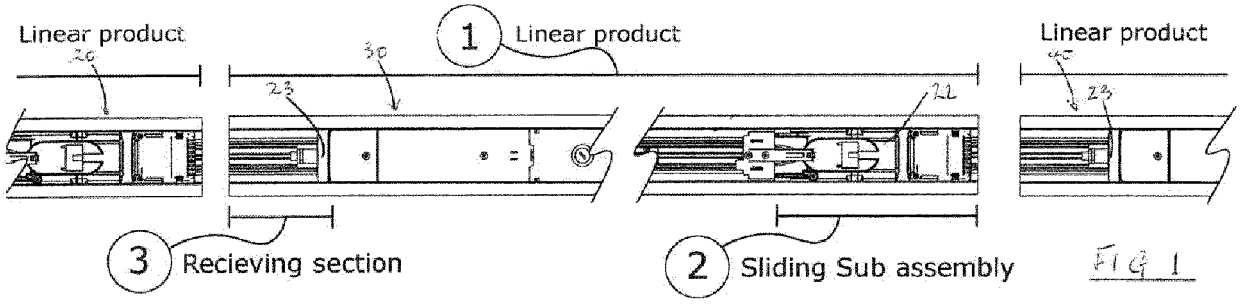

Fig 1

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Description

Field of the Invention

[0001] The present invention relates to a connector arrangement for joining two or more chassis or chamber members together in an end-to-end alignment configuration. It is particularly applicable, but in no way limited, to joining two or more linear luminaires together, combining both mechanical and electrical connections in one arrangement or assembly, and in a single tool less operation.

Background to the invention

[0002] LED Linear Luminaires are one of the latest additions to the range of energy efficient lighting for commercial applications. These products are designed to replace 4ft, 5ft and 6ft T5 and T8 batten fittings, in response to growing demand for long-lasting, complete-luminaire solutions. One or more of the known LED Linear Luminaires can be connected together in end-to-end alignment through the ends or the rear of the adjacent fittings. This in theory allows for end-to-end continuous linear arrangements, ideal for use in factories, on production lines, in supermarkets and in public transport stations. However, the known joining or connector arrangements for such luminaires suffer from a number of disadvantages. For example, linear luminaires are generally fitted with end caps, and these prevent a true continuous seamless run of strip lighting, especially when the connection between adjacent luminaires includes or is facilitated by the end caps.

[0003] In addition the structural rigidity of the run of luminaires, as well as their linear alignment, is often provided by the surface to which the luminaires are fixed, together with the surface fixings, rather than by the connector arrangements. These present a real problem when the linear luminaires are suspended from a support element or surface such as a ceiling by means of tensile elements such as wires, ropes or chains, and therefore the luminaires have a number of degrees of freedom, and are therefore free to move relative to each other to a certain extent.

[0004] A further disadvantage of known connector arrangements is that they often require the use of tools to complete the operation of forming both mechanical and electrical connections between adjacent luminaires. This type of linear luminaire is generally installed well above normal head height, and therefore requires the installer to work from a step ladder or other elevated platform. Because tools are required, and because the luminaire must be held aloft during the connection procedure, this generally requires two people to complete the joining/assembly operation, to comply with health and safety regulations and safe working practices. When an electrical as well as a mechanical connection has to be made between adjacent luminaires, a qualified electrician may be required to do this work. These requirements inevitably increase both the cost and the time of any joining or connection operation.

[0005] As well as the need for assembly without the use of tools, it is an important requirement that once assembled the linear run or array of luminaires can be easily disassembled, again without the need for tools, in the event that the array of linear luminaires has to be modified or completely reorganised, for example due to a change in use of the premises.

[0006] Certain luminaire module connection arrangements are known, for example DE 202016101229U (WILA Group), which describes a connection arrangement but which includes an unlatching mechanism which is both inaccessible and requires tools to operate it. CN206419736U describes a connection arrangement without any obvious unlatching mechanism.

[0007] It is an object of the present invention to overcome or mitigate some or all of the problems outlined above.

Summary of the Invention

[0008] According to a first aspect of the present invention there is provided a suspension apparatus according to Claim 1. There is described a connector arrangement for joining two chassis members in end-to-end alignment to form a continuous chassis member, said connector arrangement comprising:-

(i) a first chassis member having a first end and a second end;
(ii) a second chassis member having a first end and a second end, in use the first end of the first chassis member to be joined to the second end of the second chassis member;
(iii) a first connector assembly located substantially at or near the first end of the first chassis member, the first connector assembly incorporating a sliding sub-assembly, said sliding sub-assembly being slidable within the first chassis member between a retracted position and a connected or locked position;
(iv) a second connector assembly comprising a receiving section sub-assembly located substantially at or near the second end of the second chassis member, the receiving section sub-assembly being adapted to receive the sliding sub-assembly;
(v) a latching mechanism adapted to latch the sliding sub-assembly to the receiving section sub-assembly such that the first and second chassis members become firmly mechanically joined together;
(vi) an unlatching mechanism adapted to unlatch the sliding sub-assembly from the receiving section sub-assembly;

wherein the latching and unlatching process can be operated manually by hand, without the use of tools.

[0009] The result of using this combination of compo-

nents in a connector arrangement according to the present invention is that that the adjacent chassis members are held substantially rigidly in end-to-end linear alignment, all components of the connector arrangement remaining internal to the chassis members being joined. Importantly, the connection between adjacent chassis members can be made and unmade without the use of tools.

[0010] Preferably when the connector arrangement is in the connected or locked position the sliding sub-assembly extends into the body of the second chassis member, spanning the joint region between the first and second chamber members. By providing first and second connector assemblies, the connector assemblies being fixed internally at opposing or facing ends of adjacent chassis members in end-to-end alignment, and one of the connector assemblies incorporating a sliding sub-assembly and the connector arrangement incorporating a latching mechanism, it is possible for the first and second chassis members to be firmly mechanically joined together, the degree of freedom of movement of the sliding sub-assembly being constrained by the co-operating shapes of the chassis member and sliding sub-assembly, such that the adjacent chassis members are held substantially rigidly in end-to-end linear alignment.

[0011] Preferably the latching mechanism comprises a protrusion on the sliding sub-assembly and a corresponding aperture on the receiving section sub-assembly, or vice versa, and more preferably the protrusion incorporates a hooked or barbed end, in order to positively engage in the aperture.

[0012] Preferably the connector arrangement further comprises an unlatching mechanism adapted to unlatch the sliding sub-assembly from the receiving section sub-assembly, and preferably the unlatching mechanism comprises a moveable lever adapted to move the protrusion away from the aperture. Preferably the unlatching mechanism comprises an unlock plate handle grip and an unlock handle, and preferably the unlock plate handle grip and the unlock handle are both on the sliding sub-assembly.

[0013] Preferably the connector arrangement further comprises a compression spring tensioner adapted to maintain tension between the first and second chassis members to hold the two chassis members firmly together.

[0014] Preferably movement of the sliding sub-assembly is constrained such that in use the only movement the sliding sub-assembly can make is backwards and forwards along the linear axis of the aligned chassis members.

[0015] Preferably the connector arrangement creates both mechanical and electrical connections between the joined chassis members, for example wherein the first connector assembly incorporates a female connector block and the receiving section sub-assembly incorporates a male connector block, or vice versa.

[0016] Preferably the male and female connector blocks are pre-wired with the required electrical and/or data cables.

Brief description of the drawings

[0017] The invention will now be described, by way of example only, in relation to the accompanying Figures wherein:

Figure 1 shows sections of first, second and third chassis members, in end-to-end alignment, with sliding sub-assemblies and receiving sections in place, prior to the chassis members being joined together;
Figure 2A shows part of a sliding sub-assembly in a fully retracted configuration;
Figure 2B shows part of a sliding assembly in a fully extended configuration;
Figure 3A shows a perspective view of a sliding sub-assembly in a partly extended configuration;
Figure 3B shows an exploded view of a sliding sub-assembly and a chassis member in which it is accommodated;
Figure 4 shows an exploded view of a receiving section sub-assembly and a chassis member in which it is accommodated;
Figure 5 shows a fixed terminal plate tongue and fixed terminal plate handle of a receiving section sub-assembly;
Figures 6A and 6B show the sliding element of a sliding sub-assembly and a fixed latch respectively;
Figure 7 shows an unlocking or unlatching plate, with an enlarged cross-section of an unlatching lever;
Figure 8 shows a cross-section of a luminaire chassis member;
Figure 9 shows a cross-section of a sub-assembly extrusion of a sliding sub-assem bly;
Figure 10 shows a cross-section of the sub-assembly extrusion of Figure 9 located within the chassis member of Figure 8;
Figure 11 shows a cross-section of a fixed latch located in the chassis member of Figure 8;
Figure 12 shows a cross-section of a sliding element of a sliding sub-assembly;
Figure 13A and 13B show a cross-section of a sliding sub-assembly in a first chassis member and a fixed terminal plate in a second chassis member in a fully retracted (Figure 13A) and fully connected (Figure 13B) configurations;
Figures 14A to 14C show a tensioner spring moving from an un-tensioned to a tensioned configuration;
Figures 15A and 15B show the unlatching procedure using an unlatching plate as shown in Figure 7.

Description of the Preferred Embodiments

[0018] The present invention will now be described by way of example only. These are the best ways currently known to the applicant of putting the invention into prac-

tice, but they are not the only ways. Although the examples described are based on joining a series of linear luminaires end to end, the connector arrangement described herein is applicable to joining together a wide range of other items which incorporate a chassis similar to the type described and illustrated herein.

[0019] Referring to Figure 1 and Figures 2A and 2B, these illustrate the main components of a connector arrangement or assembly according to the present invention installed in one end of a first chassis member 20, in first and second ends of a second chassis member 30 and in one end of a third chassis member 40. This arrangement can be repeated as many times as necessary along a linear run of chassis members. A first end of luminaire chassis member 20 includes a sliding assembly. The sliding assembly comprises a fixed latch portion shown as 4 in Figures 3A and 3B, and a sliding sub-assembly 22. The sliding sub-assembly is held captive in the chassis member 20, 30 by means of a sliding sub-assembly extrusion 6 (see Figures 8, 9 and 10 and description below) but importantly the sliding sub-assembly 22 is free to slide along the linear axis of the chassis member relative to the fixed latch and the chassis member between a fully retracted configuration as shown in Figure 2A and a fully extended configuration as shown in Figure 2B. The sliding assembly is fixed into the chassis member substantially at or near a first end of each chassis member to be joined or connected together.

[0020] During assembly, a sliding assembly 21 is slid into a first end of a chassis member and the fixed latch portion 4 is firmly secured to the chassis member 20 using bolts 4.2 as shown in Figure 3B, once the sliding assembly 21 has been positioned in the desired location. Other types of fixings other than bolts could be used. A preferred location is as shown in Figure 2A, in which the protruding end of the sliding sub-assembly 22 in its fully retracted configuration is just short of, and does not protrude from, the end of the chassis member 20. It will be understood that movement of the sliding sub-assembly is constrained such that the only movement the sliding sub-assembly can make is backwards and forwards along the linear axis of the chassis member 20. These chassis members are typically formed by an extrusion process such that the cross-section of the chassis member is substantially constant along substantially the whole of its length, as shown for example in Figure 8 and as described below. Movement of the sliding sub-assembly 22 is limited or constrained to linear movement along the axis of the chassis member 20 by the complementary shapes of the internal surface of the chassis member and the external surface of the sliding sub-assembly. This is shown more clearly in Figure 10 and described in the associated description below.

[0021] A receiving section assembly 23 is fixed at or near a second end of each chassis member to be joined using bolts 8.4, although other types of fixings could be used. The components of the receiving section assembly are shown in Figures 4 and 5. These show a fixed terminal plate 8 which includes a fixed terminal plate handle 8.1 and a fixed terminal plate tongue 8.2. Tongue 8.2 includes an aperture 8.3 adapted to accommodate a snap hook 6.1 on the end of the sliding sub-assembly. Snap hook 6.1 includes a barbed end 6.4 adapted to positively engage in the tongue aperture 8.3 when the two parts come together. A handle 6.3 on the sliding sub-assembly provides the installer with a useful gripping point and in combination with handle 8.1 on the fixed terminal plate enables the operator to pull these two parts together and thus join the two adjacent chassis members with a substantially rigid mechanical connection. Because both the sliding assembly 21 and the receiving section assembly 23 are held firmly in place in their respective chassis members, along part of the length of each chassis member, there are substantially no degrees of freedom for the chassis members to move with respect to each other in the joined region.

[0022] The profile of the chassis member extrusion is characterised by having two opposing sides and a cross-member or base portion and is described in more detail below.

[0023] An unlatching mechanism is provided and the components of this unlatching mechanism are shown in Figure 7 and Figures 15A and 15B. An unlock plate 50 includes an unlock plate handle grip 5.2 and an unlock plate lever shown as item 5.1 in an enlarged cross-section in Figure 7. A protrusion or lever 52; 5.1 near the end of the unlock plate 50 acts to push snap hook 6.1 out of and away from aperture 8.3 when the unlock handle plate is slid along the sliding assembly 21. The operation of this sliding unlocking mechanism and procedure is shown in more detail in Figures 15A and 15B. These show an unlock plate 50 with unlock handle 5.2 and unlock handle plate 5.1 which incorporates unlatching protrusion 52. A spring 53 acting against a stop 54, which tends to keep the protrusion 52 back and away from the snap hook 6.1 in the normal "at rest" position when the two adjacent chassis members are joined together. When adjacent chassis members are required to be separated, the unlock handle grip is forced towards the latching mechanism against the action of the spring 53, such as by gripping handles 5.2 and 6.3 between fingers and thumb and forcing the two handles towards each other. As a result the snap hook 6.1 is forced out of aperture 8.3 and the parts are free to separate. Releasing handle 5.2 allows spring 53 to expand and the unlock handle plate returns to its "at rest" position, as shown in Figure 15A, but with the sliding assembly and the receiving section assembly now separated.

[0024] An important feature of the present connector arrangement is a tensioner or biasing means 6.2, one tensioner being located on each side of the sliding sub-assembly in this example. The operation of this biasing means 6.2, in the form of a compression spring, is shown in more detail in Figure 14. This biasing means is designed to engage, in use, with fixed latch hooks 4.1, one fixed latch hook being located on each side of the fixed

latch. As the sliding sub-assembly nears the end of its travel towards a fully latched configuration, the springs 6.2 contact the fixed latch hooks 4.1, as shown in Figure 14B. Continued movement of the sliding sub-assembly into the fully latched configuration puts spring 4.1 under tension, as shown in Figure 14C. The effect of this tension is to force the two adjacent chassis members together. This tensioning force is then present at all times until the chassis members are un-latched, and adds to the rigidity of the join. A compression spring suitable for use as a biasing means in this application can take a variety of forms, just one example being the deformable 'U'-shaped spring 6.2 shown in Figure 14. It will be understood that the biasing means can be located in any suitable position, not just as part of the sliding sub-assembly.

[0025] A cross-section of a connector assembly in an un-latched or fully retracted configuration is shown in Figure 13A and a cross-section of the same assembly in a latched or fully connected configuration is shown in Figure 13B.

[0026] The cross-sections shown in Figures 8 to 11 illustrate how the various components described above are retained by and operate within one or more chassis members. A cross-section of a typical chassis chamber is shown in Figure 8. The chassis member 7 consists of a cross-member or base portion 77, with two opposing side portions or side walls 78, 79. The cross-member gives both strength and rigidity to the chassis chamber construction, as well as creating two separate compartments, a lowermost-in-use or bottom portion and an uppermost-in-use or top portion. In this example the cross-member 77 is located nearer to the bottom or base of the chassis member, making the uppermost-in-use compartment the larger of the two compartments.

[0027] The angle of these side portions with respect to the base portion is important in that they form an obtuse angle with the base. That is to say the sides spay out away from the base such that the chassis member becomes narrower towards the bottom in the orientation as viewed in Figures 8 to 11. The base or lowermost-in-use bottom portion of the chassis extrusion is designed to accommodate an array of LEDs together with a lens or diffuser if required. This base portion can therefore also be considered as the light emitting portion, or the light emitting side of the chassis member. The top or uppermost-in-use portion of the chassis extrusion, between inwardly directed flanges 80, 81 is substantially open. This allows easy access into the upper part of the chassis for installing electrical or electronic components and for activating the latching and unlatching mechanisms by hand during the joining or un-joining procedure. Importantly, the unlatching mechanism is fully accessible from the top or uppermost-in-use portion of the chassis extrusion, without the need to remove or disturb any other components. Conversely, the unlatching mechanism is not accessible from the light emitting, base or lowermost-in-use bottom portion of the chassis extrusion, because the cross-member 77 substantially blocks access to it. There is therefore no need to disturb the array of LEDs or the lens or diffuser during the unlatching process.

[0028] Thus in this example the body of the chassis chamber or member is substantially trapezoidal in cross-section, if one considers the base, two sides and the open top and discounts the inwardly directed flanges 80 and 81, the cross-section approximating to a trapezium. It could also be described as substantially frustoconical in cross-section, that is to say it is shaped like an inverted frustum of a cone when viewed in cross-section in the 'in use' or suspended configuration, with the base or light emitting portion of the chassis chamber directed downwards into the space beneath it. It will be understood however that extruded chassis members with different cross-sections could be used equally well with connector arrangements according to the present invention.

[0029] In use, sub assembly extrusion 6 is slid inside the chassis member 7 and is retained by lugs 71, 72, 73, 74 on the chassis member which are held captive in corresponding channels 61, 62, 63, 64 in the sub-assembly extrusion as shown in Figure 10. The fixed latch portion 4 and fixed latch hooks 4.1 are accommodated in recesses 75 and 76 in the chassis member, as shown in Figure 11, and the fixed latch portion secured to the chassis member. Once the linear run of luminaires is completed, an end cap, not shown, can be added to each end of the run of luminaires as required.

[0030] A further important feature of the present invention is that an electrical connection can be made between adjacent chassis members, at the same time as the mechanical connection is made. A male electrical connector block 9 is attached to the receiving section sub-assembly as shown in Figure 4. A corresponding female electrical connector block 1 is attached to the sliding sub-assembly 22 as shown in Figures 3A and 3B. The female electrical connector block 1 is covered by a clip-on cover 2. The male and female connector blocks at opposing ends of the same chassis member are pre-wired to each other during manufacture to form the appropriate electrical connections for power and data as required, including connections to other electrical components that may be required within a fitting such as a luminaire chassis member. These include driver units, emergency lighting units and wireless interface modules (WIMs). It will also be appreciated that the location of the male and female connectors could equally well be reversed. A cable tidy 4.3 as shown in Figure 3B is designed to accommodate and secure cables associated with the electrical connector blocks, to ensure that these cables remain in place during movement of the sliding sub-assembly.

[0031] As the sliding sub-assembly 22 approaches and engages with the receiving section sub-assembly, so the electrical connector blocks start to engage with each other. Once the two chassis members are fully latched together the electrical connector blocks are fully engaged with each other and an electrical connection is made. A qualified electrician is not required to carry out this operation, which simply involves the connection of two plug

together connector blocks, without the need to touch either of the connector blocks. Importantly, this electrical connection cannot be broken accidentally and can only be broken when the unlatching mechanism is triggered.

Claims

1. A connector arrangement for joining two chassis members in end-to-end alignment to form a continuous chassis member, said connector arrangement comprising:-

   (i) a first chassis member having a first end and a second end;
   (ii) a second chassis member having a first end and a second end, in use the first end of the first chassis member to be joined to the second end of the second chassis member;
   (iii) a first connector assembly located substantially at or near the first end of the first chassis member, the first connector assembly incorporating a sliding sub-assembly, said sliding sub-assembly being slidable within the first chassis member between a retracted position and a connected or locked position;
   (iv) a second connector assembly comprising a receiving section sub-assembly located substantially at or near the second end of the second chassis member, the receiving section sub-assembly being adapted to receive the sliding sub-assembly;
   (v) a latching mechanism adapted to latch the sliding sub-assembly to the receiving section sub-assembly such that the first and second chassis members become firmly mechanically joined together;
   (vi) an unlatching mechanism adapted to unlatch the sliding sub-assembly from the receiving section sub-assembly;

   wherein the latching and unlatching mechanism can be operated by hand, without the use of tools.

2. A connector arrangement according to Claim 1 wherein when in the locked position the sliding sub-assembly extends into the body of the second chassis member, spanning the joint region between the first and second chamber members.

3. A connector arrangement according to Claim 1 or Claim 2 wherein the latching mechanism comprises a protrusion or snap hook on the sliding sub-assembly and a corresponding aperture on the receiving section sub-assembly, or vice versa.

4. A connector arrangement according to Claim 3 wherein the protrusion or snap hook incorporates a hooked or barbed end, in order to positively engage in the aperture.

5. A connector arrangement according to Claim 3 or Claim 4 wherein the unlatching mechanism comprises a moveable lever adapted to move the protrusion away from the aperture.

6. A connector arrangement according to any preceding claim wherein the unlatching mechanism comprises an unlock plate handle grip and an unlock handle.

7. A connector arrangement according to Claim 6 wherein the unlock plate handle grip and the unlock handle are both on the sliding sub-assembly.

8. A connector arrangement according to any preceding claim further comprising a compression spring tensioner adapted to maintain tension between the first and second chassis members to hold the two chassis members firmly together.

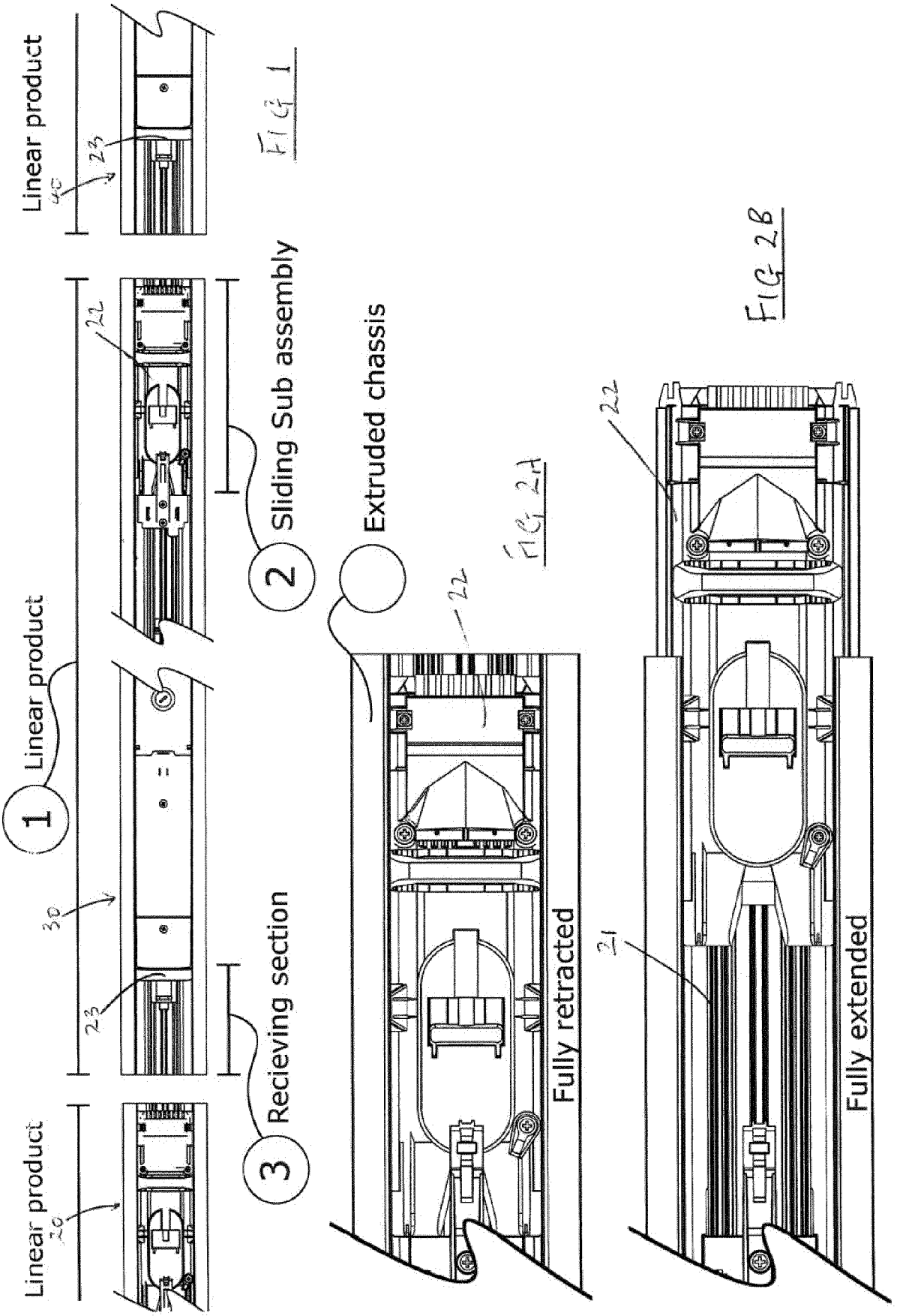
9. A connector arrangement according to Claim 8 wherein the compression spring is attached to or part of the sliding sub-assembly.

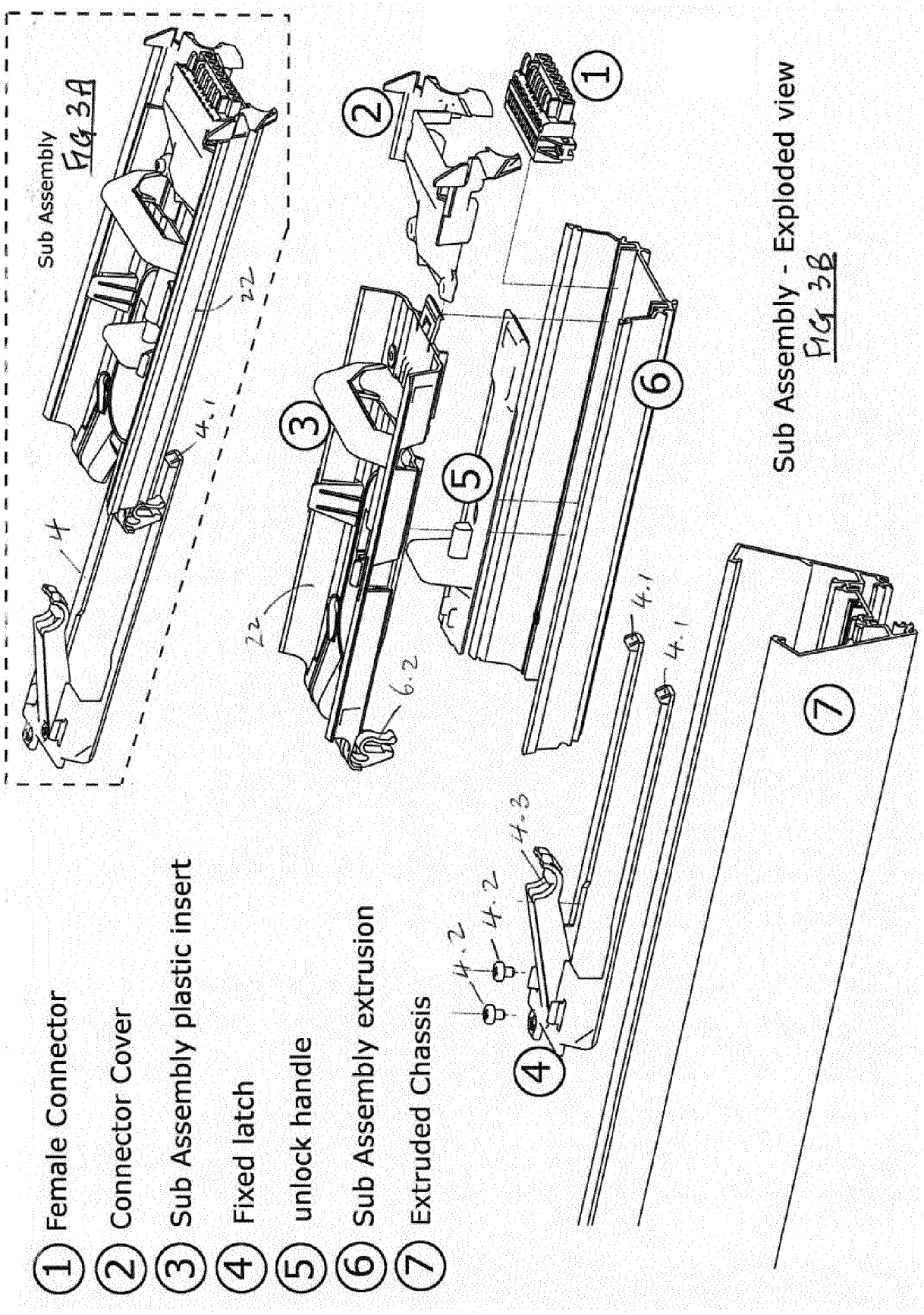
10. A connector arrangement according to any preceding claim wherein movement of the sliding sub-assembly is constrained such that in use the only movement the sliding sub-assembly can make is backwards and forwards along the linear axis of the chassis members.

11. A connector arrangement according to any preceding claim wherein the arrangement creates both mechanical and electrical connections between the joined chassis members.

12. A connector arrangement according to Claim 11 wherein the first connector assembly incorporates a female connector block and the receiving section sub-assembly incorporates a male connector block, or vice versa.

13. A connector arrangement according to Claim 12 wherein the male and female connector blocks are pre-wired with the required electrical and/or data cables.


Linear product
40
23
FIG 1
1
Linear product
30
23
22
2
Sliding Sub assembly
3
Recieving section
Linear product
20
Extruded chassis
22
FIG 2A
Fully retracted
22
FIG 2B
21
Fully extended


1 Female Connector
2 Connector Cover
3 Sub Assembly plastic insert
4 Fixed latch
5 unlock handle
6 Sub Assembly extrusion
7 Extruded Chassis
Sub Assembly
FIG 3A
Sub Assembly - Exploded view
FIG 3B
22
4.1
4.2
4.3
6.2

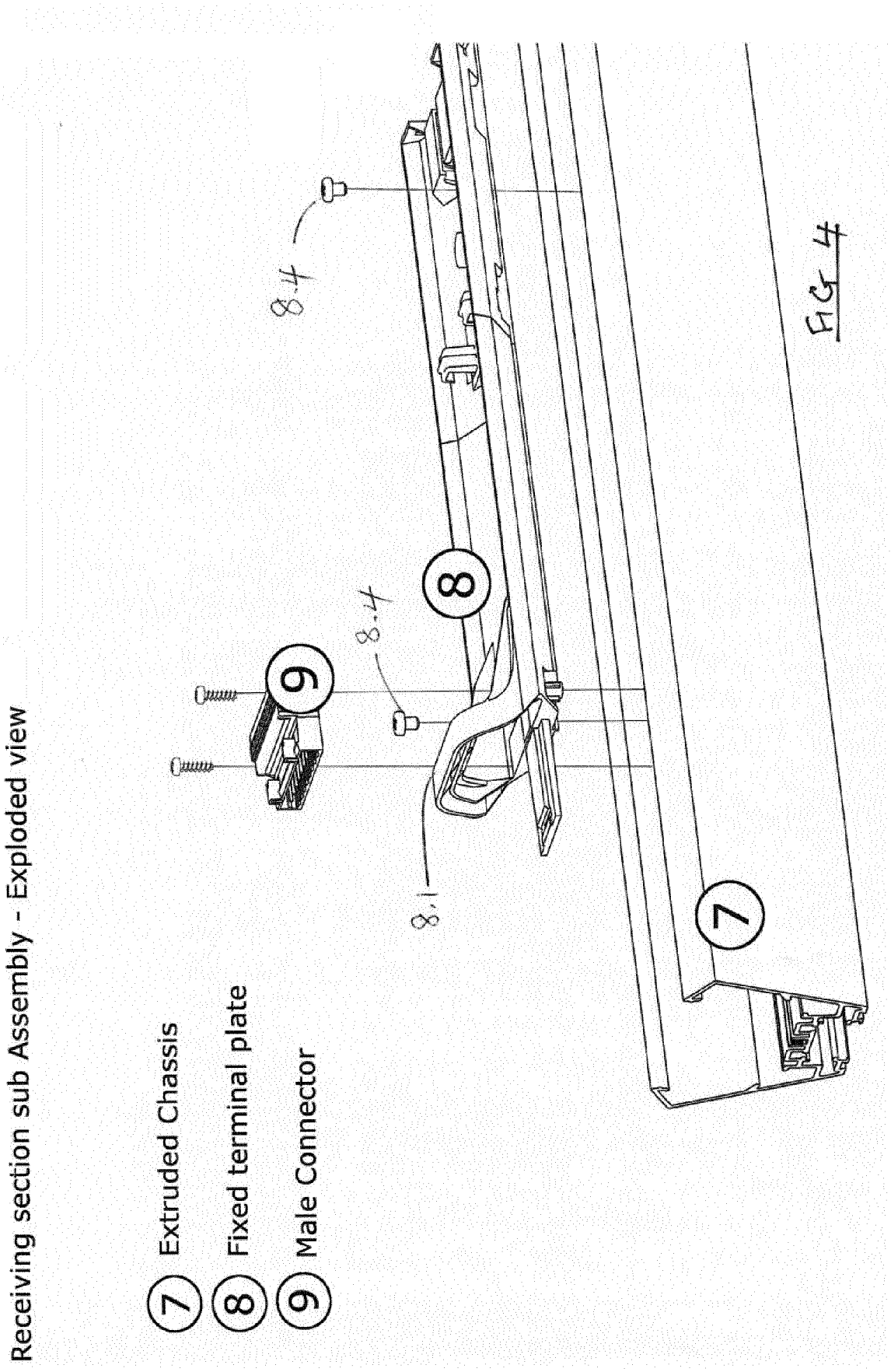

Receiving section sub Assembly - Exploded view
7 Extruded Chassis
8 Fixed terminal plate
9 Male Connector
8.4
8
8.4
9
8.1
7

FIG 4

4.1 Fixed latch hooks

5.1 Unlock handle plate
5.2 Unlock handle grip

6.1 Snap hook
6.2 Sliding sub assembly spring features
6.3 Sliding subassembly handle

8.1Fixed terminal plate handle
8.2 fixed terminal plate toung

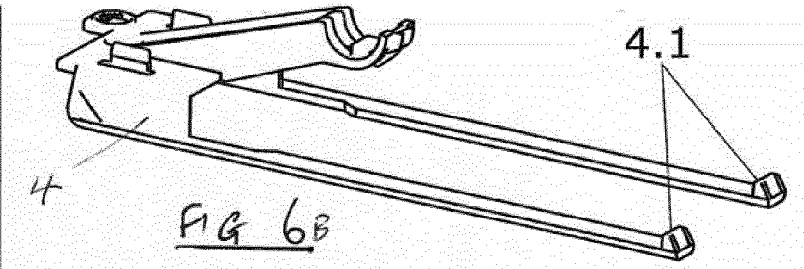


FIG 6B

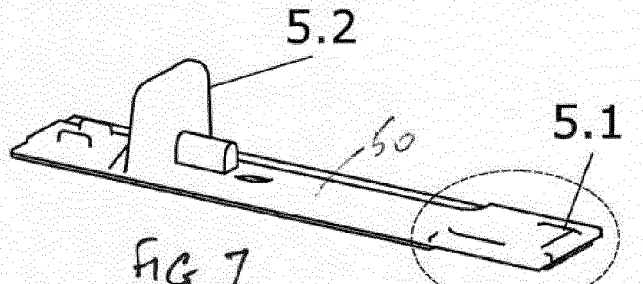
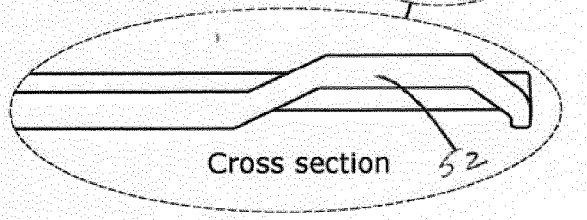


FIG 7



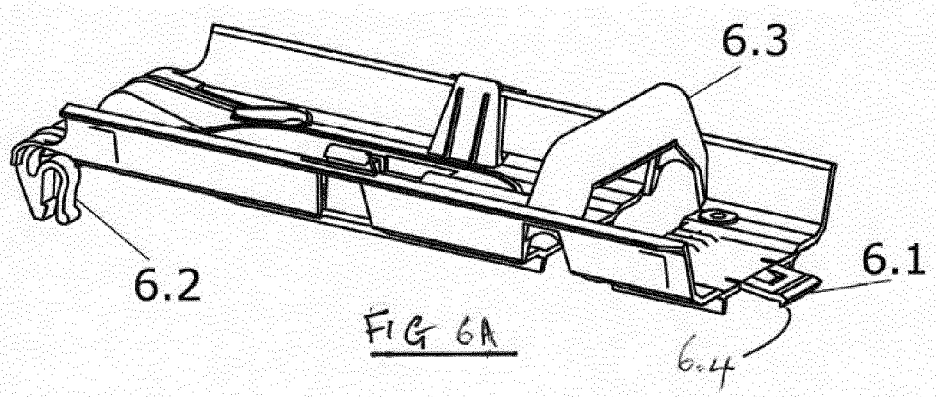


FIG 6A

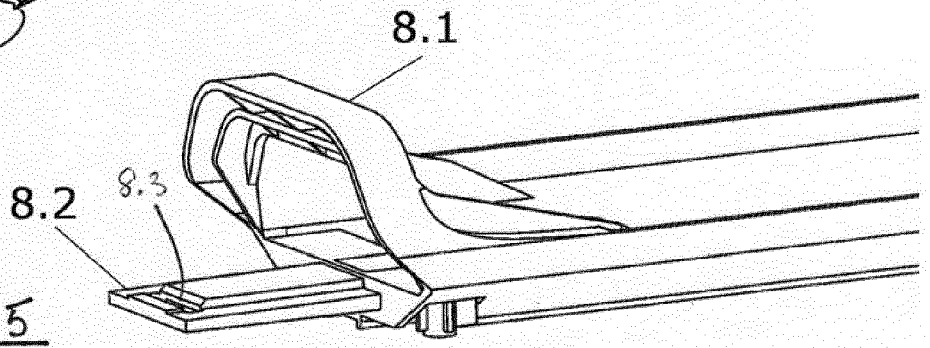
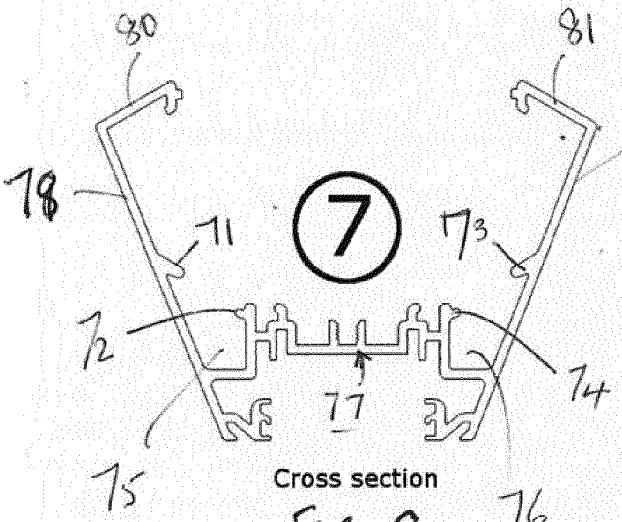


FIG 5

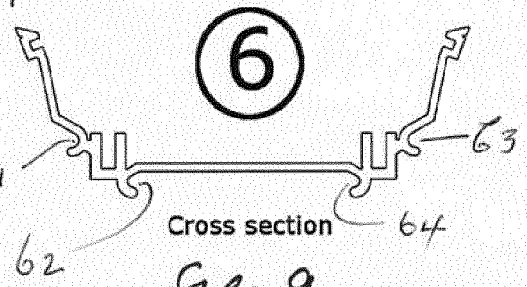
⑥ Sub Assembly extrusion

⑦ Extruded Chassis



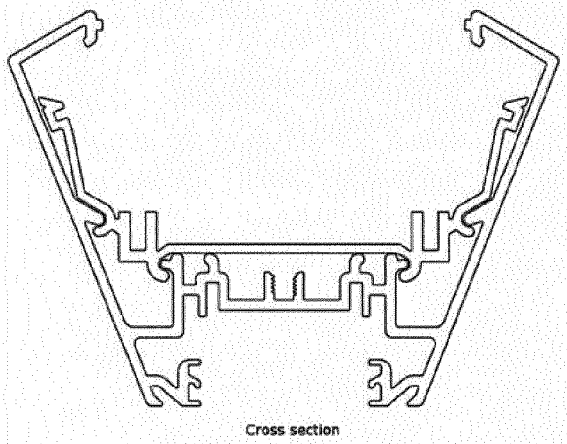
Cross section

FIG 8



Cross section

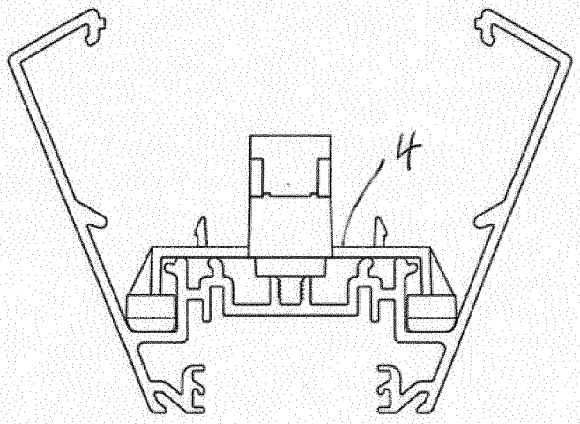
FIG 9



Cross section

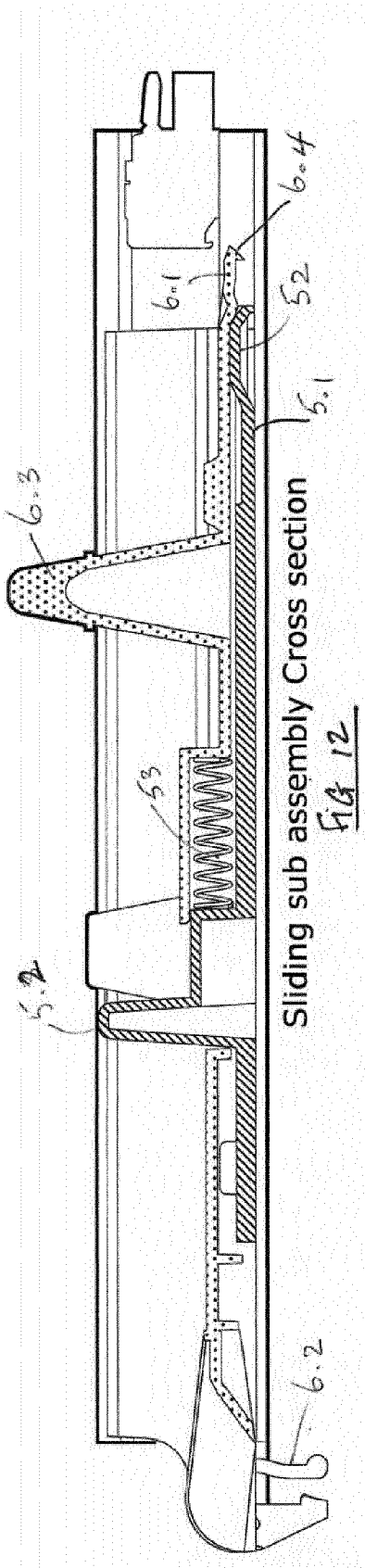
Sub assembly extrusion inside Chassis extrusion

FIG 10



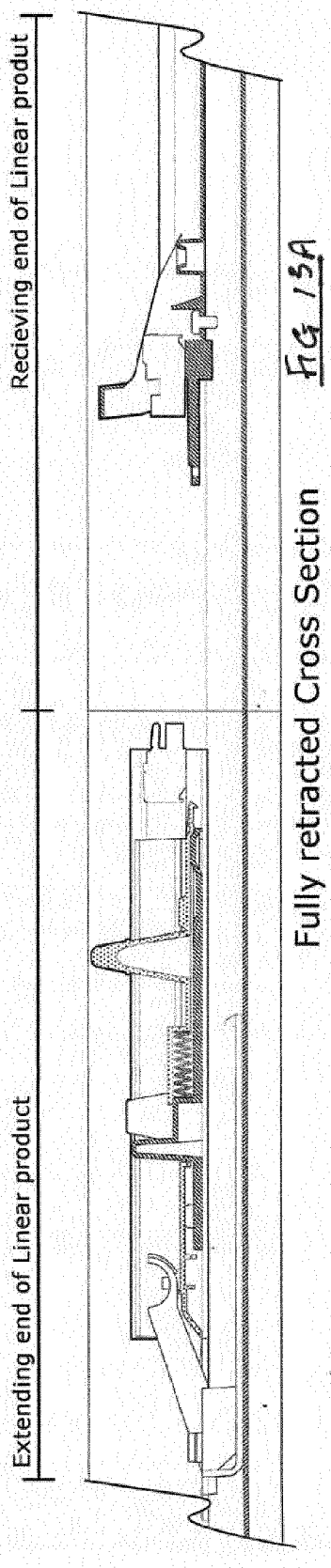
Fixed latch inside chassis extrusion

FIG 11



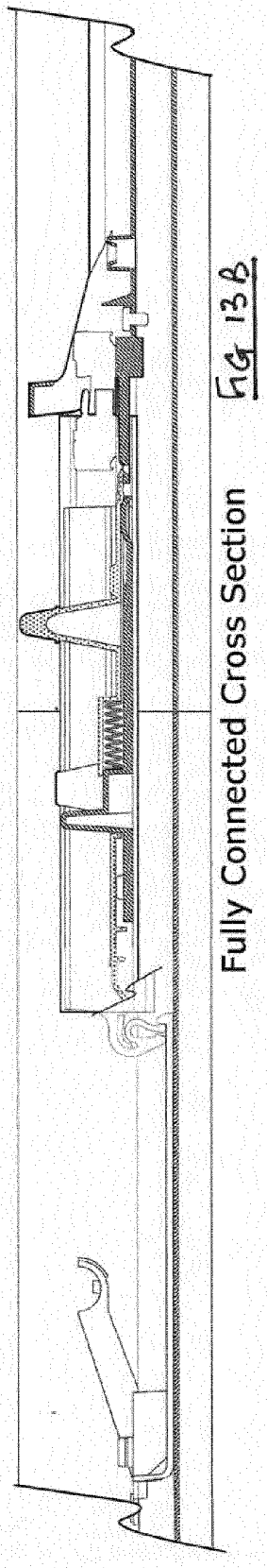
Sliding sub assembly Cross section

Fig 12



Fully retracted Cross Section

Fig 13A



Fully Connected Cross Section

Fig 13B

Sprung feature function

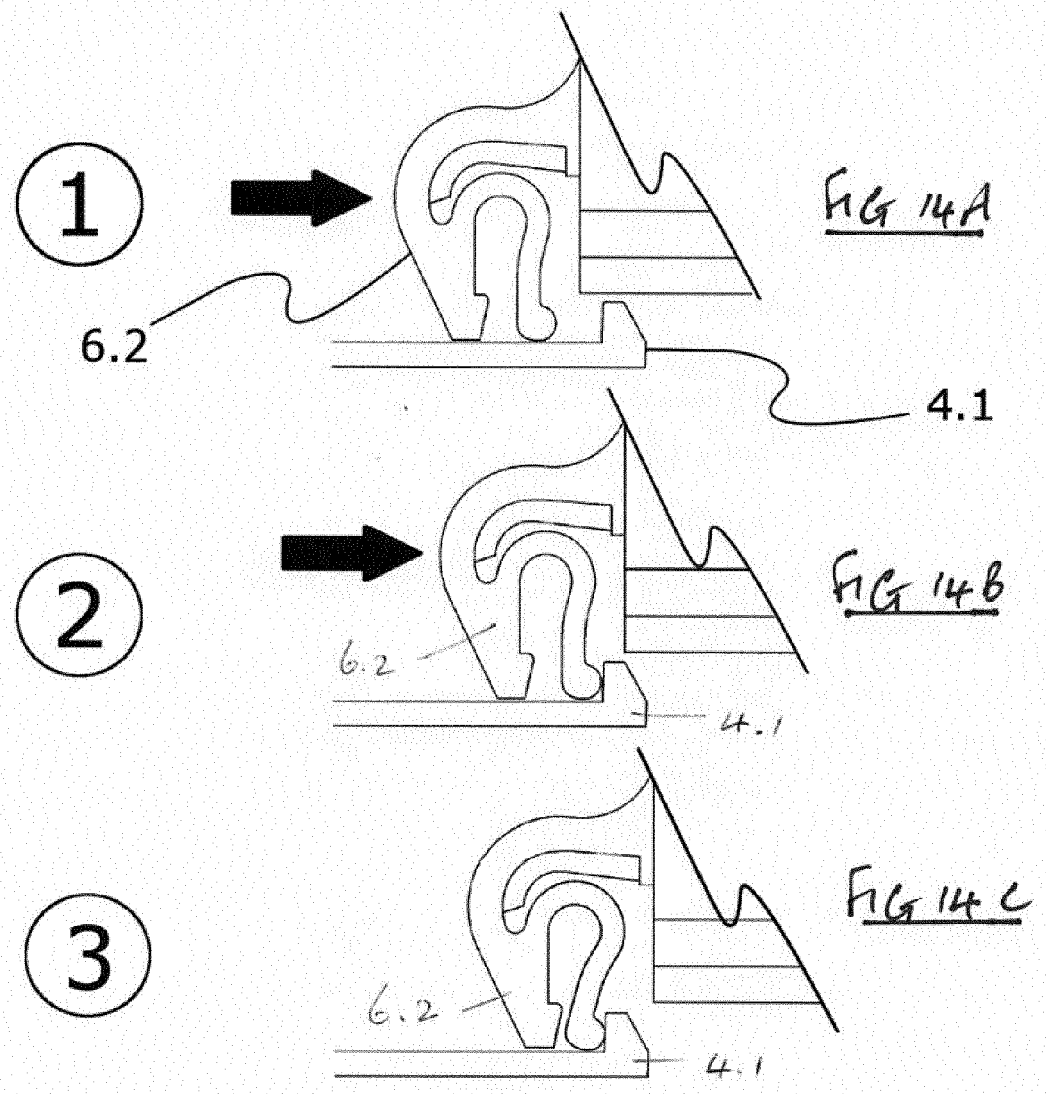


FIG 14A

FIG 14B

FIG 14C

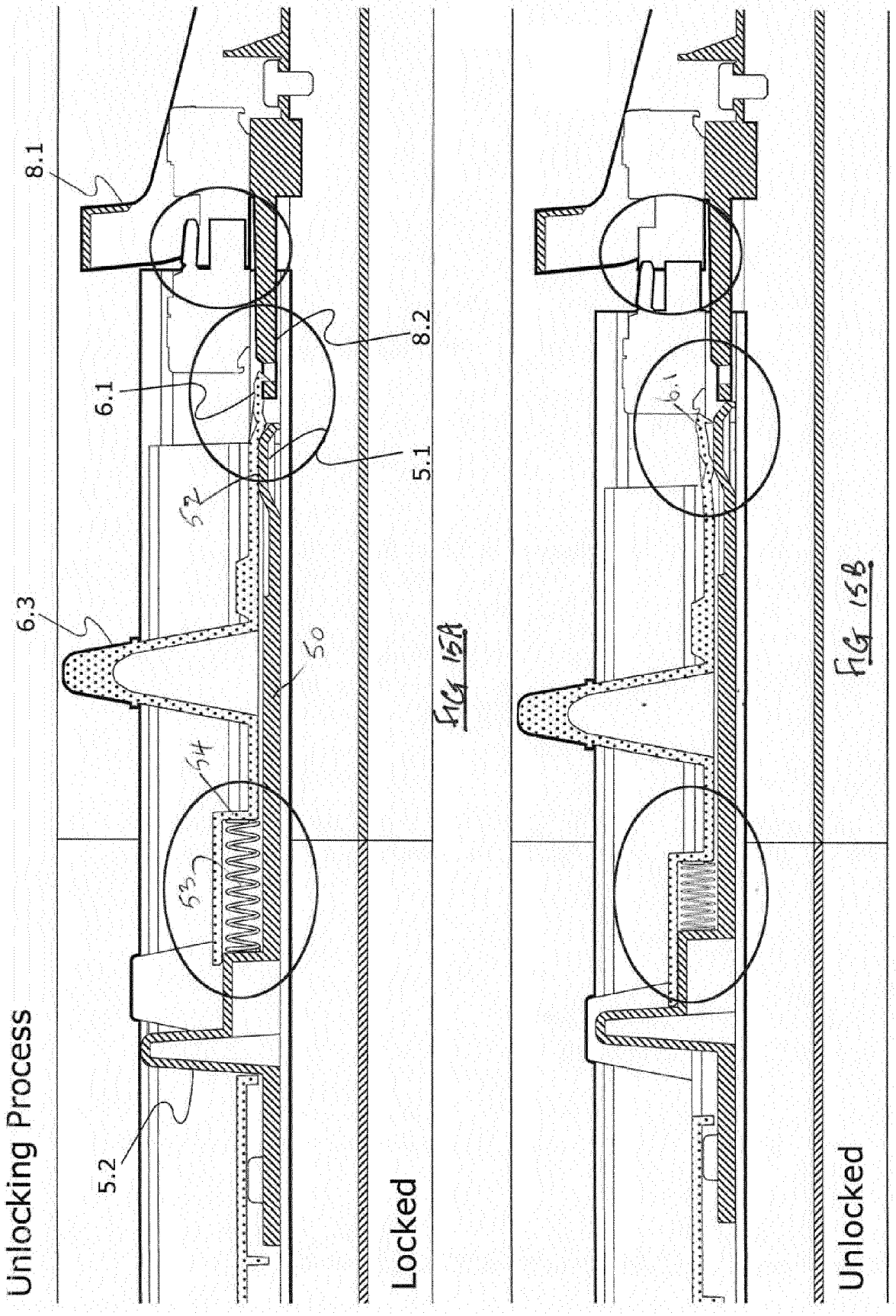


FIG 15A

FIG 15B

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 0913

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2016 101229 U1 (WILA GROUP LTD [GB]) 24 March 2016 (2016-03-24) * paragraph [0023] - paragraph [0037] * * figures 1-5 * -----	1,2,6,7, 10-13	INV. F21V21/005 F21V23/06 H01R13/627 H01R13/633

TECHNICAL FIELDS SEARCHED (IPC)

F21V
H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 June 2019	Blokland, Russell

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202016101229 U1	24-03-2016	NONE	

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- CN 206419736 U **[0006]**