



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication: **30.11.2011 Bulletin 2011/48** (51) Int Cl.: **E06B 1/60 (2006.01) E06B 1/36 (2006.01)**

(21) Application number: **11167823.1**

(22) Date of filing: **27.05.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **27.05.2010 DK 201070219**

(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

(72) Inventor: **Mikkelsen, Søren Martin**
6950 Ringkøbing (DK)

(74) Representative: **Münzer, Marc Eric**
Guardian IP Consulting I/S
Diplomvej, Building 381
2800 Kgs. Lyngby (DK)

(54) **A window assembly with two profile elements fastened together with a fastening device and a related method**

(57) A window assembly comprising a first profile element (101), a second profile element (102) and a fastening device (20), said two profile elements being fastened together by said fastening device (20), each of said two profile elements comprising at least one groove (103,104) and said fastening device (20) fastening the two profile elements together by engaging the at least one groove in the first profile element and the at least one groove in the second profile element. Said fastening device comprising the following elements: an elongated element (23) where a portion (27) of said elongated member located between the centre of the elongated member and said second end is formed with an external thread, a first engaging element (21) engaged with the grooves (103) in the first and second profile elements (101,102),

a second engaging element (22) engaged with the grooves (104) in the first and second profile elements (101,102), a first fixing member (36/37), a second fixing member (42/43), and a spring element (24). Where the fastening device (20) is arranged such that: said second engaging element (22) is arranged on said threaded portion (27), said first and/or said second fixing member (36/37,42/43) being arranged displaceably along the longitudinal axis of the elongated element and said spring element (24) being arranged to bias one of said first or second fixing members (36/37,42/43) towards or away from the other corresponding fixing member (42/43, 36/37), and said first engaging element (21) being arranged on said elongated element (23) between said first end (25) and said second engaging element (22).

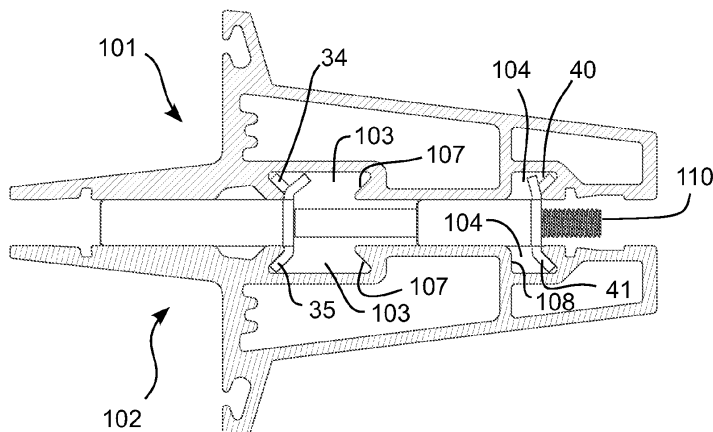


Fig. 8

Description

[0001] The current invention provides a window assembly comprising a first profile element, a second profile element and a fastening device where the two profile elements are arranged parallel to each other and fastened together by said fastening device. Each of said two profile elements comprise at least one groove running parallel to the longitudinal axis of the profile elements and said two profile elements being arranged such that the at least one groove in the first profile element faces the at least one groove in the second profile element. The fastening device fastens the two profile elements together by engaging the at least one groove in the first profile element and the at least one groove in the second profile element. The current invention also provides a method of fastening two profile elements together with a fastening device.

[0002] An example of profile elements which could be joined together with the fastening device of the current invention are profile elements for window frames. In most cases, window frames comprise four separate frame profile elements which are assembled into a rectangular window frame. In certain cases, it is desired to join two or more rectangular window frames together, for example to form a compound window. In one typical case, two identical window frames are joined side by side to form a compound window. The fastening device of the current invention is suitable for establishing the connection between the two adjacent frame profile members of such a compound window. The method of the current invention is suitable for forming the connection between the two adjacent frame profile members of such a compound window.

[0003] It should be noted that the profile elements of the window assembly or the method claimed in this specification do not necessarily both have to be profile elements of a window frame, but one of the profile elements could also be a post arranged in a window opening or a profile element arranged along an opening in a wall. For example, a profile element could be fastened to a side of a wall opening and the fastening device could then be used to fasten a profile element of a window frame to the profile element fastened to the side of a wall opening. Or a profile element could be arranged as a post arranged in a window opening. The fastening device could then be used to fasten a profile element of a window frame to the profile element arranged as a post.

Description of related art

[0004] Fastening devices of the kind described above are well known in the art. These can take on many different forms. Some typical examples are: US 7,434,364, US 7,543,412, US 3,430,997, US 4,497,148 and US 4,457,117. Another type of fastening device is disclosed in EP 0 459 653.

[0005] However, the prior art types of fastening devices

all suffer from different drawbacks. For example, some are difficult to install, others are not strong enough, others require multiple people to help install them, others are not suitable for use with window assemblies, etc...

Summary of the invention

[0006] It is therefore a first aspect of the current invention to provide a window assembly with two profile elements fastened together with a fastening device and a method for fastening two profile elements of a window assembly together which are better than the solutions provided in the prior art.

[0007] This is provided with a window assembly and a fastening device as provided according to the features of the independent claim 1.

[0008] Furthermore, a method of fastening a first and a second profile element of a window assembly together is provided according to the features of claim 10.

[0009] Additional features are provided according to the dependent claims.

[0010] It should be emphasized that the term "comprises/comprising/comprised of" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

Brief description of the drawings

[0011] In the following, the invention will be described in greater detail with reference to the embodiments shown by the enclosed figures. It should be emphasized that the embodiments shown are used for example purposes only and should not be used to limit the scope of the invention.

Figure 1 shows a schematic view of a compound window assembly comprising two window frames joined together with two fastening devices according to the current invention.

Figure 2 shows a schematic view of a compound window assembly comprising three window frames joined together with four fastening devices according to the current invention.

Figure 3 shows a perspective view of a first embodiment of a fastening device according to the current invention.

Figure 4 shows a side view of the fastening device of figure 3.

Figure 5 shows a top view of the fastening device of figure 3.

Figure 6 shows an exploded perspective view of the

fastening device of figure 3.

Figure 7 shows a side cross section view showing the fastening device of figure 3 fastened to a first profile element.

Figure 8 shows a side cross section view showing the fastening device of figure 3 fastening two profile elements together.

Figure 9 shows a side view of a second embodiment of a fastening device according to the current invention.

Figure 10 shows a top view of the fastening device of figure 9.

Figure 11 shows a side view of a third embodiment of a fastening device according to the current invention.

Figure 12 shows a top view of the fastening device of figure 11.

Figure 13 shows a side view of a fourth embodiment of a fastening device according to the current invention.

Figure 14 shows a top view of the fastening device of figure 13.

Figure 15 shows a side view of a fifth embodiment of a fastening device according to the current invention.

Figure 16 shows a top view of the fastening device of figure 15.

Detailed description of the embodiments

[0012] Figure 1 shows a first example of a compound window assembly 1 which comprises a first window frame 2 and a second window frame 3. The two window frames are each assembled from four profile elements joined together at the corners of the window frame. The first window frame 2 has a top frame element 4a, a bottom frame element 4c and two side frame elements 4b, 4d. The second window frame 3 has a top frame element 5a, a bottom frame element 5c and two side frame elements 5b, 5d. The left most side frame element 5d of the second window frame 3 is arranged adjacent the right most side frame element 4b of the first window frame 2. These two adjacent frame elements 4b, 5d are joined together with two fastening devices 6a, 6b. In this example, the frame elements are all formed as profile elements. By profile elements is meant an element having an essentially constant cross section along its length. A typical example of such a profile is an extruded or pultruded profile.

[0013] Figure 2 shows a second example of a compound window assembly 10 which comprises a first window frame 11, a second window frame 12 and a third window frame 13. The first window frame comprises four frame elements, a top frame element 14a, a bottom frame element 14c and two side frame elements 14b, 14d. The second window frame also comprises top 15a, bottom 15c and side frame elements 15b, 15d. Likewise the third window frame 13 comprises top 16a, bottom 16c and side frame elements 16b, 16d. The first, second and third window frames are arranged such that the right most frame element 14b of the first frame is arranged adjacent the left most frame element 15d of the second window frame 12 and the left most frame element 16d of the third window frame 13. Furthermore, the top frame element 16a of the third window frame 13 is arranged adjacent the bottom frame element 15c of the second window frame 12. The adjacent frame elements are fastened together with fastening devices 17a, 17b, 17c, 17d according to the current invention.

[0014] Figures 3, 4, 5 and 6 show different views of a first embodiment of a fastening device 20 according to the current invention. The fastening device 20 comprises a first engaging element 21, a second engaging element 22, an elongated element 23 and a spring element 24.

[0015] The elongated element has a first end 25 (which is the leftmost end in figure 3) and a second end 26 (which is the rightmost end in figure 3). The elongated element has an external threaded portion 27 which is located at the second end of the elongated element. The elongated element furthermore has a shoulder 28 arranged between the first end and the threaded portion. In this embodiment, the shoulder is formed as a transition between a portion of the elongated element which has a narrow diameter 29 and a portion of the elongated element which has a larger diameter 30. However, the shoulder could also be formed in different ways, for example a protrusion or ridge (not shown) which protrudes from the normal diameter of the elongated element.

[0016] The first engaging element 21 is slidably and rotatably arranged on the elongated element between the first end 25 and the shoulder 28. The spring element 24 is arranged to bias the first engaging element towards the shoulder 28. In this embodiment, the spring element is arranged as a compression spring which is arranged coaxially with the elongated element and compressed between the first end 25 and the first engaging element. The spring therefore will always apply a force to the first engaging element which presses the first engaging element towards the shoulder. In another embodiment (not shown), the spring element could be arranged as a tension spring which pulls the first engaging element towards the shoulder.

[0017] In the embodiment shown in figures 3-6, the fastening device is assembled in that the first engaging element is mounted on the elongated element, after which the spring is slid onto the elongated element. In order to hold the spring element in place, a washer is

applied on the elongated element and then the first end of the elongated element is compressed to form a back stop as shown at the first end of the elongated element in figures 3-6. This prevents the washer from falling off the first end of the elongated element. The spring element is now compressed between the washer and the first engaging element. If the first engaging element is displaced towards the first end, away from the shoulder, the spring element will be compressed and will attempt to push the first engaging element back towards the shoulder.

[0018] Due to the design of the first engaging element and the shoulder, the first engaging element cannot travel past the shoulder towards the second end of the elongated element. In addition, if the elongated element is displaced in a direction towards the first end, then the first engaging element will be forced to displace the same amount in the same direction.

[0019] The second engaging element is arranged with a through hole 31 formed with an internal thread. This thread matches the external thread 27 of the threaded portion of the elongated element 23. The second engaging element is mounted on the threaded portion of the elongated element. When the fastening device is delivered from the factory, the second engaging element will typically be arranged at the end of the threaded portion which is closest to the first end of the elongated element. In figures 3-5, the second engaging element is arranged close to the second end. In the case where a rotational motion about the longitudinal axis of the elongated element is applied to the elongated element, the second engaging element will displace along the elongated element either towards the first end or the second end depending on the direction of rotation.

[0020] In the embodiment of figures 3-6, the elongated element is shown as a single integrated element made from a single piece of material. However, in other embodiments (not shown), the elongated element could be assembled from multiple parts, for example a first sliding portion for the first engaging element and a second threaded portion, said first sliding portion and said second threaded portion being portions of different elements joined together. In one example, the connection between the two elements could be freely pivotable about the longitudinal axis of the elongated element.

[0021] In the current embodiment, the first and second engaging elements are each formed from a single piece of plate material which is stamped and bent into the appropriate shape. In this type of manufacturing method, a number of flanges are formed which protrude in different angles. Within the scope of the current invention, manufacturing methods which are different from stamping/bending plate material could be imagined. For example, the first and second engaging elements could be injection moulded or forged as a more complex element. In these types of manufacturing methods, flanges are not typically used, but other elements equivalent to flanges would be used. The scope of protection of the current invention is defined in some of the claims of this specification on the

basis of the term flanges, however, the person skilled in the art should interpret the word "flange" to include all elements which fulfil the same function as the flange mentioned in the claim.

[0022] The first engaging element has a main body portion 32 which is arranged essentially perpendicular to the longitudinal axis of the elongated element. The main body portion has a hole 33 which goes through the centre of the main body portion and through which the narrow portion 29 of the elongated element projects. The main body portion in the current embodiment is rectangular and elongated. On one side of a plane A which goes through the longitudinal axis C of the elongated element and the longitudinal axis D of the main body portion, is arranged a first flange 34 and on the other side of said plane A, is arranged a second flange 35. The first and second flanges are essentially arranged on planes which have vector components which are parallel to the longitudinal axis D of the main body portion. In the current embodiment, the angle between the two flanges is 90 degrees when measuring from the first end of the elongated element. When measured from the second end of the elongated element, the angle between the two flanges is 270 degrees. The angle between the longitudinal axis C of the elongated element and the two flanges is 45 degrees in the current embodiment when measured from the first end of the elongated element and 135 degrees when measured from the second end of the elongated element.

[0023] In the current embodiment, the angle between the flanges is about 90 degrees, but in other embodiments angles between 20 and 180 degrees could be imagined. The angle of the flanges can be chosen to fit with the angle of a groove in which the engaging element will engage when fastened to a profile element. In the current example, the groove is a dovetail groove which fits with the 45 degree angle of the first and second flanges.

[0024] The first engaging element furthermore has a third flange 36 and a fourth flange 37. The third and fourth flanges are arranged on the same plane and form an angle to the longitudinal axis C of the elongated element of 40 degrees when measured from the second end of the elongated element in the current embodiment. The third and fourth flanges are arranged on the same side of the plane A as the first flange 34. There are no flanges equivalent to the third and fourth flanges on the same side of the plane A as the second flange 35. The reason for this will be explained later on with regards to figures 7 and 8. In the language of the claims, the third and fourth flanges 36, 37 can be considered as "fixing members" which are formed as integrated components of the first engaging element.

[0025] The first engaging element also has two "spacing" flanges 38, 39 arranged one at each end of the main body portion. The two spacing flanges in this embodiment form an angle to the main body portion of around 95 degrees when measured from the centre of the main body portion, but could assume angles between 20 and 160

degrees.

[0026] The second engaging element 22 is for the most part the same as the first engaging element 21. However, the second engaging element has its own first 40, second 41, third 42 and fourth 43 flanges. In the current embodiment, the first and second flanges of the second engaging element are mirror images of the first and second flanges of the first engaging element (mirrored about a plane which is perpendicular to the longitudinal axis of the elongated element. In this particular embodiment, the first and second flanges of the second engaging element are arranged at an angle to each other of 90 degrees when measured from the second end of the elongated element and 270 degrees when measured from the first end of the elongated element. The third and fourth flanges 42, 43 form an angle of around 80 degrees to the longitudinal axis of the elongated element when measured from the first end of the elongated element. In general, the first and second flanges of the first and second engaging elements point away from each other and the third and fourth flanges of the first and second engaging elements point towards each other. As with the first engaging element, the third and fourth flanges 42, 43 of the second engaging element can be considered as "fixing members" which are integrally formed with the second engaging element.

[0027] The second engaging element also has two spacing flanges 44, 45. The spacing flanges of the second engaging element are arranged pointing towards the first engaging element and the spacing flanges of the first engaging element are arranged pointing away from the second engaging element.

[0028] In figures 7 and 8, the method of assembling two profile elements is shown in more detail. In the embodiment shown in figures 7 and 8, the profile elements are two frame elements of two separate window frames. In figure 7 the fastening device 20 is fastened to a first frame element 101. A second frame element 102 is arranged beside the first frame element but not connected to it yet. In figure 8, the first and second frame elements are connected together by the fastening device 20.

[0029] As can be seen from the figures, both the first and the second frame elements have a first 103 and a second groove 104. The first and second grooves are formed in the "outer" surface 105 of the frame element. The "outer" surface is the surface which would face the periphery of the window opening when the window frame is mounted in a window opening. When assembling a compound window, two window frames are joined together via their outer surfaces.

[0030] The first groove 103 is a dovetail groove with a first side surface 106 and a second side surface 107, both side surfaces being arranged at an angle of about 45 degrees to the outer surface 105. The second groove 104 is arranged as a half dovetail groove where a first side surface 108 of the groove forms an angle of 90 degrees to the outer surface and the second side surface 109 of the groove forms an angle of 45 degrees to the

outer surface. It should be noted that the first side surface 106 of the first groove 103 and the second side surface 109 of the second groove can be called the "outermost" side surfaces as they are furthest from the centre line of the profile element. Likewise, the second side surface 107 of the first groove and the first side surface 108 of the second groove can be called the "innermost" side surfaces of the grooves.

[0031] It should be noted that according to this specification, when discussing the groove, the term "groove side surface" is used. In general, a groove will have three surfaces, two side surfaces and one bottom surface. While grooves can come in many shapes and sizes, it is maintained that the person skilled in the art can define three surface portions of a groove which could be identified with the terms side surface and bottom surface.

[0032] The term opposing groove side surfaces should be understood as groove side surfaces about which a clamp can be arranged. For example, in figure 7, the surface 106 of the first groove 103 and the surface 109 of the second groove 104 would be considered opposing groove side surfaces. The same is true for surface pairs 106/107, 107/108, and 108/109. It should be noted that surface pair 106/107 would require a clamp having clamping parts which are pressed away from each other, whereas surface pair 107/108 would require a clamp having clamping parts which are pressed towards each other. Both sets of surface pairs would be considered to be opposing groove side surfaces.

[0033] In figure 7, the fastening device 20 has been fastened to the first frame element 101. In order to attach the fastening device 20 to the first frame element, the following procedure is used. From the factory, the fastening device is delivered so that the second engaging element 22 is at the end of the threaded portion 27 which is closest to the first end 25 of the elongated element 23. The first engaging element 21 has then been displaced towards the first end 25 of the elongated element against the force of the spring element 24 such that the first engaging element can be inserted into the first groove 103 and the second engaging element can be inserted into the second groove 104. This can for example be done by holding the fastening device with ones fingers around the first engaging element and ones thumb on the first end 25 of the elongated element.

[0034] Once both engaging elements are in their respective grooves, the first engaging element is released and due to the spring element, the first engaging element is displaced towards the second engaging element. In this way, the third and fourth flanges 36, 37 of the first engaging element come to rest against the second surface 107 of the first groove and the third and fourth flanges 42, 43 of the second engaging element 22 come to rest against the first surface 108 of the second groove 104. In this way, the fastening element 20 is held in place on the first frame element 101. The third and fourth flanges 36, 37, 42, 43 are called "fixing members" in the claims, since they "fix" the fastening device on the first profile

element during the assembly process. This is in contrast to the first and second flanges 34,35,40,41 which can be considered as engaging members of the "engaging elements" since they "engage" with the grooves and hold the profile elements together when the fastening device is engaged with both profile elements.

[0035] The second frame element 102 can now be brought up against the fastening device as shown in figure 8. By holding the second frame element against the fastening device, the spacing flanges 38,39,44,45 of the first and second engaging elements, determine the proper spacing between the first and second frame elements. In addition, the friction between the first and second frame elements and the spacing flanges, ensures that the fastening device doesn't move during the assembly process.

[0036] It should be noted that when the second frame element is brought up against the first frame element, portions of the first and second engaging elements are also inserted into the first and second grooves of the second frame element. In particular, the second flanges 35, 41 of the first and second engaging elements are inserted into the first and second grooves 103, 104 of the second profile element respectively.

[0037] Once the second frame element is in place as shown in figure 8, a hex key is inserted between the two frame elements and into the hex socket 110 in the elongated element at its second end. By turning the hex key, the second engaging element is displaced along the elongated element towards the second end 26 of the elongated element or seen from another reference point, the elongated element will start to displace in a direction such that the distance between its first end 25 and the second engaging element increases. Due to the form of the shoulder 28, once the shoulder comes into contact with the first engaging element, the shoulder will press against the first engaging element 21 and force the first engaging element to displace away from the second engaging element. By turning the hex key further in the correct direction, the second engaging element will displace further towards the second end 26 of the elongated element and away from the first engaging element. As the engaging elements displace, the first and second flanges 40,41 of the second engaging element will come into contact with the second surfaces 109 of the second groove 104 of the first and second frame elements respectively and the first and second flanges 34,35 of the first engaging element 21 will come into contact with the first surfaces 106 of the first grooves 103 of the first and second frame elements. Further turning of the hex key will tighten the connections between the first and second engaging elements and the first and second frame elements. After sufficient tightening, the first and second frame elements will be firmly connected by the fastening device.

[0038] It should be noted that the fastening device in this example has a discontinuous behaviour such that the wording of claim 1 is not fulfilled in all orientations/positions of the fastening device. For example feature i) of claim 1 is not fulfilled in the position of the fastening

device shown in figure 7. However, it should be clear to the person skilled in the art that after rotating the elongated element of the embodiment of figure 7 until the shoulder 28 is in contact with the first engaging element 21, then feature i) would be fulfilled. It should therefore be emphasized that as long as a fastening device fulfils the wording of the claim in some positions/orientations, then the fastening device would be included in the scope of protection of the claim.

[0039] In general, it can be noted that the fastening device according to the invention provides the function that the fastening device can easily be "snapped" into engagement with the first profile element and held in place via the fixing members and the spring force while the second profile element is brought into position. The second profile element can be placed into position without disrupting the placement of the fastening device on the first profile element. Then the profile element can be activated by rotating the elongated element so that the engaging elements displace and engage the grooves of the first and second profile elements.

[0040] Figures 9-16 show four additional embodiments of a fastening device according to the invention. Since many of the features of the additional embodiments are similar to the first embodiment 20, these additional embodiments will only be described briefly as the person skilled in the art should be able to understand the functionality of these additional embodiments based on this short description plus the more detailed description of the first embodiment.

[0041] The fastening device 200 shown in figures 9 and 10 comprises a first engaging element 201 and a second engaging element 202. In contrast to the first embodiment where the engaging elements each had three main flanges 34,35,36/37 which engaged with the grooves in the profile elements, the engaging elements of this embodiment only have two flanges each. However, this second embodiment has two independent fixing elements 203,204. The fixing elements each comprise a flange which points to the first and second end respectively and arranged on one side of the elongated element. The flange of the fixing elements can be considered to be a fixing member which is arranged on the fixing element and therefore independently displaceable from the engaging element. The fixing elements are arranged on the "outside" of the fastening elements 201, 202 such that the engaging elements are arranged between the fixing elements. The fixing elements are arranged freely displaceable along the longitudinal axis of the elongated element. A first spring element 205 biases the first fixing element 203 away from the first engaging element 201 and a second spring element 206 biases the second fixing element 204 away from the second engaging element 202.

[0042] In this embodiment, both the first and second engaging elements are mounted on threaded portions 207, 208 of the elongated portion 209. The two threaded portions are arranged with opposite thread directions, so

that when the elongated portion is rotated, the first and second engaging elements will be forced away from each other or towards each other depending on the direction of rotation of the elongated element.

[0043] When the fastening device is to be mounted on the first profile element, the first and second fixing elements are displaced towards each other such that the flanges of the first and second fixing elements can be placed into the two grooves. When the fixing elements are released, they will press onto the outermost surfaces of the two grooves, thereby holding the fastening device in place on the first profile element. A second profile element with two corresponding grooves is then placed adjacent the first profile element. Since the first engaging element and the second engaging element are displaced towards the centre of the elongated portion as shown in figure 9, the flanges of the first and second engaging elements can be easily arranged in the grooves of the second profile element. The elongated portion can then be rotated in the direction which causes the first and second engaging elements to displace away from each other. Once the flanges of the first and second engaging elements come into contact with the outermost surfaces of the grooves of the first and second profile elements and the fastening device tightened further, the fastening device establishes a strong connection between the first and second profile elements.

[0044] The embodiment 300 shown in figures 11 and 12 are in a certain respect the opposite of the embodiment shown in figures 9 and 10. In this embodiment, the first and second fixing elements (301,302) are placed between the first and second engaging elements (303,304). The first and second fixing elements are biased towards each other by a tension spring element 305. When mounting, the first and second fixing elements are displaced away from each other then snapped onto the innermost surfaces of the grooves of the first profile element. In this way, the fastening device is held in place on the first profile element while the engaging elements are again displaced away from each other to establish a strong connection between the two profile elements.

[0045] The embodiment 400 shown in figures 13 and 14 is very similar to the embodiment shown in figures 11 and 12. Instead of a tension spring element which pulls the two fixing elements towards each other, the embodiment of figures 13 and 14 has two compression spring elements 401, 402 arranged between the fixing elements and the fastening elements. In this way, the fixing elements are biased towards each other by the two compression springs.

[0046] The embodiment 500 shown in figures 15 and 16 is a combination of the embodiment shown in figures 13 and 14 and the embodiment shown in figures 3-6. In this embodiment, a first engaging element 501 is mounted on a threaded portion 502 of an elongated element 503. When the elongated element 503 is rotated, the first engaging element 501 will displace along the threaded portion. A first fixing element 504 is displaceably mounted

on the elongated portion. A first spring element 505 biases the first fixing element away from the first engaging element. A second engaging element 506 is mounted freely rotatable, but axially constrained, at the second end 507 of the elongated element. As can be seen from the figures the second engaging element 506 is formed with an integrated fixing member 508 similar to the second engaging element 22 of the first embodiment of the fastening device shown in figures 3-6.

[0047] When mounting the fastening device 500, the fixing member 508 of the second engaging element is first arranged in the second groove 104 of the first profile element 101. The fixing element 504 is then retracted towards the first engaging element 501 such that the first engaging element and the first fixing element can be inserted into the first groove 103 of the first profile element. When the first engaging element is arranged in the first groove, the first fixing element can be released whereby the first fixing element 504 and the fixing member 508 of the second engaging element hold on to the innermost surfaces of the first and second grooves.

[0048] The elongated element 503 can then be rotated thereby forcing the first engaging element away from the second engaging element. This causes the first and second engaging elements to come into contact with the outermost surfaces of the first and second grooves. Sufficient tightening of the fastening device will ensure a good connection between the two adjacent profile elements. It should be noted that when comparing to the claims, the first engaging element 501 would be the "second engaging element" as defined in the claims, the second engaging element 506 would be the "first engaging element" as defined in the claims and the second end 507 would be the "first end" as defined in the claims.

[0049] It is to be noted that the above described embodiments have shown the first and second engaging elements displacing outwardly to engage with the outermost surfaces of the grooves. However, it would also be possible to provide a fastening device according to the current invention where the first and second engaging elements displace towards each other to engage with the innermost surfaces of the grooves in the position where the fastening device forms a connection between two profile elements. It should also be noted that the above described embodiments have been described together with profile elements having two grooves. However, the scope of protection of the present claims should also extend to window assemblies having only one groove per profile element. For example, the embodiment of a fastening device shown in figures 9 and 10 would be suitable for such a profile element since both the fixing members and the engaging elements move away from each other to engage with the groove side surfaces.

[0050] It is also to be noted that within the scope of the current invention, the engaging elements could be comprised of multiple parts. For example, in one embodiment (not shown) an engaging element could be comprised of a first flange which is moveable with respect to the elon-

gated element and which engages with the first profile element and a second flange which engages with the second profile element and which is moveable with respect to the first moveable flange. The first flange could be arranged freely displaceable with respect to the elongated element while the second flange could be arranged on an external threaded portion of the elongated element so that rotation of the elongated element causes displacement of the second flange. A spring element could furthermore be arranged between the first and second flanges. In this way, the first flange could be considered as both a first fixing member as well as one of the engaging members of the engaging element.

[0051] It is to be noted that the figures and the above description have shown the example embodiments in a simple and schematic manner. Specific mechanical details have not been shown since the person skilled in the art should be familiar with these details and they would just unnecessarily complicate this description. Furthermore the embodiments shown in figures 9-16 have not been properly designed and are just disclosed to provide an indication of different possible embodiments according to the invention.

Claims

1. A window assembly comprising a first profile element (101), a second profile element (102) and a fastening device (20), said two profile elements being arranged parallel to each other and fastened together by said fastening device (20), each of said two profile elements comprising at least one groove (103,104) running parallel to the longitudinal axis of the profile elements, said two profile elements being arranged such that the at least one groove in the first profile element faces the at least one groove in the second profile element and said fastening device (20) fastening the two profile elements together by engaging the at least one groove in the first profile element and the at least one groove in the second profile element, said fastening device comprising the following elements:

- a. an elongated element (23) being arranged with its longitudinal axis perpendicular to the longitudinal axes of the first and second profile elements (101,102) and having a first end (25) and a second end (26) and where a portion (27) of said elongated member located between the centre of the elongated member and said second end is formed with an external thread,
- b. a first engaging element (21) engaged with one of the groove side surfaces (106) of one of the at least one groove (103) in the first profile element (101) and with one of the groove side surfaces (106) of one of the at least one groove (103) in the second profile element (102),

c. a second engaging element (22) engaged with one of the groove side surfaces (109) of one of the at least one groove (104) in the first profile element (101) and with one of the groove side surfaces (109) of one of the at least one groove (104) in the second profile element (102), said second engaging element (22) being engaged with groove side surfaces (109) which are opposing the groove side surfaces (106) with which the first engaging element (21) is engaged,

d. a first fixing member (36/37),

e. a second fixing member (42/43), and

f. a spring element (24),

and where the fastening device (20) is arranged such that before being engaged with the first and second profile element:

g. said second engaging element (22) is arranged on said threaded portion (27), such that when said threaded portion is rotated about its longitudinal axis said second engaging element will displace towards or away from said second end (26) depending on the direction of rotation of the elongated element,

h. said first and/or said second fixing member (36/37,42/43) being arranged displaceably along the longitudinal axis of the elongated element and said spring element (24) being arranged to bias one of said first or second fixing members (36/37,42/43) towards or away from the other corresponding fixing member (42/43, 36/37), and

i. said first engaging element (21) being arranged on said elongated element (23) between said first end (25) and said second engaging element (22), such that when said elongated element is rotated about its longitudinal axis, the distance between the first and second engaging elements will either increase or decrease depending on the direction of rotation of the elongated element.

2. A window assembly according to claim 1, **characterized in that** the fastening device (20) is designed such that it can be put into at least two positions, a first position where the first and second fixing members (36/37, 42/43) are pressed against opposing groove side surfaces (107,108) of the at least one groove (103,104) in the first profile element (101) by the force of the spring element thereby fastening the fastening device to the first profile element while the first and second engaging elements (21,22) are not engaged with the at least one groove (103,104) of the second profile element (102) and a second position where the first and second engaging elements (21,22) are engaged with opposing groove side surfaces (106,109) of the at least one groove (103,104) in both the first and second profile elements (101,102).

3. A window assembly according to claim 1 or 2, **characterized in that** said first fixing member (36/37) is an integrated component of said first engaging element (21) and/or said second fixing member (42/43) is an integrated component of said second engaging element (22). 5
4. A window assembly according to claim 1 or 2 or 3, **characterized in that** said first fixing member (203) is arranged as a discrete first fixing element (203) independently displaceable from the first engaging element (201) and/or said second fixing member (204) is arranged as a discrete second fixing element (204) independently displaceable from the second engaging element (202). 10
5. A window assembly according to any one of claims 1-4, **characterized in that** said first fixing member (36/37;301) and said second fixing member (42/43; 302) are located between said first and second engaging elements (21,22;303,304) and the spring element (24; 305) is arranged to bias the two fixing members towards each other. 20
6. A window assembly according to any one of claims 1-4, **characterized in that** said first and second engaging elements (201,202) are arranged between said first and second fixing members (203,204) and **in that** the spring element (205,206) is arranged to bias the two fixing members away from each other. 25 30
7. A window assembly according to any one of claims 1-6, **characterized in that** a portion (28) of said elongated member (23) located between said first end (25) and said threaded portion (27) is formed with a shoulder (28) and that said first engaging element (21) is arranged between said first end (25) and said shoulder (28), said shoulder (28) being arranged such that said first engaging element (21) cannot displace past the shoulder towards said second end (26). 35 40
8. A window assembly according to any one of claims 1-7, **characterized in that** said first engaging element (21) has a first flange (34) and a second flange (35), the planes essentially comprising said first flange and said second flange forming an angle to each other which is between 20 and 180 degrees when measured from the side of the first end (25) of the elongated element (23) and **in that** said second engaging element (22) has a first flange (40) and a second flange (41), the planes essentially comprising said first flange and said second flange forming an angle to each other which is between 20 and 180 degrees when measured from the second end (26) of the elongated element (23). 45 50 55
9. A window assembly according to any one of claims 3-8, **characterized in that** said first fixing member is a third flange (36/37) of said first engaging element (21) which forms an angle to the longitudinal axis of the elongated element (23) of between 10 and 90 degrees when measured from the second end (26) of the elongated element (23) and **in that** said second fixing member is a third flange (42/43) of said second engaging element (22) which forms an angle to the longitudinal axis of the elongated element (23) of between 10 and 90 degrees when measured from the first end (25) of the elongated element (23).
10. A method of fastening a first and a second profile element of a window assembly together, said method comprising the following steps:
 - a. providing a first profile element (101), said profile element comprising at least one groove (103, 104) along one surface (105) of the profile element, said at least one groove being arranged parallel to the longitudinal axis of the first profile element,
 - b. providing a fastening device (20), for example a fastening device as described in any one of claims 1-9,
 - c. displacing a first fixing member (36/37) of said fastening device away from (or towards) a second fixing member (42/43) of said fastening device against the force of a spring element (24),
 - d. then placing the fastening device (20) against the first profile element (101) such that a portion (36/37) of said first fixing member and a portion (34) of a first engaging element (21) of said fastening device are arranged in one of the at least one groove (103) of the first profile element (101) and that a portion (42/43) of the second fixing member and a portion (40) of a second engaging element (21) of said fastening device are arranged in one of the at least one groove (104) of the first profile element (101),
 - e. then releasing the fastening device (20), such that the spring element (24) forces the first fixing member (36/37) towards (or away) from the second fixing member (42/43), said first fixing member (36/37) and said second fixing member (42/43) thereby engaging opposing groove side surfaces (107,108) of the at least one (103,104) groove,
 - f. then providing a second profile element (102), said second profile element comprising at least one groove (103,104) along one surface (105) of the profile element, said at least one groove being arranged parallel to the longitudinal axis of the second profile element,
 - g. then arranging said second profile element (102) beside said first profile element (101), such that a portion (35) of the first engaging element (21) is arranged in one of the at least one

groove (103) and a portion (41) of the second engaging element (22) is arranged in one of the at least one groove (104) while the first and second fixing members (36/37,42/43) remain engaged with the opposing groove side surfaces (107,108) of the at least one groove (103,104),
 h. then activating the fastening device such that the first and second engaging elements (21,22) are forced towards opposing groove side surfaces (106, 109) of said at least one groove (103,104) in both the first and second profile element (101,102), and
 i. then continuing activation of the fastening device until said first and second engaging elements (21,22) engage said opposing side groove surfaces (106,109) of said at least one groove (103,104) in both the first and second profile elements (101,102).

11. A method of fastening two profile elements (101,102) together according to claim 10, **characterized in that** said first and second profile elements (101,102) are pressed together in step g) such that the fastening device (20) is held in place by friction between the two profile elements and the fastening device during activation of the fastening device.

12. A method of fastening two profile elements (101,102) together according to claim 10 or 11, **characterized in**
 a. **that** each of said first and second profile elements comprise first and second grooves (103,104) which are parallel to each other,
 b. **that** in step d) of claim 10, the portion (36/37) of the first fixing member and the portion (34) of the first engaging element (21) are inserted in the first groove (103) and the portion (42/43) of the second fixing member and the portion (40) of the second engaging element (22) are inserted in the second groove (104),
 c. **that** in step e) of claim 10, said first and second fixing member (36/37, 42/43) engage the innermost (107,108) (or outermost (106,109)) opposing groove side surfaces of the first groove (103) and second groove (104),
 d. **that** in step g) of claim 10, the portion (35) of the first engaging element (21) is arranged in the first groove (103) of the second profile element (102) and the portion (41) of the second engaging element (22) is arranged in the second groove (104) of the second profile element (102),
 e. **that** in step h) of claim 10 said first and second engaging elements (21,22) are forced away from (or towards) the innermost opposing groove side surfaces (107, 108) of the first and second groove (103,104),

f. **that** in step i) of claim 10 said first and second engaging elements (21,22) engage said outermost (106,109) (or innermost (107,108)) opposing groove side surfaces of said first and second grooves (103,104) respectively.

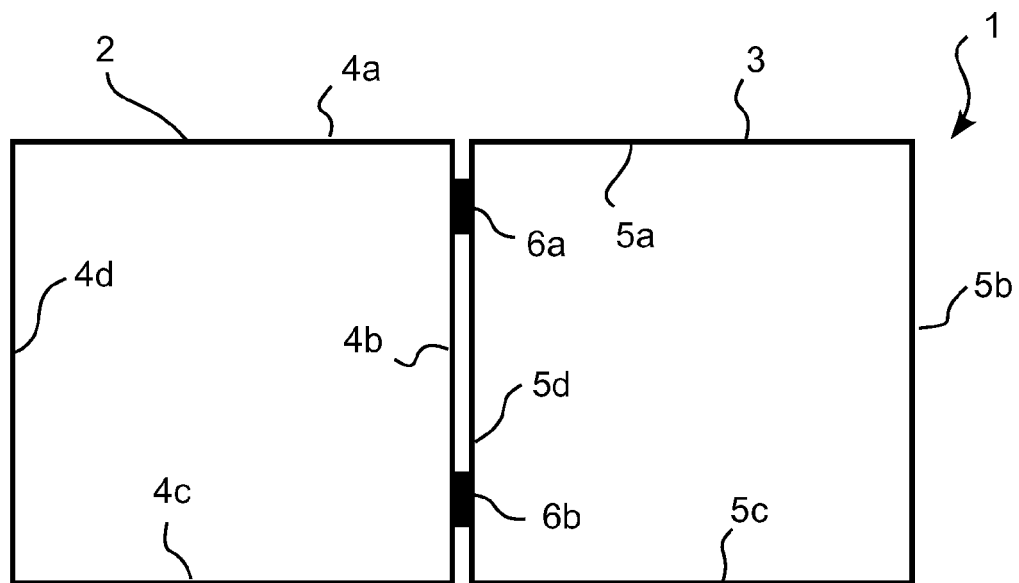


Fig. 1

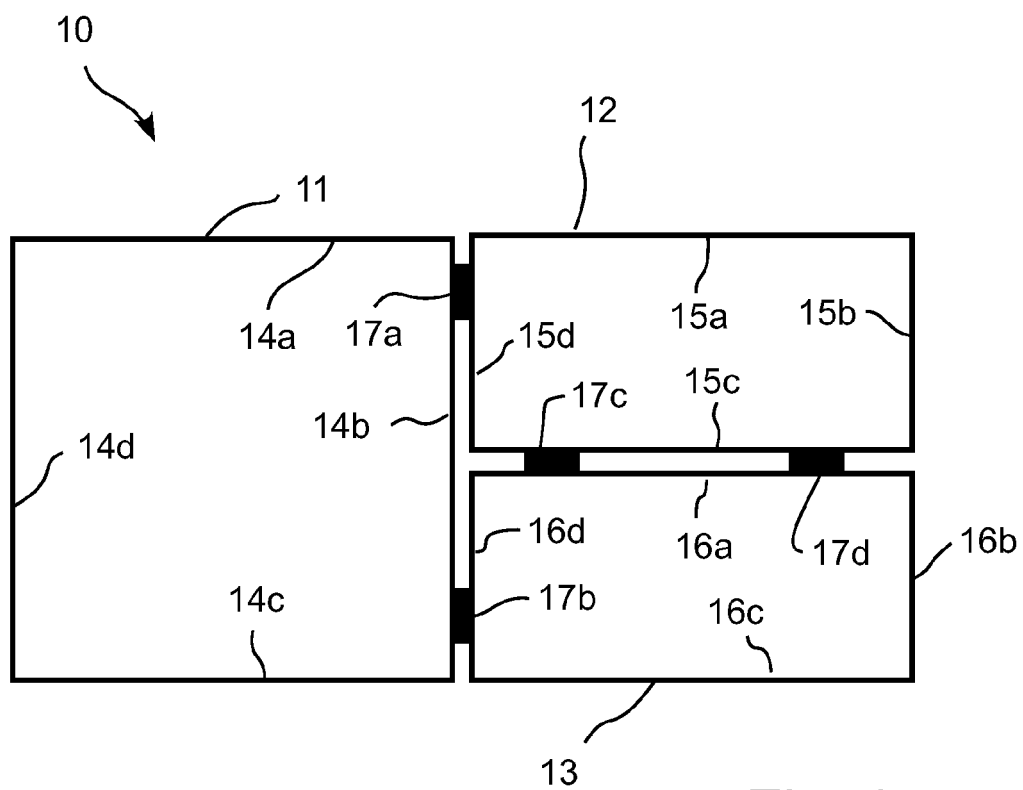


Fig. 2

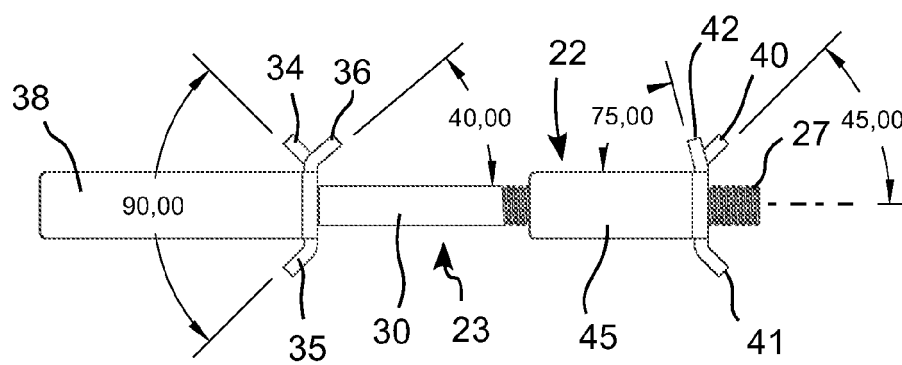
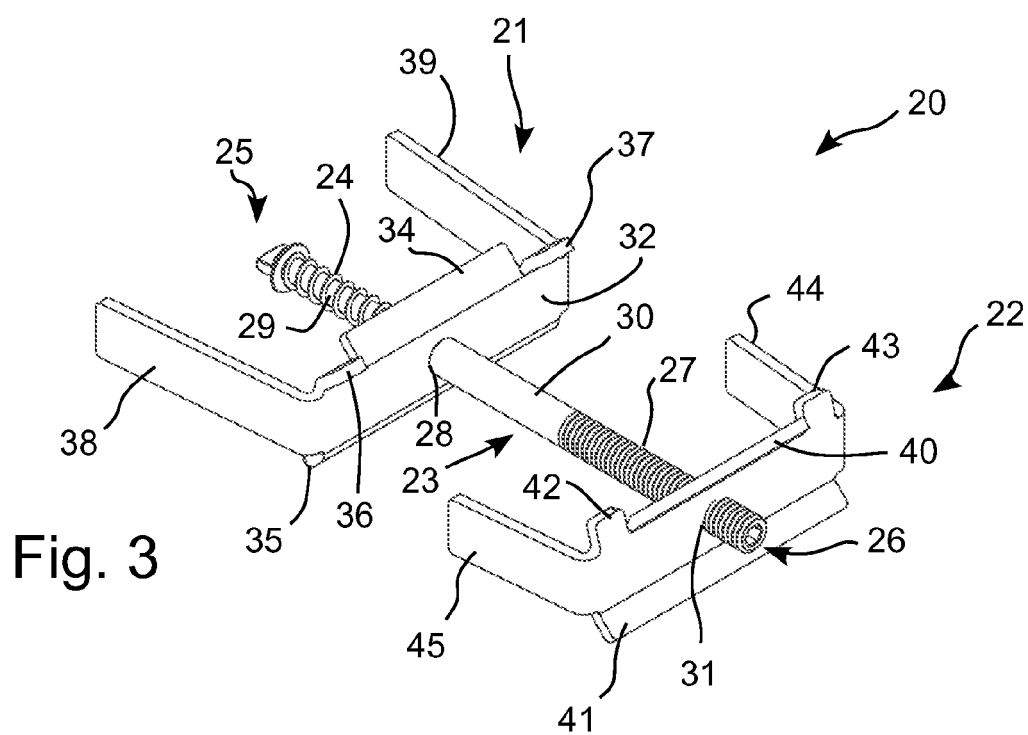


Fig. 4

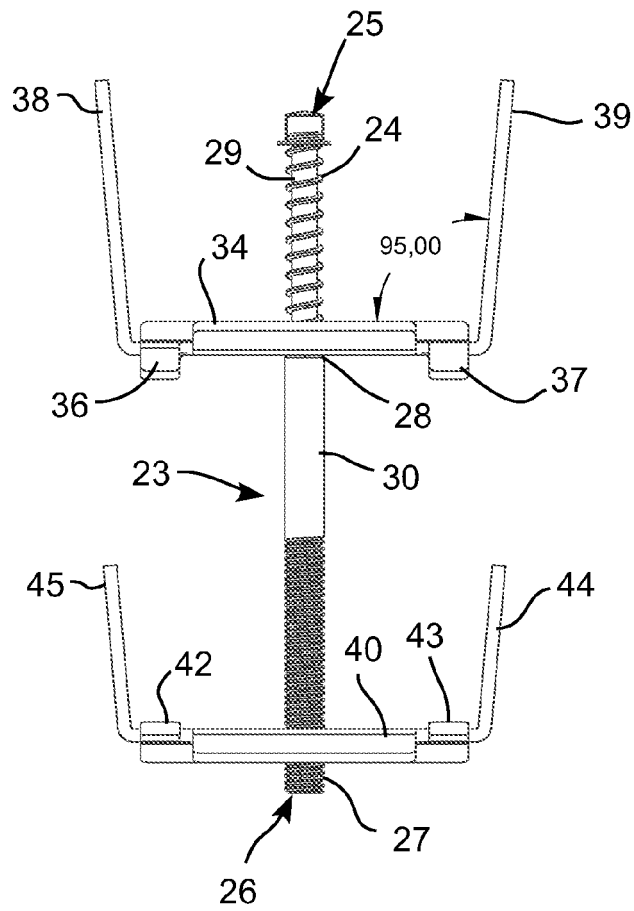


Fig. 5

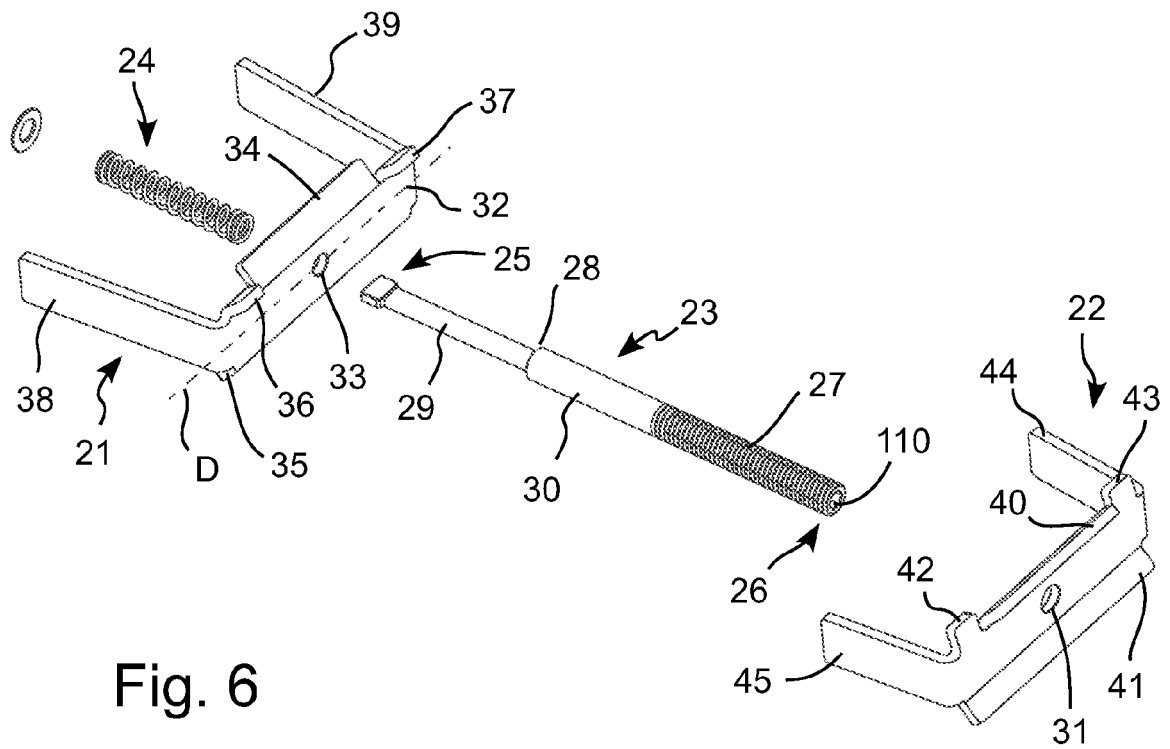


Fig. 6

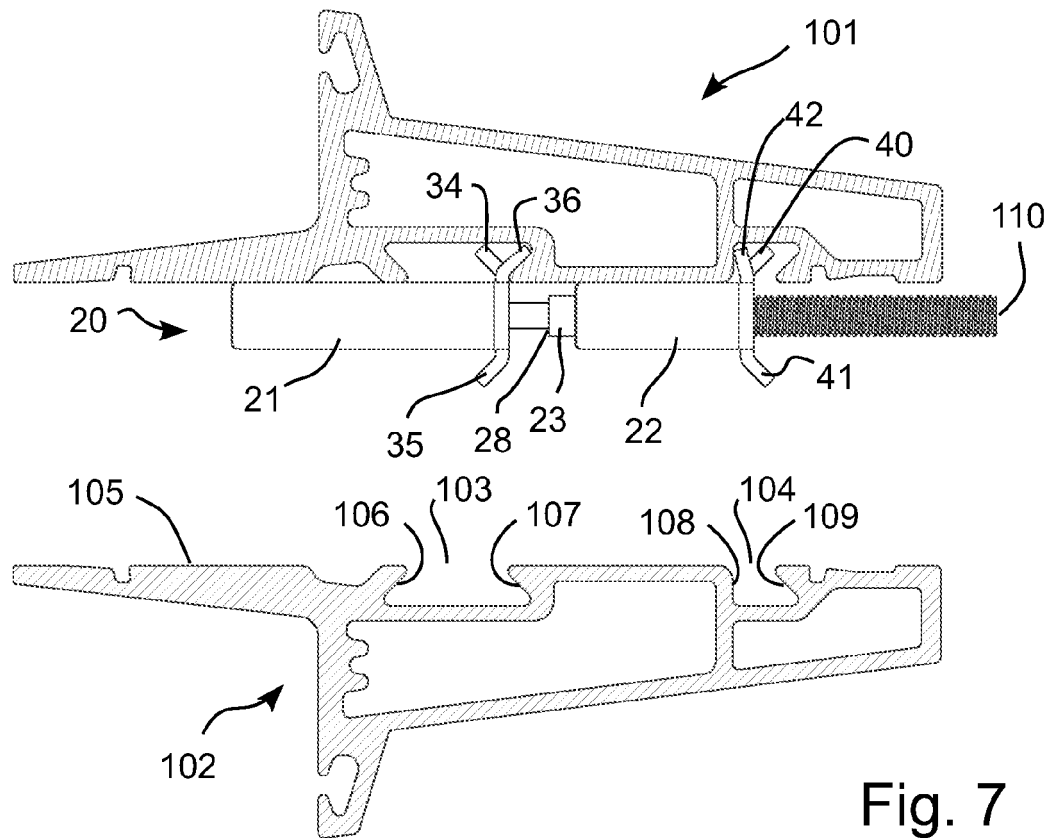


Fig. 7

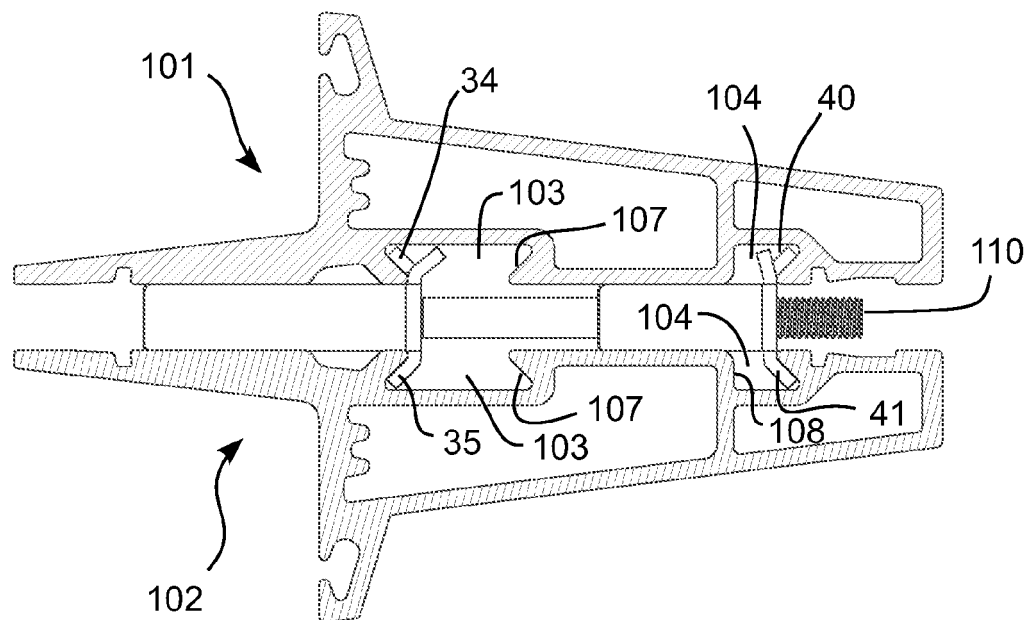


Fig. 8

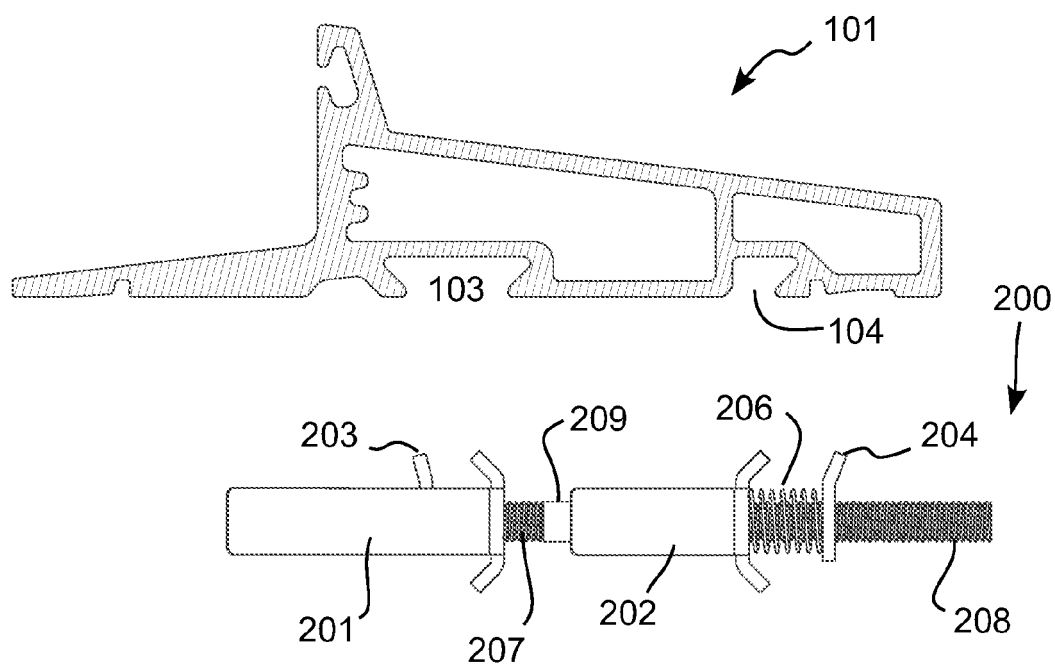


Fig. 9

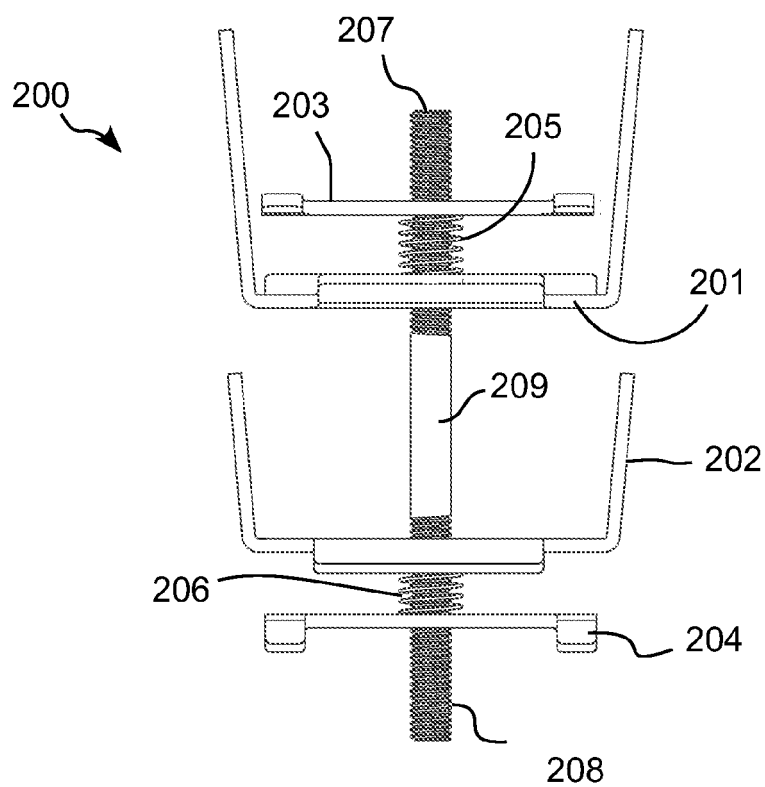


Fig. 10

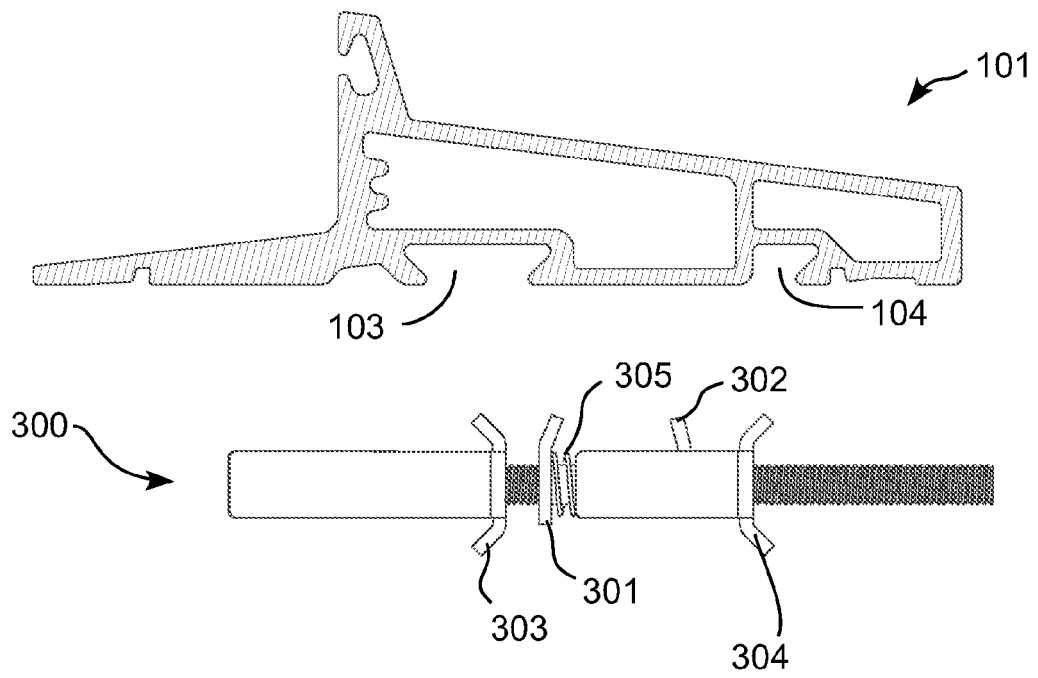


Fig. 11

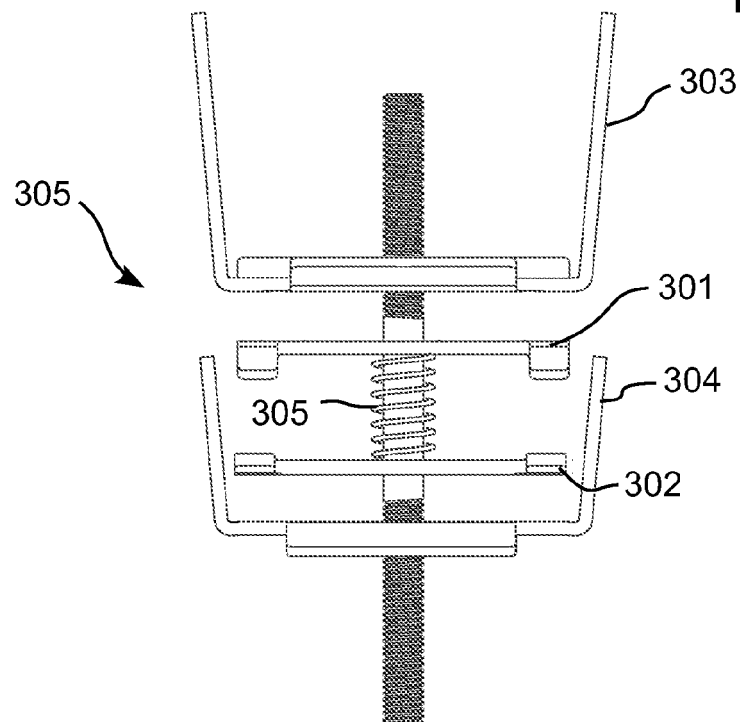


Fig. 12

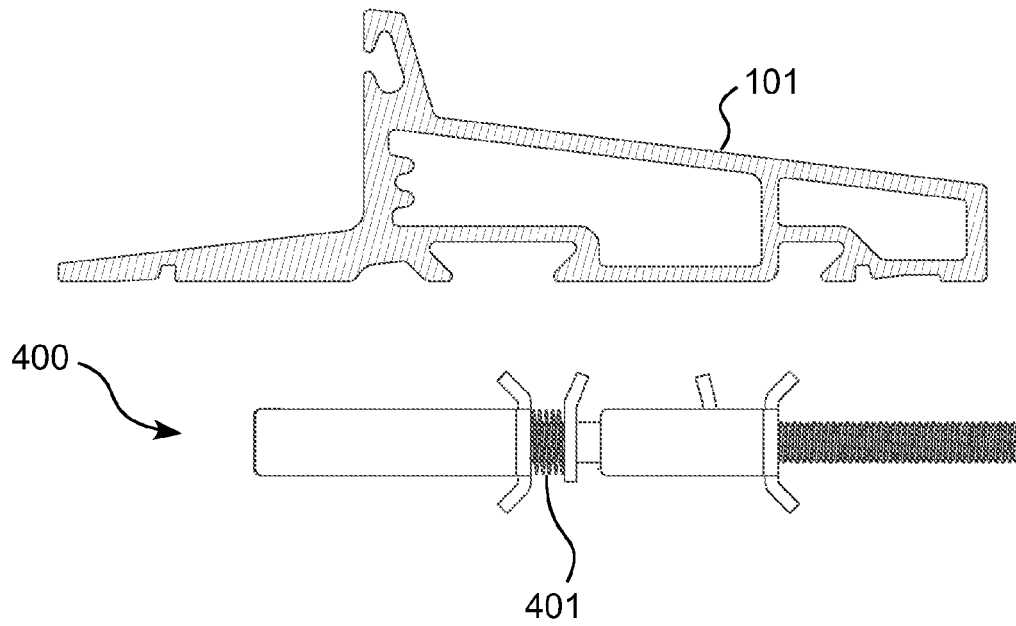


Fig. 13

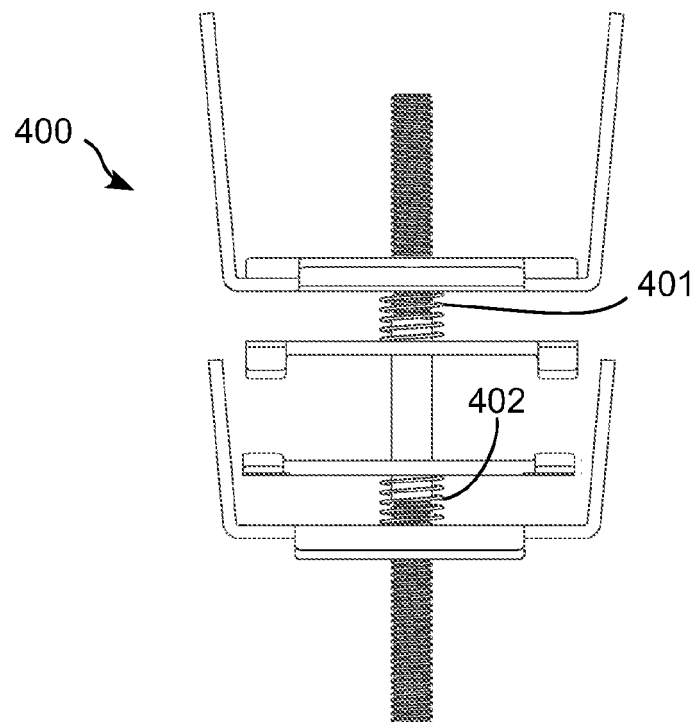


Fig. 14

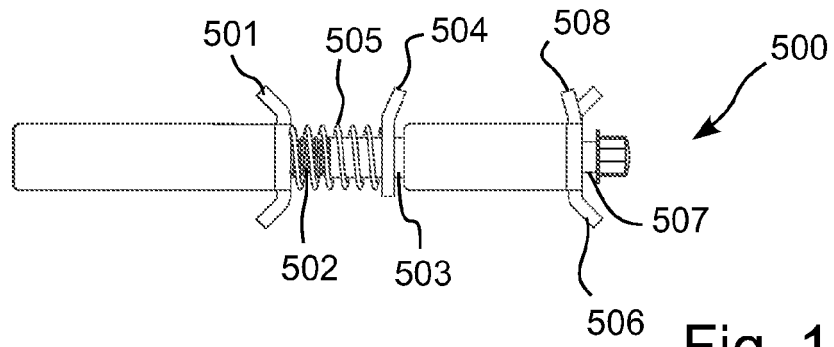
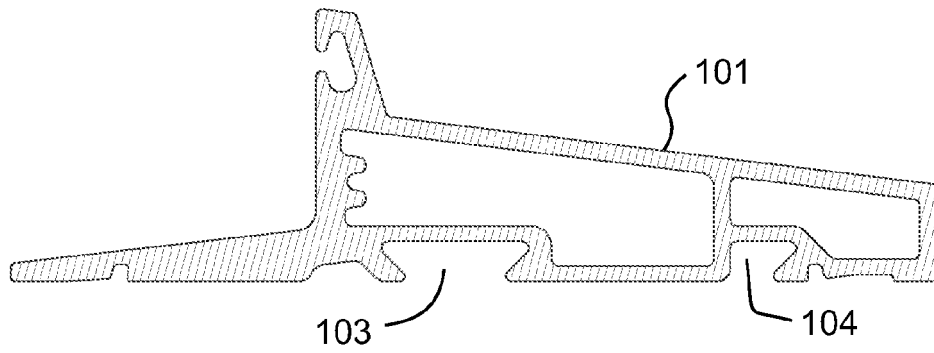


Fig. 15

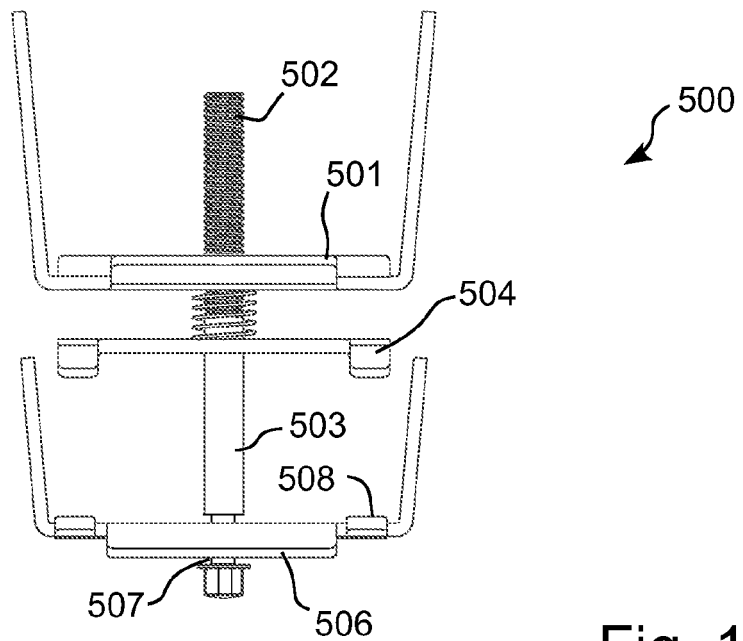


Fig. 16

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7434364 B [0004]
- US 7543412 B [0004]
- US 3430997 A [0004]
- US 4497148 A [0004]
- US 4457117 A [0004]
- EP 0459653 A [0004]