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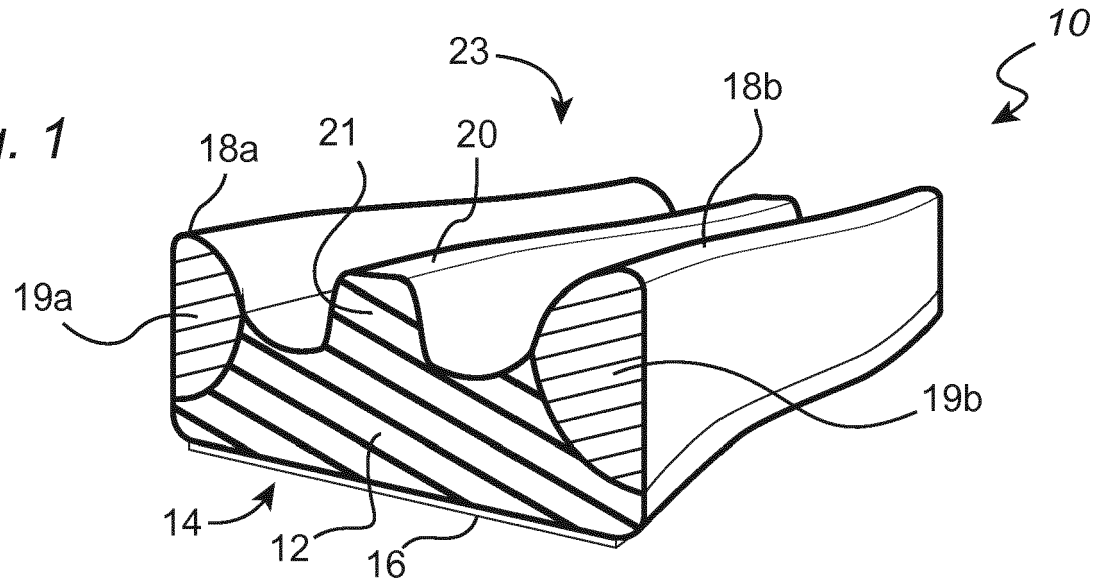
(54) **Crown-type glazing strip**

(57) A crown-type glazing strip, for sealing between a window sash and a window pane, comprises a pair of side ridges (18a-b), extending along the length of the glazing strip (10), for sealingly abutting a face of the window pane; and an intermediate ridge (20), located between the side ridges (18a-b) and extending along the length of the glazing strip (10), for sealingly abutting said face of the window pane, wherein at least a portion (19a-b) of each side ridge (18a-b) consists of cell rubber of a first density; at least a portion (21) of the intermediate ridge (20) consists of cell rubber of a second density; and said first density is higher than said second density.

Fig. 1



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Description

Field of the invention

[0001] The present invention relates to a crown-type glazing strip for sealing between a window sash and a window pane.

Background of the invention

[0002] Windows are often manufactured by positioning a window pane in a window sash or casing, and securing the window pane to the window sash by attaching a bead or second window sash part to the casing, so as to hold the window pane in place. Typically, a glazing strip of rubber is placed between the window pane and the sash, as well as between the window pane and the bead/second sash part. The purpose of the glazing strip may be manifold. By way of example, it may provide a somewhat flexible suspension of the window pane, permitting thermal expansion; it may protect the window pane against breakage; and it may seal the window against moist and wind. A glazing strip may have a sealing face for abutting the face of the window pane. The sealing face may be provided with a plurality of longitudinal ridges extending along the length of the strip such that, in profile/cross-section, the sealing face may somewhat resemble a crown. Such glazing strips are in this disclosure referred to as crown-type glazing strips. An exemplary crown-type glazing strip is illustrated in US 3155205.

[0003] There is an incessant strive to increase the tightness of windows against wind and moist. There is also a strive to reduce the manufacturing cost of windows.

Summary of the invention

[0004] It is an object of the present invention to solve, or at least mitigate, parts or all of the above mentioned problems. To this end, there is provided a crown-type glazing strip for sealing between a window sash and a window pane, the glazing strip comprising a pair of side ridges, extending along the length of the glazing strip, for sealingly abutting a face of the window pane; and an intermediate ridge, located between the side ridges and extending along the length of the glazing strip, for sealingly abutting said face of the window pane, wherein at least a portion of each side ridge consists of cell rubber of a first density; at least a portion of the intermediate ridge consists of cell rubber of a second density; and said first density is higher than said second density. Thanks to the relatively higher density of the cell rubber of the side ridge portions, the side ridges are relatively firm and provide the glazing strip with the desired mechanical stability to take up loads. The relatively lower density of the intermediate ridge portion, on the other hand, makes the intermediate ridge more flexible, thereby improving the tightness of the seal's engagement with any dust, fouling or defects on the surface of the window pane, resulting in a tighter window. Moreover, the high flexibility of the intermediate ridge will allow the intermediate ridge to better follow the motion of the window pane during conditions of fast alternating wind loads. Moreover, for a given glazing strip shape, less rubber material can be used without compromising the strip's function, which results in a lighter and less expensive glazing strip.

[0005] According to an embodiment, said cell rubber of a first density is a medium-density cell rubber; and said cell rubber of a second density is a low-density cell rubber. The use of low-density cell rubber makes the entire glazing strip more flexible than glazing strips of prior art, which makes it easier to e.g. bend the glazing strip around corners. This reduces the need for cutting the strip during installation, which minimizes the risk of wind and water penetrating the seal formed by the glazing strip at the cuts, as well as provides for easier installation. Moreover, the elevated flexibility of low-density cell rubber increases the tightness of the intermediate ridge against any imperfect surface of the window pane even further, and results in an even lighter and less expensive glazing strip.

[0006] According to an embodiment, for each of said side ridges, the respective at least a portion of the side ridge consisting of cell rubber of said first density extends across the greater part of the height of the respective side ridge. Such a design provides extra strength and rigidity to the load-carrying side ridges. The height of each side ridge is defined by the distance from its top to the glazing strip's bottom surface for mounting to a window sash.

[0007] According to an embodiment, said at least a portion of the intermediate ridge consisting of cell rubber of said second density forms the top of the intermediate ridge. Such a design provides the surface of the intermediate ridge with extra flexibility, resilience and tightness.

[0008] According to an embodiment, said at least a portion of the intermediate ridge consisting of cell rubber of said second density extends across the greater part of the height of the intermediate ridge. Such a design assists in maintaining the material properties of the intermediate ridge also when the glazing strip is substantially compressed; otherwise, the compression of the intermediate ridge will be concentrated to the most resilient portion of the intermediate ridge's height; i.e., to the relatively lower-density portion(s). The height of the intermediate ridge is defined by the distance from its top to the glazing strip's bottom surface for mounting to a window sash.

[0009] According to an embodiment, the side ridges and the intermediate ridge extend along, and are held together by, a strip body consisting of cell rubber of said second density. Thereby, the intermediate ridge and the strip body may be homogeneously formed in the same extrusion step. Moreover, by having a strip body of said second density, the glazing strip will be even lighter and more flexible. According to an embodiment, the side ridges are chemically bonded to the strip body, for instance by vulcanization. Thereby, increased durability of the glazing strip may be obtained.

[0010] According to an embodiment, at least 60% by volume of the glazing strip consists of cell rubber of said second density. Thereby, the glazing strip will be even less expensive and more flexible.

[0011] According to an embodiment, the top of each side ridge is higher than the top of the intermediate ridge. Typically, the total height of a glazing strip is compressed by about 25% when squeezed between a window pane and a window sash. The lower height of the intermediate ridge results in the intermediate ridge being less compressed, thereby maintaining the mechanical properties of the intermediate ridge closer to those of an uncompressed low-density rubber also when in use.

[0012] According to an embodiment, each of said cell rubbers of first and second densities comprises ethylene propylene diene monomer, EPDM, rubber.

[0013] According to an embodiment, the glazing strip further comprises a substantially flat mounting surface, provided with adhesive, for attaching the glazing strip to said window sash.

[0014] According to an embodiment, the glazing strip further comprises a mounting foot extending along the length of the glazing strip.

[0015] According to an embodiment, said cell rubber of a first density is a closed-cell rubber. According to an embodiment, said cell rubber of a second density is a closed-cell rubber. By using closed-cell rubber, the respective cell rubber(s) will not absorb any water that may reach the glazing strip, which reduces the risk of damage to the glazing strip, the window pane, and/or the window sash in case of being exposed to low temperatures. It is also, for the same reason, preferred that the glazing strip is essentially free from water-swellable/superabsorbent polymers.

[0016] According to another aspect of the invention, parts or all of the above mentioned problems are solved, or at least mitigated, by a method of manufacturing a crown-type glazing strip for sealing between a window sash and a window pane, the method comprising extruding a first rubber mixture comprising a blowing agent to form a glazing strip body with a first ridge; and extruding a second rubber mixture comprising a blowing agent onto the glazing strip body on either side of the first ridge to form a pair of side ridges, said second rubber mixture being different from said first rubber mixture; expanding the glazing strip body and the first ridge to a cell rubber of a first density; and expanding the side ridges to a cell rubber of a second density, said second density being higher than said first density.

[0017] According to an embodiment, said glazing strip body and first ridge, and said side ridges, are expanded to form closed-cell rubber.

[0018] According to an embodiment, the method further comprises vulcanizing the crown-type glazing strip to form chemical bonds between the glazing strip body and the side ridges.

Brief description of the drawings

[0019] The above, as well as additional objects, features and advantages of the present invention, will be better understood through the following illustrative and non-limiting detailed description of preferred embodiments of the present invention, with reference to the appended drawings, where the same reference numerals will be used for similar elements, wherein:

Fig. 1 is a diagrammatic view in perspective of a first embodiment of a crown-type glazing strip;
Fig. 2a is a cross-section of the glazing strip of Fig. 1 in an uncompressed state and as located between a window sash and the face of a window pane;
Fig. 2b is a cross-section of the glazing strip of Fig. 2a in a compressed state after assembly of the window;
Fig. 3 is a cross-section of a second embodiment of a crown-type glazing strip; and
Fig. 4 is a cross-section of a third embodiment of a crown-type glazing strip.

Detailed description of the exemplary embodiments

[0020] Fig. 1 illustrates a crown-type glazing strip 10 for sealing between a window sash and a window pane. The glazing strip 10, which has the profile of an "E", comprises a body 12 with a flat mounting surface 14. The mounting surface 14 is provided with an adhesive layer 16 for attaching the glazing strip 10 to e.g. a window sash.

[0021] A pair of side ridges 18a, 18b, and an intermediate ridge 20 located between the side ridges 18a-b, extend along the length of the glazing strip. The ridges 18a-b, 20 rise from the body 12 in a direction facing away from the mounting surface 14, and define a sealing face 23 for sealingly abutting the face of the window pane.

[0022] The body 12 and intermediate ridge 20 are integrally formed of a low-density closed-cell rubber, i.e. a closed-cell rubber having a density of less than about 0,40 kg/dm^3, whereas the material composition of the side ridges 18a-b differs from that of the body 12 and the intermediate ridge 20. The side ridges 18a-b are formed of a cell rubber of a relatively higher density, such as a medium-density closed-cell rubber having a density of between about 0,40 kg/dm^3 and 0,80 kg/dm^3. The elastomer of the body 12 and the intermediate ridge 20 as well as of the side ridges 18a-b may be any suitable elastomer type, or combination of elastomer types, known to those skilled in the art. By way of example, ethylene propylene diene monomer (EPDM) rubber is very well suited for glazing strips, and may be used for forming low-density closed-cell rubber. Thanks to the relatively higher density of the cell rubber of the side ridges 18a-b, the side ridges 18-b are relatively firm and provide the glazing strip 10 with the desired mechanical stability to take up loads. The relatively lower density of the intermediate ridge 20, on the other hand, makes the intermediate ridge

20 more flexible, thereby improving the tightness of the seal against any dust, fouling or defects on the surface of the window pane.

[0023] Fig. 2a illustrates the glazing strip 10 as attached to a glazing strip mounting surface 22 of a window sash 24. The mounting surface 22 of the window sash 24 is parallel with and abuts the mounting surface 14 (Fig. 1) of the glazing strip 10. A window pane 26, a large face 28 of which is essentially parallel to the glazing strip mounting surface 22 of the window sash 24, is placed onto the sealing face 23 (Fig. 1) of the glazing strip 10. In the view of Fig. 2a the window pane 26 does not yet apply any pressure onto the glazing strip 10; i.e., the glazing strip 10 is still in an uncompressed state. Each side ridge 18a-b has a height H1, which in the illustrated example is the same as the total height of the glazing strip 10, above the mounting surface 22 of the window sash 24. The intermediate ridge 20 has a height H2 above the mounting surface 22 of the window sash 24, said height H2 being lower than the height H1 of the side ridges. As can be seen on the cross-sections of Figs 1-2, the relatively higher-density cell rubber portions 19a-b of the side ridges 18a-b extend across a main part of the height H1 of the side ridges 18a-b, whereas the relatively lower-density cell rubber portion 21 of the intermediate ridge 20 extends across essentially the entire height H2 of the intermediate ridge 20.

[0024] When a window is assembled, the glazing strip 10 is typically substantially compressed. Such compression may be obtained by e.g. screwing different parts of the window sash 22 together, such that the glazing strip 10 is squeezed between the face 28 of the window pane 26 and the glazing strip mounting surface 22 of the window sash 24. Fig. 2b illustrates the same view as Fig. 2a after compressing the glazing strip 10. In the exemplary view of Fig. 2b, the glazing strip 10 has been compressed by about 25%, i.e. its height H3 has been reduced to about 75% of its height H1 when unloaded (Fig. 2a). Thanks to the intermediate ridge 20 being lower than the side ridges 18a-b, when the glazing strip 10 is unloaded (Fig. 2a), the cell rubber of the intermediate ridge 20 is less compressed than the cell rubber of the side ridges 18a-b when in the loaded state illustrated in Fig. 2b. Thereby, the mechanical properties of the intermediate ridge 20, such as flexibility, resilience, and aptness to respond to e.g. fluctuating wind loads onto the window pane, do not differ very much between the unloaded (Fig. 2a) and compressed (Fig. 2b) states. As the side ridges 18a-b as well as the intermediate ridge 20 are made of cell rubber, they will, thanks to the good thermal insulation properties of cell rubber, thermally insulate the window sash 24 from the window pane 26. Moreover, as the side ridges 18a-b are made of cell rubber, the glazing strip 10 will be flexible enough to be bent around corners, if so desired.

[0025] The glazing strip 10 may be manufactured by extruding the body 12 and intermediate ridge 20 from a first rubber mixture; and extruding the side ridges 18a-b onto to the body 12, on either sides of the intermediate ridge 20, from a second rubber mixture. The first and second rubber mixtures may be composed such that, when the strip 10 is expanded, the first rubber mixture will form a low-density cell rubber, and the second rubber mixture will form a cell rubber of a higher density. The body 12, the intermediate ridge 20, and the side ridges 18a-b may be formed in separate extrusion steps, or they may be co-extruded. The body 12, the intermediate ridge 20, and the side ridges 18a-b may be vulcanized, e.g. in a hot bath of molten salt, to form chemical bonds within and between themselves. The vulcanized glazing strip may, after vulcanization, be cooled and cleaned in a bath of e.g. water, in the manner known to those skilled in the art.

[0026] Fig. 3 illustrates a second embodiment of a crown-type glazing strip 110 for sealing between a window sash and a window pane. The glazing strip 110 comprises a body 112 with a flat mounting surface 14. Two side ridges 118a, 118b are integrally formed with the body 112, and extend along the length of the glazing strip 110. Two intermediate ridges 120a, 120b are located between the side ridges 118a-b and extend along the length of the glazing strip 110. The ridges 118a-b, 120a-b rise from the body 112 in a direction facing away from the mounting surface 14, for sealingly abutting the face of the window pane. The intermediate ridges 120a-b are formed of a relatively lower-density cell rubber, such as a low-density cell rubber, whereas the body 112 and side ridges 118a-b are formed of a cell rubber of a relatively higher density, such as a medium-density cell rubber. As can be seen on the cross-section of Fig. 3, the relatively higher-density cell rubber portions 119a-b of the side ridges 118a-b extend across the entire height of the side ridges 118a-b, whereas the relatively lower-density cell rubber portions 121 a-b of the intermediate ridges 120a-b extend across just more than half the height of the intermediate ridges 120a-b.

[0027] Fig. 4 illustrates a third embodiment of a crown-type glazing strip 210 for sealing between a window sash and a window pane. The glazing strip 210 comprises a body 212 with a flat mounting surface 14. The mounting surface 14 is provided with a mounting foot 215 for attaching the glazing strip 210 to a mounting groove (not shown). Two side ridges 218a, 218b, and an intermediate ridge 220 located between the side ridges 218a-b, extend along the length of the glazing strip 210. The ridges 218a-b, 220 rise from the body 212 in a direction facing away from the mounting surface 14, for sealingly abutting the face of the window pane. The body 212, intermediate ridge 220, and a substantial part of each side ridge 218a-b are homogeneously made of low-density cell rubber. However, each side ridge comprises a respective internal reinforcing member 219a-b, which extends along the length of the glazing strip 210. The reinforcement members 219a-b consist of a cell rubber of relatively higher density, and thereby provide the respective side ridges 218a-b with increased stability and ability to withstand

compressive loads. The reinforcement members 219a-b extend across about a third of the height of the side ridges 218a-b, whereas the portion 221 of the intermediate ridge 220 consisting of relatively lower-density cell rubber extends across about three quarters of the intermediate ridge's 220 height.

[0028] Thanks to most of the glazing strip 210, with the exception of the reinforcing members 219a-b, being made of low-density cell rubber, the glazing strip 210 will be very flexible, and may e.g. allow being bent around 90° corners without cutting. A hole 230, which runs along the length of the glazing strip 210, increases the flexibility of the glazing strip 210 even further. The glazing strip 210 may be formed by co-extrusion of two different rubber mixtures into the illustrated cross-section of Fig. 4.

[0029] Even though the mounting foot 215 is illustrated as being made of cell rubber, it may be preferred that it be of solid rubber, in order to facilitate mounting in a groove.

[0030] The invention has mainly been described above with reference to a few embodiments. However, as is readily appreciated by a person skilled in the art, other embodiments than the ones disclosed above are equally possible within the scope of the invention, as defined by the appended patent claims. For example, even though the specific examples hereinbefore illustrate intermediate ridges of low-density cell rubber combined with side ridges of medium-density cell rubber, the cell rubber densities recited in the independent claims should be construed in relative terms only. For example, a glazing strip may consist entirely of low-density cell rubber of two different densities: a higher density for the side ridges, and a lower density for the intermediate ridge. Even though closed-cell rubber may be preferred, also open-cell rubber glazing strips are covered.

Claims

1. A crown-type glazing strip for sealing between a window sash (24) and a window pane (26), the glazing strip comprising
   a pair of side ridges (18a-b; 118a-b; 218a-b), extending along the length of the glazing strip (10), for sealingly abutting a face (28) of the window pane (26); and
   an intermediate ridge (20; 120a-b; 220), located between the side ridges (18a-b; 118a-b; 218a-b) and extending along the length of the glazing strip (10), for sealingly abutting said face (28) of the window pane (26), the glazing strip being **characterized in that**
   at least a portion (19a-b; 119a-b; 219a-b) of each side ridge (18a-b; 118a-b; 218a-b) consists of cell rubber of a first density; and
   at least a portion (21; 121a-b; 221) of the intermediate ridge (20; 120a-b; 220) consists of cell rubber of a second density,
   wherein said first density is higher than said second density.

2. The crown-type glazing strip according to claim 1, wherein
   said cell rubber of a first density is a medium-density cell rubber; and
   said cell rubber of a second density is a low-density cell rubber.

3. The crown-type glazing strip according to any of the previous claims, wherein, for each of said side ridges (18a-b; 118a-b), the respective at least a portion (19a-b; 119a-b) of the side ridge (18a-b; 118a-b) consisting of cell rubber of said first density extends across the greater part of the height (H1) of the respective side ridge (18a-b; 118a-b).

4. The crown-type glazing strip according to any of the previous claims, wherein said at least a portion (21; 121 a-b; 221) of the intermediate ridge (20; 120a-b; 220), consisting of cell rubber of said second density, forms the top of the intermediate ridge (20; 120a-b; 220).

5. The crown-type glazing strip according to any of the previous claims, wherein said at least a portion (21; 121a-b; 221) of the intermediate ridge (20; 120a-b; 220), consisting of cell rubber of said second density, extends across the greater part of the height (H2) of the intermediate ridge (20; 120a-b; 220).

6. The crown-type glazing strip according to any of the previous claims, wherein the side ridges (18a-b; 218a-b) and the intermediate ridge (20; 120) extend along, and are held together by, a strip body (12; 212) consisting of cell rubber of said second density.

7. The crown-type glazing strip according to any of the previous claims, wherein at least 60% by volume of the glazing strip consists of cell rubber of said second density.

8. The crown-type glazing strip according to any of the previous claims, wherein the top (H1) of each side ridge (18a-b; 118a-b; 218a-b) is higher than the top (H2) of the intermediate ridge (20; 120a-b; 220).

9. The crown-type glazing strip according to any of the previous claims, each of said cell rubbers of first and second densities comprising ethylene propylene diene monomer, EPDM, rubber.

10. The crown-type glazing strip according to any of the previous claims, further comprising a substantially flat mounting surface (14) provided with adhesive (16) for attaching the glazing strip (10) to said window sash (24).

11. The crown-type glazing strip according to any of the previous claims, further comprising a mounting foot (215), extending along the length of the glazing strip (210), for attaching the glazing strip (210) to said window sash (24).

12. The crown-type glazing strip according to any of the previous claims, wherein said cell rubber of a first density is a closed-cell rubber.

13. The crown-type glazing strip according to any of the previous claims, wherein said cell rubber of a second density is a closed-cell rubber.

14. A method of manufacturing a crown-type glazing strip for sealing between a window sash and a window pane, the method comprising
extruding a first rubber mixture comprising a blowing agent to form a glazing strip body (12) with a first ridge (20); and
extruding a second rubber mixture comprising a blowing agent onto the glazing strip body (12) on either side of the first ridge (20) to form a pair of side ridges (18a-b), said second rubber mixture being different from said first rubber mixture;
expanding the glazing strip body (12) and the first ridge (20) to a cell rubber of a first density; and
expanding the side ridges (18a-b) to a cell rubber of a second density, said second density being higher than said first density.

15. The method according to claim 14, wherein said glazing strip body (12) and first ridge (20), and said side ridges (18a-b), are expanded to form closed-cell rubber.

Fig. 1

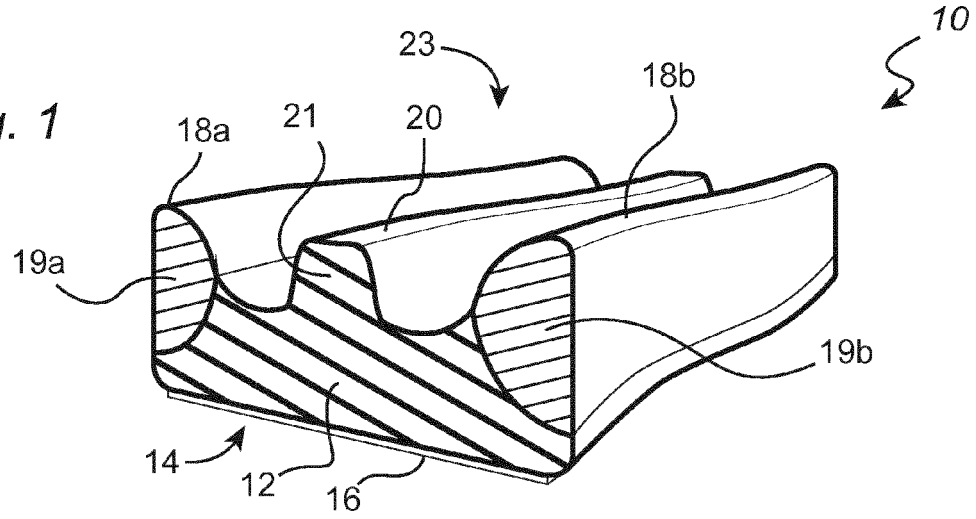


Fig. 2a

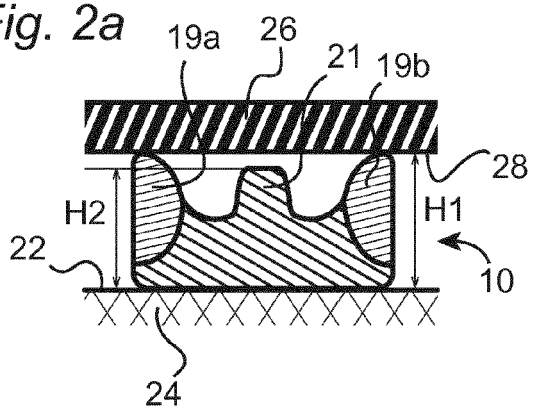


Fig. 2b

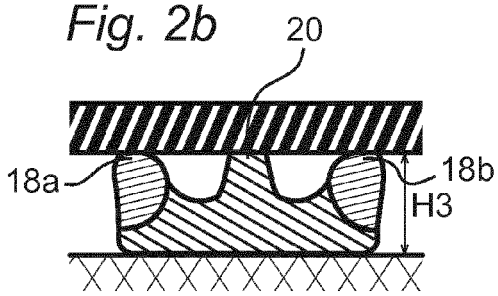


Fig. 3

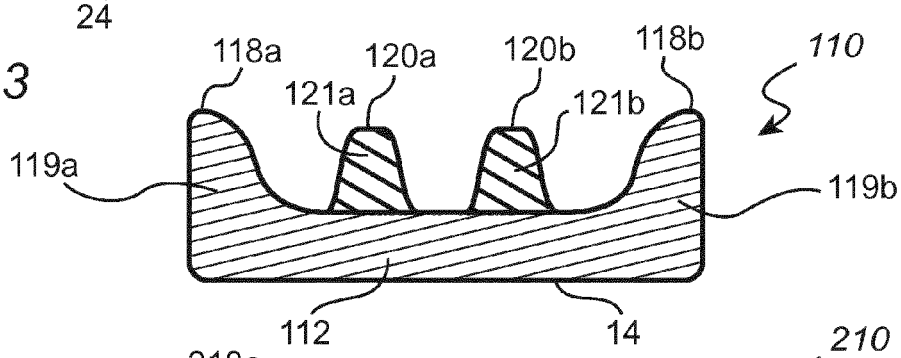
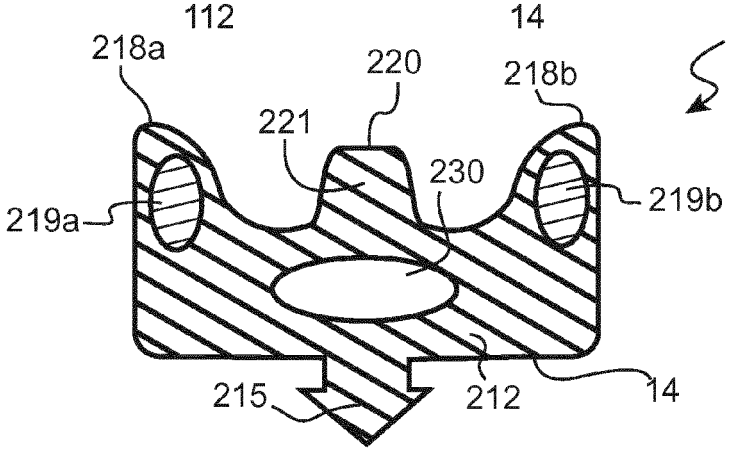


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 8085

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	EP 2 369 116 A2 (SCHUECO INT KG [DE]) 28 September 2011 (2011-09-28) * figure 2a * -----	1-15	INV. E06B7/23 E06B3/263
X	EP 1 835 121 A2 (TRELLEBORG BUILDING SYSTEMS AB [SE]) 19 September 2007 (2007-09-19) * paragraph [0040] - paragraph [0041]; figures 2, 4 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 April 2015	Cobusneanu, D

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 19 8085

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-04-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2369116 A2	28-09-2011	DE 202010000444 U1	08-08-2011
		EP 2369116 A2	28-09-2011
EP 1835121 A2	19-09-2007	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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