(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 447 228 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.02.2019 Bulletin 2019/09

(51) Int Cl.:
E06B 3/263 *(2006.01)* ***E06B 3/273*** *(2006.01)*

(21) Application number: **17200171.1**

(22) Date of filing: **06.11.2017**

(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
Designated Validation States:
MA MD

(30) Priority: **25.08.2017 PL 42263417**

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(54) **THERMAL COMPENSATION SPACER**

(57) The invention relates to a thermal compensation spacer for connecting together external and internal aluminium profiles in an aluminium joinery system, said spacer being formed as an elongated strip element made by coextrusion of two materials of different hardness, wherein at least the edge regions along longer edges of the strip element designed to be crimped in the external and internal aluminium profiles are made of a hard polymer material, and at least one region between said edge regions is made of a soft and elastic polymer material.

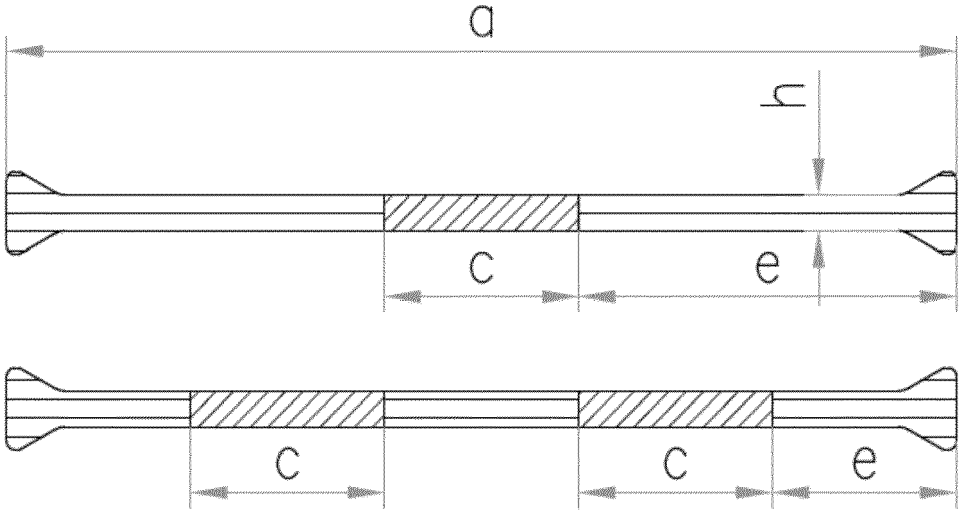


FIG. 1

EP 3 447 228 A1

Description

Field of the invention

[0001] The invention relates to a thermal compensation spacer for connecting together external and internal aluminium profiles in an aluminium joinery system. In addition to thermal insulation, the spacer also compensates stresses occurring between the external and internal aluminium profiles.

Background art

[0002] Thermal spacers in form of strip elements are used in the production of insulated aluminium profiles and serve to increase thermal insulation of aluminium profiles used for manufacturing window and door structures. Low thermal conductivity of the thermal spacers in the profiles used to make window and door constructions prevents cold air penetrating indoor spaces in winter (freezing) and, likewise, hot air in summer (excessive heating).

[0003] The thermal spacer, which generally is formed as a longitudinal strip element, is assembled with the external and internal aluminium profiles by crimping said aluminium profiles at the edge regions along the longer edges of the strip element on both sides.

[0004] Examples of thermal spacers commonly used in aluminium joinery systems are disclosed e.g. in the Polish patent application P.388324 and in the protection rights for utility models PL 66 696 Y1 and PL 66 697 Y1.

[0005] Thermal spacers made of polymer materials not only have good thermal insulation properties, but also high load capacity and are designed to carry access loads together with (external and internal) aluminium profiles. The material most commonly used for producing thermal spacers is polyamide (PA) reinforced with glass fibre, but some other materials are also used, e.g. acrylonitrile-butadiene-styrene (ABS) terpolymer, polyethylene terephthalate (PET), or Noryl™ (amorphous mix of poly(phenylene oxide, poly(phenylene ether) and polystyrene). Apart from the material, thermal spacers may vary in shape: straight, omega-shaped (in cross-section), chamber type, complex and other.

[0006] Ready-made window and door constructions made of aluminium profiles mounted as external structures are exposed to atmospheric conditions (heating and cooling). High temperatures (temperature difference between the external and internal aluminium profiles) make the external aluminium profile extend more than the internal one, thus exposing the profile to deformations (the so-called bimetallic effect, generally described in relation to elements composed of two metals having different thermal expansion properties in specific temperature conditions, but present alike in structures made of one metal whose various parts are exposed to various temperatures). This effect is particularly noticeable when using structures facing south, painted in dark colours and with their frame filled with an aluminium panel instead of glass. A similar effect is also noticeable in winter (cooling of the external aluminium profile). Due to the different expansion properties of the external and internal aluminium profiles composing the window and door structures an arching is generated thereby depriving the structure of its tightness.

[0007] One of the known methods for eliminating deformations of composite aluminium profiles is to use special compensation spacers with local notches of various shapes (rectangles, triangles, circles, etc.) that to some extent compensate the stress between the external and internal aluminium profiles. Such solutions are disclosed e.g. in the U.S. Patent No. 7913470 and in the U.S. Patent Application US 2010/0115850. Notches of the spacer are masked with a cover integrated with the spacer, which results in aesthetic appearance without affecting the spacer operation.

[0008] Given that aluminium joinery systems are commonly used in a variety of climates, including often very large structures (skyscrapers, industrial buildings, large commercial and service buildings, public utility buildings), there is a constant need for new solutions that would allow for the best possible stress compensation and compensation of the resulting deformations of aluminium profiles, while maintaining the simplest possible and economically attractive methods for manufacturing spacers and assembling ready systems.

Summary of the invention

[0009] The aim of the present solution was to overcome the problems referred to above and associated with the use of known solutions, and in particular to provide good stress compensation between the external and internal aluminium profiles in case of large temperature differences between the environments on the external and internal profile sides, and the simplest possible method for manufacturing thermal spacers and installation of spacers in aluminium joinery systems.

[0010] Accordingly, the present invention relates to a thermal compensation spacer for connecting together external and internal aluminium profiles in an aluminium joinery system, said spacer being formed as an elongated strip element, made by coextrusion of two materials of different hardness, wherein at least the edge regions along longer edges of the strip element designed to be crimped in the external and internal aluminium profiles are made of a hard polymer material, and at least one region between said edge regions is made of a soft and elastic polymer material.

[0011] Preferably, the hard polymer material is selected from polyamide (PA), acrylonitrile-butadiene-styrene (ABS) terpolymer, poly(ethylene terephthalate) (PET).

[0012] Preferably, the soft and flexible polymer material is a thermoplastic elastomer.

[0013] In one preferred embodiment, the thermal spacer of the invention consists of three regions extending

longitudinally over the entire length of the strip element, wherein the two distal edge regions are made of a hard polymer material, and between them there is an intermediate region made of soft and elastic polymer material.

[0014] In another preferred embodiment, the thermal spacer of the invention consists of five regions extending longitudinally over the entire length of the strip element, wherein the two distal edge regions and the middle region are made of a hard polymer material, and between each of the distal edge regions and the middle region there is an intermediate region made of soft and flexible polymer material.

[0015] In yet another preferred embodiment, the thermal spacer of the invention has closed air chambers at least on a portion of its length.

[0016] In another embodiment, the thermal spacer of the invention has additional projections on one or both sides for attaching rails or caps.

[0017] According to the present invention, the thermal spacer is composed of two components of different hardness and is produced by co-extrusion, i.e. extrusion of several layers which may differ in structure and colour. The hard external (in cross sectional view) parts of the spacer, as in conventional spacers, are crimped in the external and internal aluminium profiles, respectively. The middle part or parts are made of soft and flexible material. The use of flexible parts permanently connected to the hard parts allows to compensate the differences in the displacement of external and internal profiles resulting from different temperatures affecting the external and internal parts of the window and door structures. The co-extrusion process enables to obtain a multicomponent spacer showing required rigidity and strength as well as to maintain the desired tolerances of linear and cross-sectional dimensions. The thermal spacers of the invention can be manufactured in all the currently commercially available shapes, i.e. straight, omega-shaped (in cross-sectional view), in a three-dimensional and chambered variants, with caps, in complex systems, etc.

Brief description of the drawings

[0018] The invention will now be presented in greater detail in preferred embodiments, with reference to the accompanying drawings, in which:

fig. 1 is a cross-sectional view of straight-shaped thermal compensation spacers in two embodiments of the invention;

fig. 2 is a cross-sectional view of omega-shaped thermal compensation spacers in two embodiments of the invention;

fig. 3 is a cross-sectional view of chamber type thermal compensation spacers in four embodiments of the invention;

fig. 4 is a cross-sectional view of thermal compensation spacers with caps in six embodiments of the invention;

fig. 5 is a top view of a thermal spacer fragment in one embodiment of the invention;

fig. 6 is a top view of a thermal spacer fragment in another embodiment of the invention;

Detailed description of preferred embodiments

[0019] In the drawing the regions of the spacers of the invention made of hard polymer material are marked with horizontal hatching, while the regions made of soft and flexible polymer material are marked with oblique hatching.

[0020] Fig. 1 is a cross-section of two embodiments of straight-shaped thermal compensation spacers of the invention, with the embodiment with one intermediate region of soft and flexible polymer material being shown at the top, and below there is an embodiment with two such regions divided by a middle region of hard polymer material.

[0021] Fig. 2 is a cross-section of two embodiments of omega-shaped thermal compensation spacers of the invention, whereby - similarly to fig. 1 - the embodiment with one intermediate region of soft and flexible polymer material is shown at the top, and below there is an embodiment with two such regions divided by a middle region of hard polymer material.

[0022] Fig. 3 is a cross-section of four embodiments of chamber type thermal compensation spacers of the invention, varying in number and arrangement of chambers and regions of hard polymer material and of soft and flexible polymer material.

[0023] Fig. 4 is a cross-section of six embodiments of thermal compensation spacers with caps of the invention, showing various ways of fastening the caps and numbers of regions of hard polymer material and of soft and flexible polymer material.

[0024] Fig. 5 is a top view of a thermal spacer fragment in the embodiment with one intermediate region of soft and flexible polymer material, and fig. 6 is an analogue view of the embodiment with two such regions dividing the middle region of hard polymer material.

Claims

1. A thermal compensation spacer for connecting together external and internal aluminium profiles in an aluminium joinery system, said spacer being formed as an elongated strip element, **characterised in that** it is made by coextrusion of two materials of different hardness, wherein at least the edge regions along longer edges of the strip element designed to be crimped in the external and internal aluminium profiles are made of a hard polymer material, and at least one region between said edge regions is made of a soft and elastic polymer material.

2. The thermal compensation spacer according to

claim 1, **characterised in that** the hard polymer material is selected from polyamide (PA), acrylonitrile-butadiene-styrene (ABS) terpolymer, poly(ethylene terephthalate) (PET).

3. The thermal compensation spacer according to claim 1 or 2, **characterised in that** the soft and flexible polymer material is a thermoplastic elastomer.

4. The thermal compensation spacer according to one of the claims 1 to 3, **characterised in that** it consists of three regions extending longitudinally over the entire length of the strip element, wherein the two distal edge regions are made of a hard polymer material, and between them there is an intermediate region made of soft and elastic polymer material.

5. The thermal compensation spacer according to one of the claims 1 to 3, **characterised in that** it consists of five regions extending longitudinally over the entire length of the strip element, wherein the two distal edge regions and the middle region are made of a hard polymer material, and between each of the distal edge regions and the middle region there is an intermediate region made of soft and flexible polymer material.

6. The thermal compensation spacer according to one of the claims 1 to 4, **characterised in that** it has closed air chambers at least on a portion of its length.

7. The thermal compensation spacer according to one of the claims 1 to 5, **characterised in that** on one or both sides it has additional projections for attaching rails or caps.

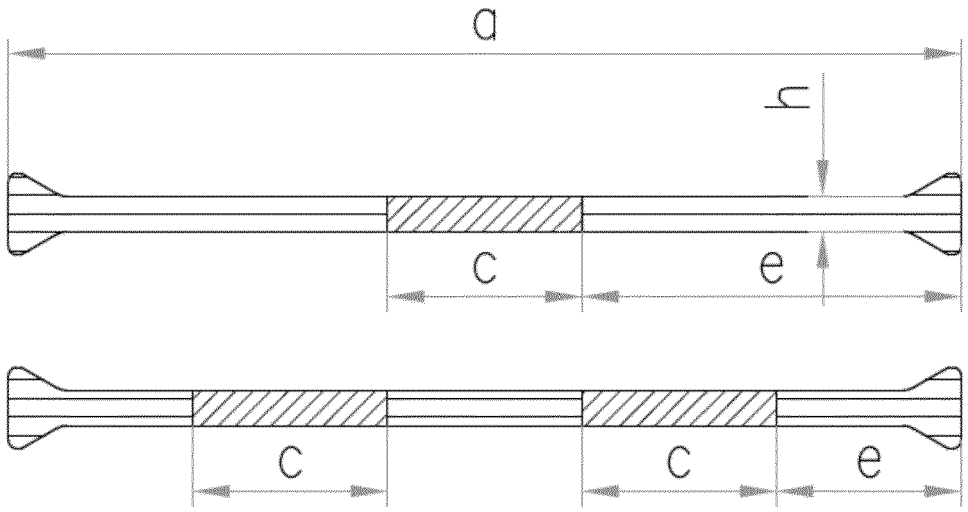


FIG. 1

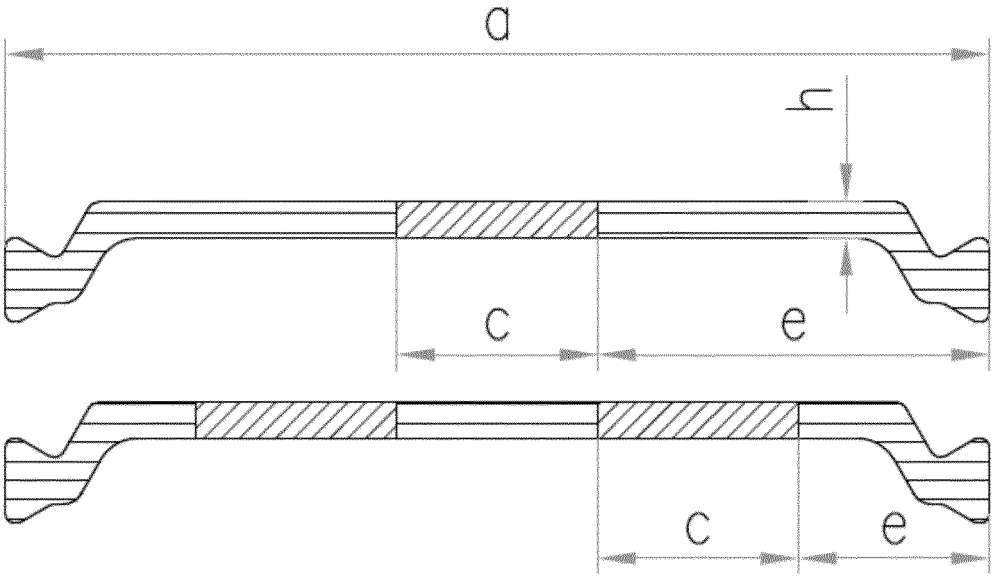


FIG. 2

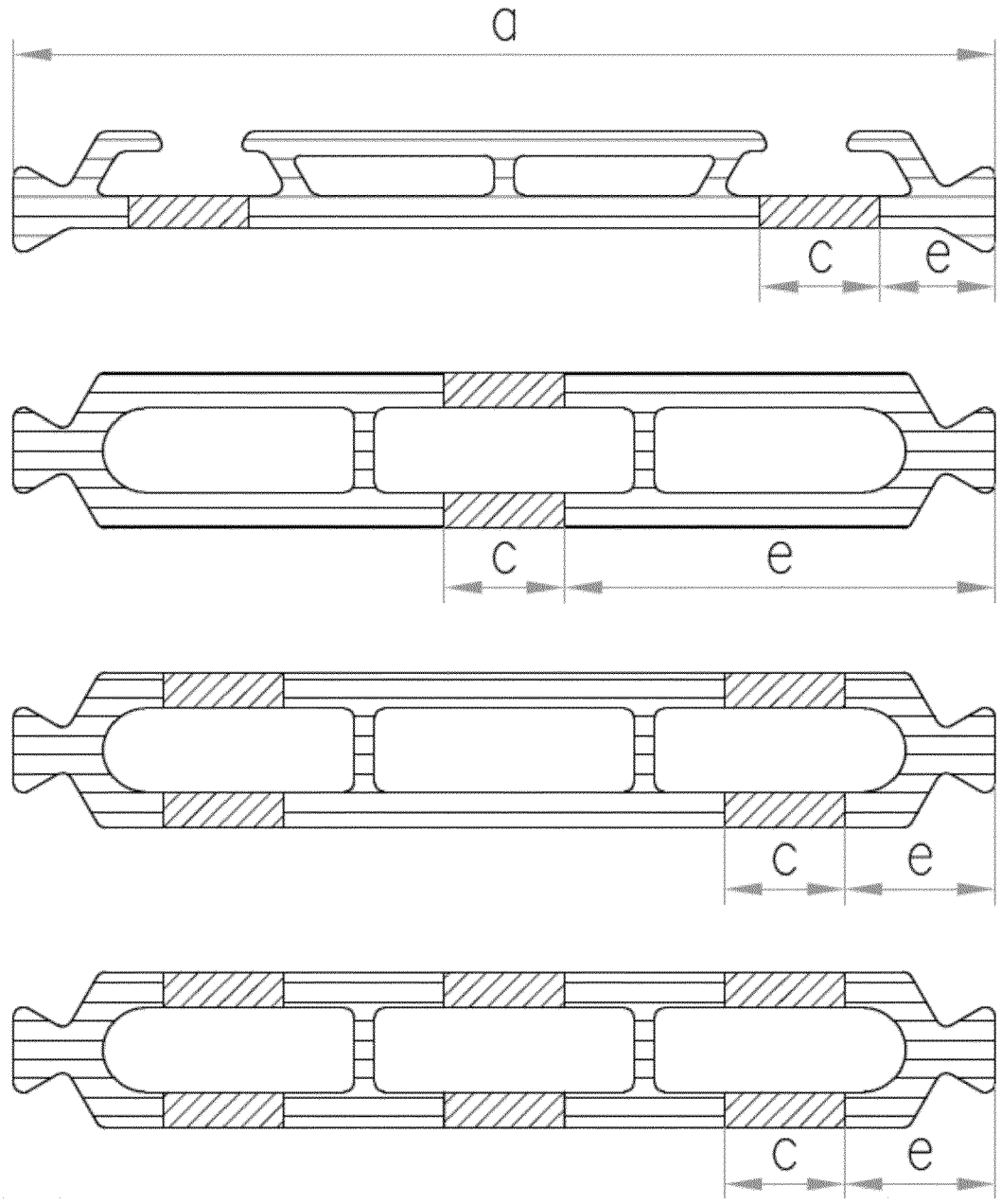


FIG. 3

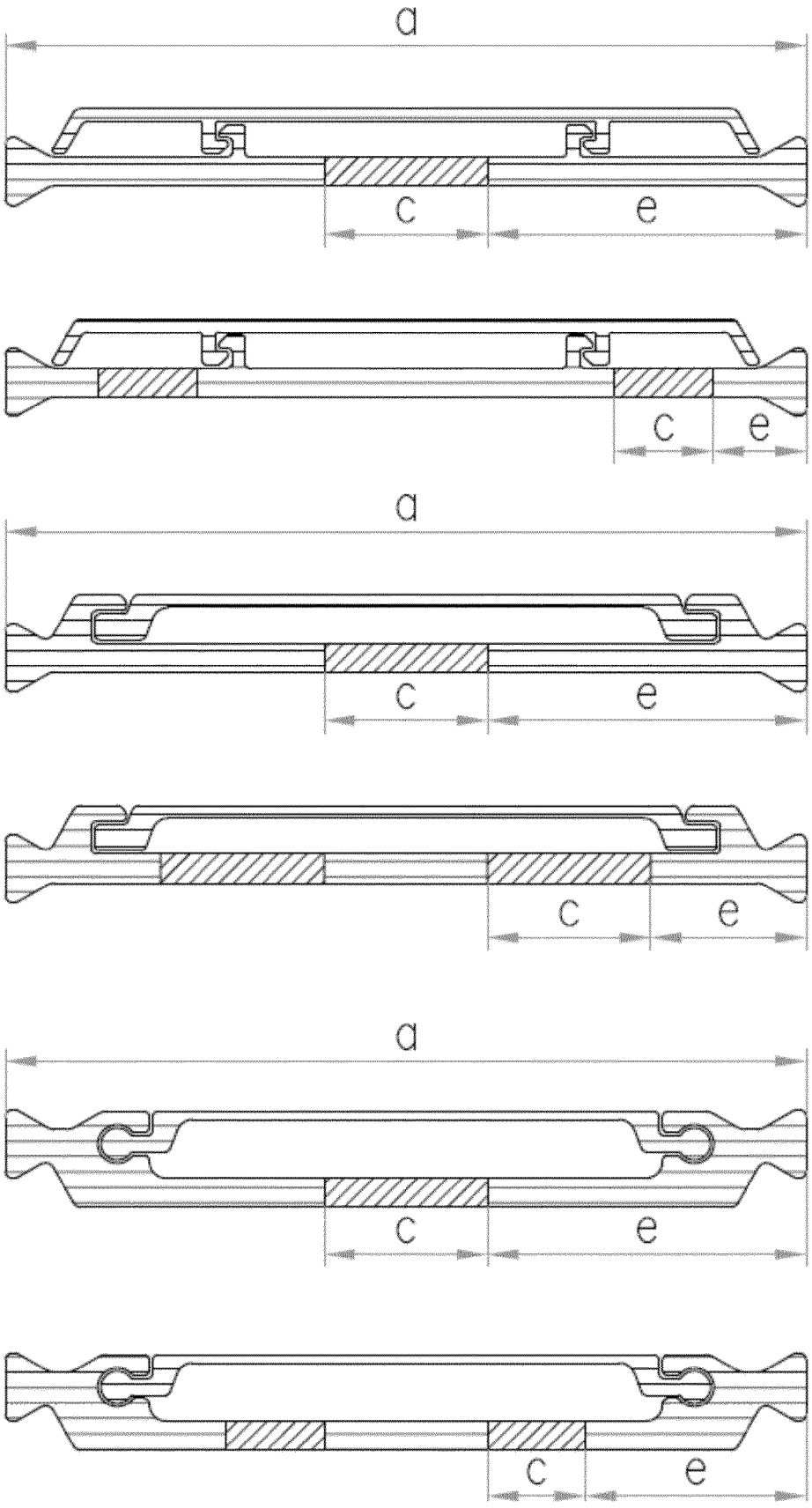


FIG. 4

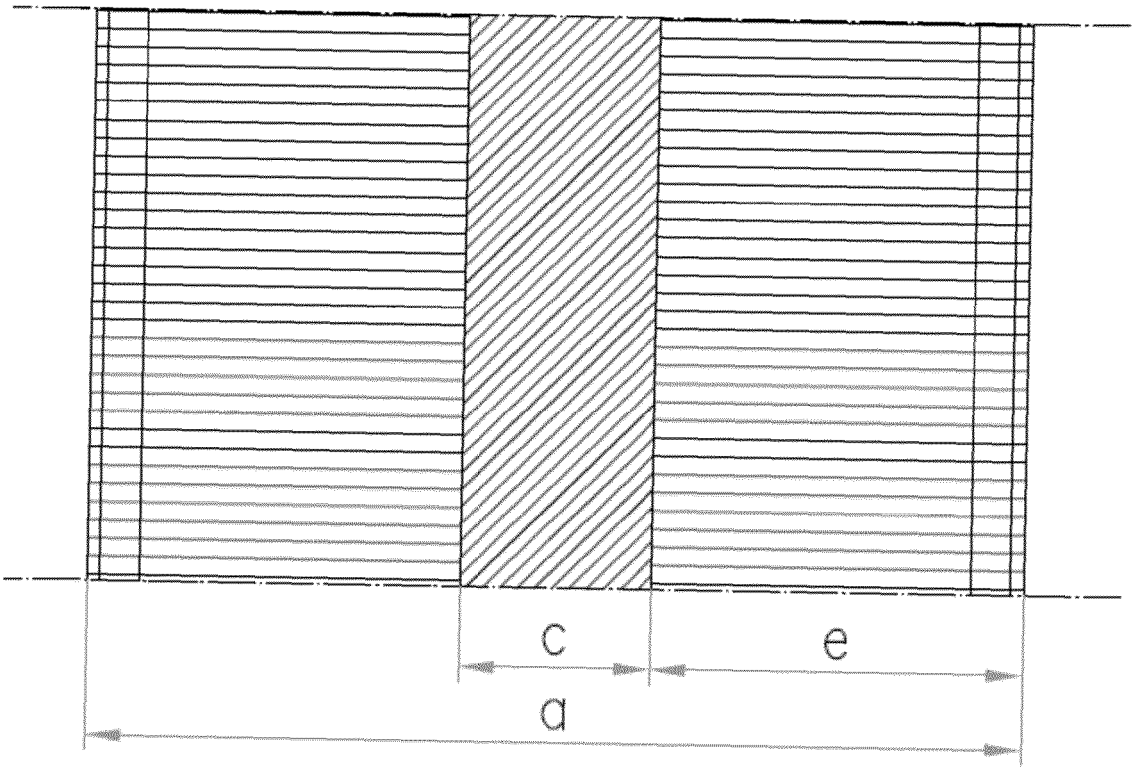


FIG. 5

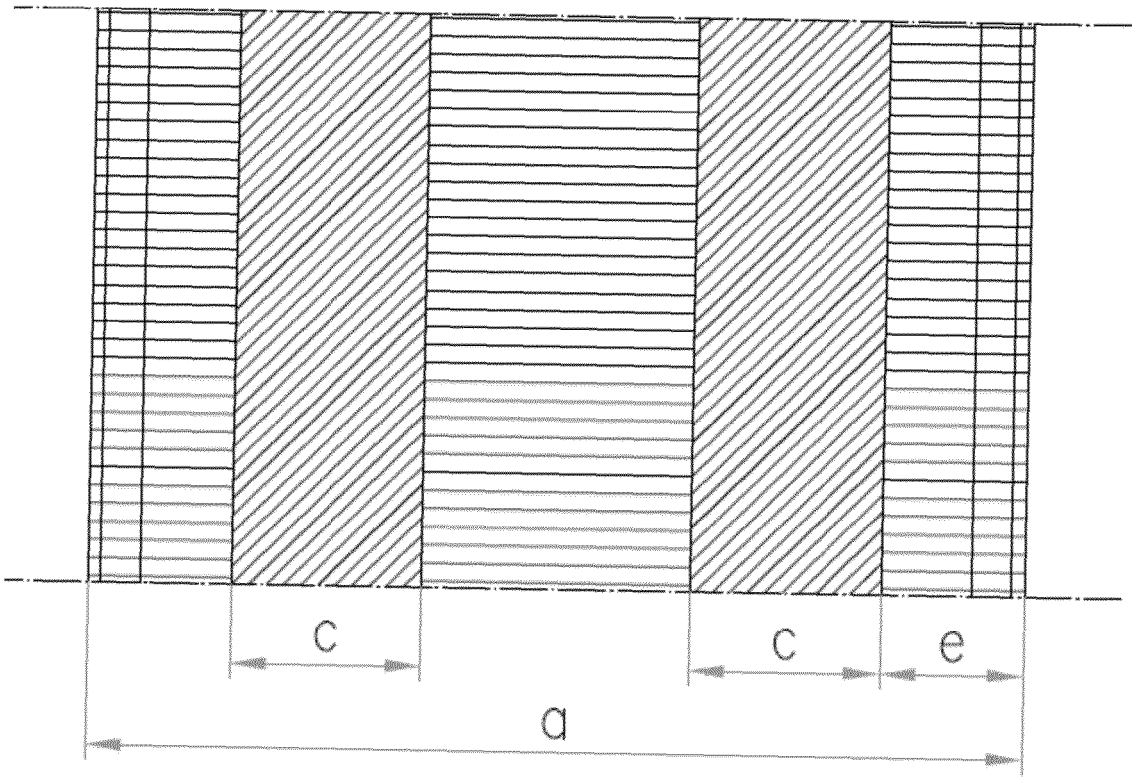


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 0171

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 1 002 924 A2 (NORSK HYDRO AS [NO]) 24 May 2000 (2000-05-24) * paragraph [0011]; figures 1a, 1b, 5 * * paragraph [0014] * * paragraph [0021] * -----	1-7	INV. E06B3/263 E06B3/273
X	DE 10 2004 038868 A1 (HYDRO BUILDING SYSTEMS GMBH [DE]) 23 February 2006 (2006-02-23) * paragraph [0006] - paragraph [0007]; figures 1-9 * * paragraph [0023] * -----	1-7	
			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	22 February 2018	Cobusneanu, D

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22-02-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1002924 A2	24-05-2000	DE 19853235 A1	25-05-2000
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- PL 66697 Y1 **[0004]**
- US 7913470 B **[0007]**
- US 20100115850 A **[0007]**