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Description

According to the preamble of claim 1, the invention relates to a gap closure element for laying in gaps of wooden terraces and/or between wooden material boards in outdoor areas with ventilation. The invention further relates to a wooden terrace for outdoor use. Furthermore, the invention relates to a method for closing gaps in wooden terraces and/or between wooden material boards in outdoor areas with a gap closure element mentioned at the beginning.

At present, it is state of the art that longitudinal and transverse gaps of wooden terrace boards as well as boards made of wood-based materials must be of open design. Depending on the material and laying technique, a gap width of between 5 and 9 mm is recommended for these open gaps. This open gap design is technically necessary because the material-related longitudinal and transverse expansion of the boards must be absorbed and, in addition, ventilation of these components must be ensured.

Furthermore, these open gaps cause the moisture accumulation on the terrace surface to drain into the subsoil. This is necessary in some applications, for example, when a vertical distance of a water-bearing level to doors must be maintained.

However, open gaps have significant disadvantages. The penetration of vermin into the space below the decking boards against the subsoil is unrestricted. All objects of a size less than the width of the gap fall between the boards into the subsoil under the terrace, which is no longer accessible. Overgrowth can protrude from the subsoil of the terrace through the gaps onto the terrace surface. Compounding this problem is the fact that these terrace boards are increasingly being installed without visible screw fasteners. While this increases the durability of the boards, it makes access to the area below the boards virtually impossible without extensive decking removal.

AT 5920 U2 attempts to solve this problem by inserting a gap sealing profile with lateral lamellae and an internal cavity into the gaps of wooden boards, which are brought to a maximum of 12 percent wood moisture content by artificial drying. In the weathered state, the wood moisture value rises to 16 to 20 percent "and no longer falls below the 14% mark." The moisture-induced expansion of the wooden boards compresses the gap sealing profile into the gaps, resulting in a dust- and water-tight wood floor. However, the disadvantage of this is that the under-ventilation of the wooden floor is not possible and surface water cannot drain away. In addition, if there are frequent

changes between wet and dry periods, the resulting expansion and contraction of the wooden boards and the grouted gap sealing profile can cause damage to the wood. A solution disclosed in DE 17 50 008 A also has similar disadvantages.

EP 1 083 269 A describes a terrace composed of slabs, wherein the gaps between the slabs are closed by gap bars. Due to the wave-like design of the gap bars, a certain water permeability is achieved. Since the gap bars have to be held by the stilt bearings, the laying is error-prone. In particular, this solution is not suitable for use with wooden terraces.

KR 101 549 065 B discloses a gap closure element with a housing in which two rails are movably mounted and pretensioned outwardly by wave-shaped springs. This makes it possible to exert pressure in the axial direction on the adjacent boards and to close the gap virtually completely. A design that allows ventilation and water drainage cannot be realized with this.

Furthermore, DE 199 40 837 A shows a laying system for slabs in which a pretension is created between the slabs by wave-shaped springs. However, the springs do not serve to mechanically close the gaps or to influence the water drainage.

It is therefore an object of the invention to provide a gap closure element or a wooden terrace with such a gap closure element, so that the thermal-hygric necessity of a butt joint is taken into account and at the same time its mechanical closure is made possible. Furthermore, it is an object of the invention to provide a method for closing gaps between wooden material boards without special tools or special assembly elements, in which the above-mentioned conditions are fulfilled.

This object is solved by a gap closure element mentioned at the beginning, which according to the invention has the features of claim 1.

In particular, it is provided that the gap closure element is designed as a zigzag-shaped strip section made of an elastic material, wherein the gap closure element is intended to be accommodated in the gap under pretension. Thus, the spring effect of the gap closure element is utilized to hold it in the gap, even if variations in the gap width occur. It is an essential feature of the invention that the zigzag design on the one hand ensures pretensioning in a suitable manner and on the other hand leaves the gap open enough to allow water to flow off unhindered and to ensure ventilation.

Preferably, the pretension is created by the strip section in the non-assembled state having an oversize relative to a gap width of the gaps of from 1.1 times to 1.9 times the gap width. The gap width referred to here is the value that occurs at average

moisture levels. In particular, in the case of increased moisture of the wooden material boards, the gap width can be significantly smaller.

This provides a water-permeable gap closure element to protect against small parts falling through for gaps of wooden terraces and wooden material boards in outdoor areas. The zigzag shape results in a spring effect in longitudinal tension, so that the gap closure element is particularly easy to install in existing terraces and a variation in gap width due to changes in wood moisture can be accommodated without loss of clamping effect.

In one variant of the invention, when the gap closure element is not assembled, the normal distance between at least two immediately adjacent extreme deflections of the zigzag-shaped strip section in a direction normal to a longitudinal direction of the gap closure element is between 1.1 times to 1.9 times the gap width of the gaps.

Preferably, it is provided that the gap closure element is provided with rectangular segments arranged substantially at right angles to respective adjacent segments. As a result, the gap closure element is vertically prismatic in the position of use and thus leaves the maximum possible cross-section free for water drainage and ventilation.

The object of the invention is further solved by a wooden terrace mentioned at the beginning of the invention in that gap closure elements of the type described above are provided in the gaps at least partially and/or in sections.

Conveniently, the wooden material boards are arranged on supporting beam elements, with the supporting beam longitudinal axes extending transversely, preferably normally, to the direction of a board longitudinal axis.

In one variant of the invention, the supporting beam elements are thereby arranged at a supporting beam spacing of 30 cm to 90 cm, preferably of 45 cm, from one another.

The object of the invention is further solved by a method mentioned at the beginning for closing gaps in wooden terraces and/or between wooden material boards in outdoor areas with a gap closure element of the above-mentioned type according to the invention by the following steps:

- a) applying a tensile load to end sections of a strip section of the gap closure element that are opposite one another in the longitudinal direction of the gap closure element;
- b) inserting the gap closure element into a gap;
- c) terminating the tensile load on the gap closure element.

This makes it possible to exploit the spring effect of the gap closure element according

to the invention and to achieve particularly rapid and reliable closure of the gap.

In one variant of the invention, in a step a0) carried out before step a), two or more gap closure elements are placed in one another in a form-fitting manner before steps a) to c) are carried out. Placing in one another in a form-fitting manner means that the respective extreme deflections of the strip sections of the two or more gap closure elements are brought into engagement so that the strip sections are in direct contact with one another. The change in length can then be achieved by applying the tensile load to the respective end sections together. This embodiment variant also allows wider gaps or gap sections to be reliably closed.

In a further variant, in a step a00) carried out before all the other steps, the wooden terrace is erected in an outdoor area by laying wooden material boards, wherein gaps with a gap width of between 5 mm and 9 mm, preferably with a gap width of 7 mm, are made between adjacent wooden material boards. It is advantageous if the wooden material boards are laid with a wood moisture content of between 14 percent and 18 percent, preferably between 16 percent and 18 percent.

This can ensure particularly easy insertion of the gap closure elements according to the invention.

The invention is explained in more detail below with reference to a non-limiting exemplary embodiment shown in the figures, wherein:

Fig. 1 shows an oblique view of a gap closure element according to the invention;

Fig. 2 shows a top view of a gap closure element according to the invention in the non-assembled state;

Fig. 3 shows a top view of the gap closure element of Fig. 2 when subjected to a tensile load in the longitudinal direction;

Fig. 4 shows a perspective view of a wooden terrace according to the invention with gap closure elements; and

Fig. 5 shows a sectional view of the wooden terrace along line A-A in Fig. 4.

Fig. 1 shows a perspective view of a gap closure element 100 according to the invention. The gap closure element 100 is embodied as a zigzag-shaped strip section 1, which is composed of substantially a plurality of rectangular segments. This is to be understood as a strip section 1 having a certain thickness of material, which has a sequence of extreme deflections in a direction normal to a longitudinal axis 1a of the strip section 1 or the gap closure element 100. The extreme deflections thereby form the boundaries of the successive segments. In this case, immediately successive

extreme deflections extend in opposite directions from the longitudinal axis 1a in each case, as can be seen in particular from Fig. 2 and Fig. 3. This results in the aforementioned zigzag shape - essentially, in plan view, a sequence of isosceles triangles whose apexes point in opposite directions of the immediately adjacent triangles in each case. The width of the strip section 1 is essentially the result of the spacing of immediately adjacent extreme deflections in a direction normal to the longitudinal axis 1a of the gap closure element 100.

In Fig. 2, a first extreme deflection 101 and an immediately adjacent second extreme deflection 102 are provided with reference signs as examples: The width of the strip section 1 is obtained as the distance between these extreme deflections 101, 102 in a direction normal to the longitudinal axis 1a of the gap closure element 100.

While the present figures show an exemplary embodiment in which the absolute value of all deflections with respect to the longitudinal axis 1a is selected to be the same, variants are also possible in which the extreme deflections vary over the longitudinal extension of the strip section 1. The width is then defined by the largest distance between adjacent extreme deflections.

The strip section 1 of the gap closure element 100 is made of an elastic material. In the present disclosure, elastic is understood to mean the property of absorbing acting tensile forces or acting pressure by deformation and of returning to the original shape when the action ceases. This property is provided in particular by plastics such as elastomers; for example, the strip section 1 may be made of a thermoplastic elastomer. The shape and choice of material of the gap closure element 100 according to the invention allow its width to be varied by longitudinal stretching, similar to an accordion. Thus, when a tensile load is applied to end sections 1', 1" of the strip section 1 that are opposite in the direction of the longitudinal axis 1a, the result is an elongation with a simultaneous reduction in width.

Fig. 2 shows a gap closure element 100 according to the invention in the non-mounted state, in which neither the action of a tensile load nor a compressive load is present. The strip section 1 of the gap closure element 100 has a first width B1 and a first length L1. Fig. 3 now shows this gap closure element 100 with applied load - for example, the first end section 1' is held and a tensile load is applied to the second end section 1" along the longitudinal axis 1a in a direction away from the second end section 1" or vice versa, or a tensile load is applied to both end sections 1', 1" in opposite directions in each case. Due to the zigzag shape of the strip section 1, there is an extension to

a second length L2 with a simultaneous reduction in width from the first width B1 to a narrower second width B2.

For example, in the exemplary embodiment according to Fig. 2 and Fig. 3, the second width B2 is 20 percent less than the first width B1, while the second length L2 is 30 percent greater than the first length L1. In an embodiment using a TPO strip with A-Shore hardness 90, i.e., a strip made of an olefin-based thermoplastic elastomer with corresponding material hardness, the inventor's tests showed a 30 percent reduction in width with a 20 percent increase in length.

When the tensile load on the gap closure element 100 is terminated, the initial position shown in Fig. 2 is resumed.

If, at the time of ending the tensile load, the gap closure element 100 is inserted into a gap 2 that is narrower than the first width B1 but wider than the second width B2, the gap closure element 100 cannot fully return to its initial position with the first width B1 but gets jammed in the gap 2.

Thus, the gap closure element 100 according to the invention enables simple, in particular also subsequent, laying in gaps 2 of wooden terrace 3 and/or between wooden material boards 4 in the outdoor area, in that the strip section 1 in the non-mounted state is designed with an oversize relative to a gap width F0. In particular, the oversize is 1.1 times to 1.9 times the gap width F0.

It should be noted that a zigzag-shaped strip section 1 in the sense of the present invention is not only to be understood as a strip of elastic material composed of flat segments, but also as an alternatively shaped strip, as long as the clamping effect is ensured with appropriate pretensioning and as long as the sharpest possible edge is formed between the segments. This avoids surface contact between the strip and the wooden material boards, so that no moisture accumulation can occur due to capillary effects.

Fig. 4 shows a wooden terrace 3 consisting of wooden material boards 4 mounted on supporting beam elements 5 in the form of upholstered timbers, which is located outdoors, i.e. not provided inside a building and thus exposed to the weather. In the illustrated exemplary embodiment, the supporting beam longitudinal axes 5a run normal to the direction of the board longitudinal axes 4a and the supporting beam elements 5 are arranged at a supporting beam spacing S1 of 45 cm from each other. The wooden material boards 4 are spaced apart from each other so that there are gaps 2 between the wooden material boards 4.

The Austrian Society for Wood Research (HFA-ÖGH) recommends a gap width F_0 of at least 7 mm at a wood moisture content of 16 percent to 18 percent when erecting wooden terrace 3. As the moisture content of the wood changes due to weather conditions, the wooden material boards 4 expand or contract accordingly, so that the gap width F_0 varies. Practical measurements by the inventor have shown that the gap width F_0 varies in the range of about 2 mm, i.e., with an assumed gap width F_0 of 7 mm during installation, it varies between 6 mm and 8 mm, although larger fluctuations are also possible depending on the wood moisture content during installation and the weather. This poses great challenges for gap sealing, which the invention solves accordingly.

The width B_1 of the strip section 1 of the gap closure element 100 in the non-assembled state is selected to have an oversize of from 1.1 times to 1.9 times the gap width F_0 . In a variant of the invention, in the non-assembled state of the gap closure element 100, the normal distance between at least two immediately adjacent extreme deflections 101, 102 of the zigzag-shaped strip section 1 in a direction normal to the longitudinal axis 1a of the gap closure element 100 is executed between 1.1 times to 1.9 times the gap width F_0 of the gaps 2. In the case described above of an installation joint density F_0 of 7 mm, for example, a gap closure element 100 with a first width B_1 of 9.5 mm is used.

The width of the zigzag-shaped strip section 1 can be reduced by longitudinal tension to such an extent that simple insertion into the gap 2 becomes possible. The restoring force due to the elasticity of the material subsequently causes permanent clamping in the gap 2 without the need for further mechanical fixing. By leaving isosceles triangles (prisms) open as a continuous opening, the design ensures safe drainage of surface water from the surface of the wooden terrace 3 into the subsoil. Since contact with the flank - i.e. the side surfaces 4' bounding the gap 2 - of the wooden material boards 4 only occurs via individual, short lines at the tip of said isosceles triangular prisms, the formation of a capillary-absorbing interface is prevented. This ensures that the flank zone does not take on increased wood moisture compared to the board surface.

In Fig. 4, gap closure elements 100 in the form of zigzag-shaped strip sections 1 are inserted into the gaps 2 accordingly. The predetermined zigzag geometry, in conjunction with the selected elastic material of the strip section 1 (e.g. thermoplastic polyolefin), ensures constant adaptation to the thermally hygric changes in the gap width F_0 and thus its secure fixing. The gap closure element 100 is thus inserted into

the gap 2 in such a way that the zigzag course extends in a direction parallel to the surface of the wooden terrace 3 or the wooden material boards 4, so that the extreme deflections cause it to jam with the side surfaces 4' (see Fig. 5) of the wooden material boards 4 bounding the gap 2.

The lattice-shaped closure of the gap 2 resolves the conflict of objectives between the desired protection against objects falling through and their openness required from the point of view of structural physics. The length of the strip sections 1 is selected here so that the second length L2 in the inserted state is greater than the supporting beam spacing S1. This facilitates installation because a stop is provided for the strip sections 1 during insertion if the gap closure elements 100 are pushed deeper into the gaps 2. The strip sections 1 can be pushed in until they rest against the supporting beam elements 5.

This ensures that the gap closure element 100 remains in the gap 2 even in the event that the gap width F0 is greater than the first width B1 of the strip section 1 - this may be the case in the event of extreme dryness and a corresponding reduction in the wood moisture content or in the event of an age-related reduction in the elasticity of the material of the strip section 1, but may also be due to errors during the laying. In such a case, it can also be provided that when the gap closure elements 100 are inserted, two strip sections 1 in each case are placed in one another in a form-fitting manner and only then inserted. In this case, a shorter strip section 1 can also be inserted into a longer strip section 1 in order to bridge a locally limited excess width of the gap 2.

In the illustrated exemplary embodiment, the element height H1 (i.e., the height of the gap closure element 100 or its strip section 1) is selected to be between 0.5 times and 1.0 times the board height H0. This can be seen in Fig. 5, where a section along line A-A in Fig. 4 is shown: the element height is about 0.75 times the board height H0 and the strip section 1 is pushed all the way down into the gap 2 so that there is a gap between the top of the strip section 1 and the surface of the wooden terrace 3 or the wooden material boards 4.

The invention thus enables an elastic gap closure element 100 with ventilation for gaps 2 of wooden terraces 3 and/or wooden material boards 4 in outdoor areas, wherein the choice of a zigzag-shaped geometry in conjunction with an elastic material makes it possible for water to flow out of the terrace surface to a large extent and drying back from the subsoil is not impaired. The flank formation between the gap closure element

100 and the wooden side walls of the wooden material boards 4 is designed in such a way that no capillary effect occurs. The purpose of the gap closure is to prevent the penetration of insects into the terrace subsoil and to prevent the loss of small objects through the gap. As shown in the figures, this is achieved by a zigzag formation of a longitudinally and transversely elastic strip section 1 made of plastic (preferably thermoplastic polyolefin). On the one hand, this achieves ease of insertion (width reduction due to longitudinal expansion) and the clamping effect required for fixation (oversize compared to the gap width F_0). On the other hand, the lattice-like design of the gap closure prevents small objects from falling through. The elastic deformability also ensures that the material-related geometry changes of the gap 2 are absorbed. To improve the clamping effect, the strip section 1 can also be provided with a surface structure that allows better interaction with the wooden material boards 4.

It is also easy to install the gap closure element 100. Accordingly, a method for closing gaps 2 according to the invention comprises the following steps:

First, a tensile load is applied to at least one of two end sections 1', 1" of the strip section 1 opposite each other in the longitudinal direction of the gap closure element 100; preferably, such a large tensile load is applied that the first width B_1 of the strip section is reduced to a second width B_2 , which is smaller than the gap width F_0 . If the gap 2 is wider or has sections with a greater width, two or more gap closure elements 100 can also be laid one inside the other in a preceding step, or a slightly shorter strip section 1 for the wider area can be laid inside a longer strip section 1.

In the next step, the gap closure element 100 is inserted into the gap 2. It does not matter whether the wooden terrace 3 has been freshly erected and the installation gap width is available or whether the gap closure element 100 is inserted at a later time when the gap width F_0 has changed due to weather conditions. By varying the tensile load, the width of the gap closure element 100 can be adjusted accordingly.

Finally, the tensile load on the gap closure element 100 is terminated. Because it is made of an elastic material and has a zigzag shape, the gap closure element 100 attempts to restore its original state and expand from the second width B_2 back to the first width B_1 . This results in the clamping effect of the gap closure element 100 in the gap 2 and its permanent closure.

If the closing of the gaps 2 is carried out directly during installation, the wooden terrace 3 is erected in a previous step in an outdoor area by laying wooden material boards 4, wherein gaps 2 with a gap width F_0 of between 5 mm and 9 mm, preferably with a gap

width F0 of 7 mm, are made between adjacent wooden material boards 4. In this case, wooden material boards 4 are preferably laid with a wood moisture content of 14 percent to 18 percent, preferably between 16 percent and 18 percent, or it must be ensured before laying that drying is carried out if the wood-based material boards 4 are intensively moisturized, e.g. due to careless storage.

In conclusion, the laying is carried out as described above.

Patentkrav

1. Træterrasse (3) til udendørsbrug med ventilation og mindst bestående af træmaterialeplader (4), mellem hvilke der er dannet fuger (2), hvor der mindst delvist i fugerne (2) og/eller i sektioner i hvert tilfælde under forspænding er optaget et fugelukningselement (100) til nedlægning i træterrassers (3) fuger og/eller mellem træmaterialeplader (4) ved udendørsbrug med ventilation, **kendetegnet ved**, at fugelukningselementet efterlader fugen åben i en sådan grad, at vandet kan løbe uhindret af, hvilket fugelukningselement (100) er udformet som en zigzagformet båndsektion (1) fremstillet af et elastisk materiale.
2. Træterrasse (3) ifølge krav 1, **kendetegnet ved**, at fugelukningselementets (100) båndsektion (1) i den ikkemonterede tilstand har en overstørrelse i forhold til en fugebredde (F0) af fugerne (2) fra 1,1 gang til 1,9 gang fugebredden (F0).
3. Træterrasse (3) ifølge et af kravene 1 eller 2, **kendetegnet ved**, at den normale afstand mellem mindst to direkte tilstødende ekstreme udbøjninger (101, 102) i fugelukningselementets (100) ikkemonterede tilstand for den zigzagformede båndsektion (1) i en retning vinkelret på en længdeakse (1a) af fugelukningselementet (100) er mellem 1,1 gang og op til 1,9 gang fugernes (2) fugebredde (F0).
4. Træterrasse (3) ifølge et af kravene 1 til 3, **kendetegnet ved**, at fugelukningselementet (100) består af rektangulære segmenter, der er anbragt i det væsentlige vinkelret på respektive tilstødende segmenter.
5. Træterrasse (3) ifølge et af kravene 1 til 4, **kendetegnet ved**, at fugelukningselementet (100) består af segmenter, mellem hvilke der i hvert tilfælde er tilvejebragt kanter.
6. Træterrasse (3) ifølge et af kravene 1 til 5, **kendetegnet ved**, at fugerne (2) er udformet med en fugebredde (F0) på mellem 5 mm og 9 mm, fortrinsvis med en fugebredde (F0) på 7 mm.
7. Træterrasse (3) ifølge et af kravene 1 til 6, **kendetegnet ved**, at

træmaterialepladerne (4) er anbragt på bærebjælkelementer (5), hvor bærebjælkelementerne (5a) strækker sig på tværs, fortrinsvis vinkelret, på retningen af en plades længdeakse (4a).

8. Træterrasse (3) ifølge krav 7, **kendetegnet ved**, at bærebjælkelementerne (5) er anbragt med en bærebjælekeafstand (S1) på 30 cm til 90 cm, fortrinsvis på ca. 45 cm, fra hinanden.

9. Træterrasse (3) ifølge et af kravene 1 til 8, **kendetegnet ved**, at fugelukningselementet (100) efterlader mindst 50 %, fortrinsvis mindst 70 %, af fugens (2) tværsnit åben i den monterede tilstand.

10. Fremgangsmåde til lukning af fuger (2) i træterrasser (3) og/eller mellem træmaterialeplader (4) i udendørsområdet med et fugelukningselement (100) ifølge et af kravene 1 til 9, **kendetegnet ved** følgende trin:

- påføring af en trækbelastning på endesektioner (1', 1'') af en båndsektion (1) af fugelukningselementet (100), som er modsat hinanden i fugelukningselementets (100) længderetning;
- indføring af fugelukningselementet (100) i en fuge (2);
- afslutning af trækbelastningen på fugelukningselementet (100).

11. Fremgangsmåde ifølge krav 10, **kendetegnet ved**, at to eller flere fugelukningselementer (100) i et trin a0), der udføres før trin a), anbringes formsluttende i hinanden, før trin a) til c) udføres.

12. Fremgangsmåde ifølge et af kravene 10 eller 11, **kendetegnet ved**, at træterrassen (3) i et trin a00), der udføres før alle de andre trin, opføres i et udendørsområde ved lægning af træmaterialeplader (4), hvor fuger (2) med en fugebredde (F0) på mellem 5 mm og 9 mm, fortrinsvis med en fugebredde (F0) på 7 mm, frembringes mellem tilstødende træmaterialeplader (4).

13. Fremgangsmåde ifølge et af kravene 10 til 12, **kendetegnet ved**, at træmaterialepladerne (4) lægges med et træfugtindhold på 14 procent til 18 procent, fortrinsvis på mellem 16 procent og 18 procent.

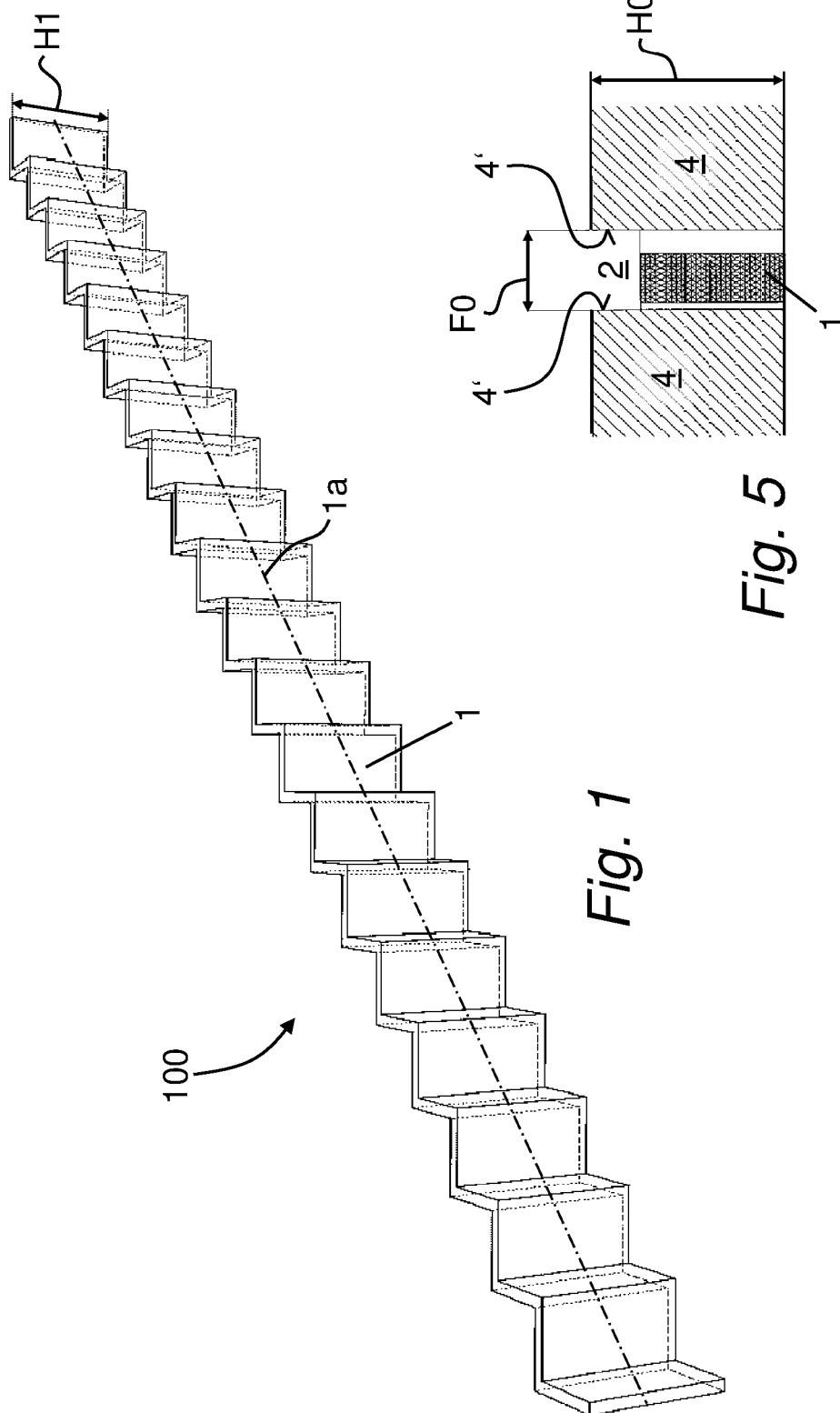


Fig. 1

Fig. 5

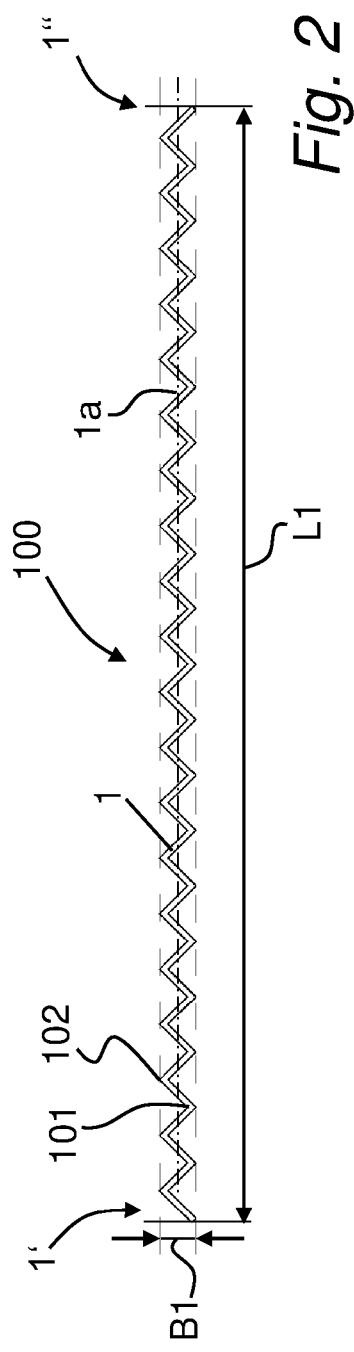


Fig. 2

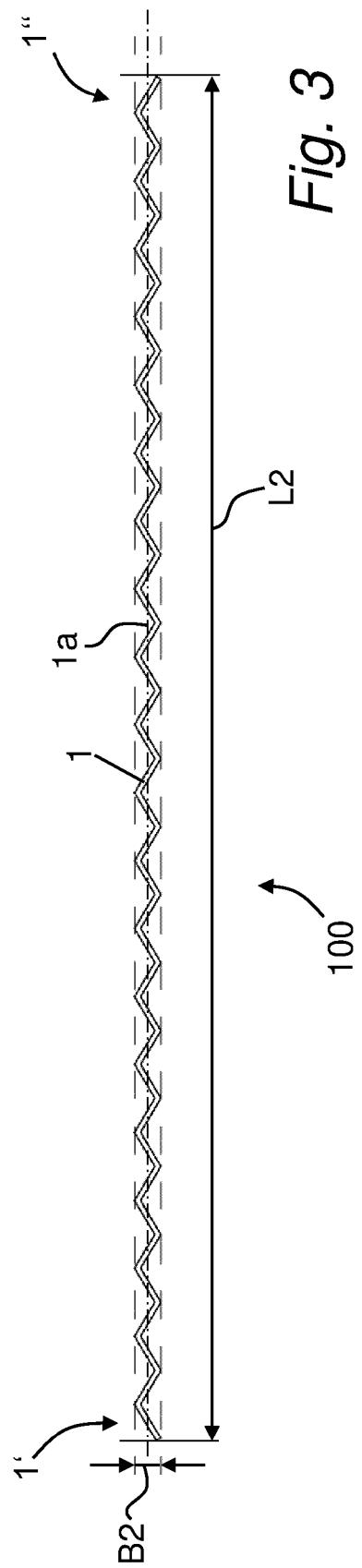


Fig. 3

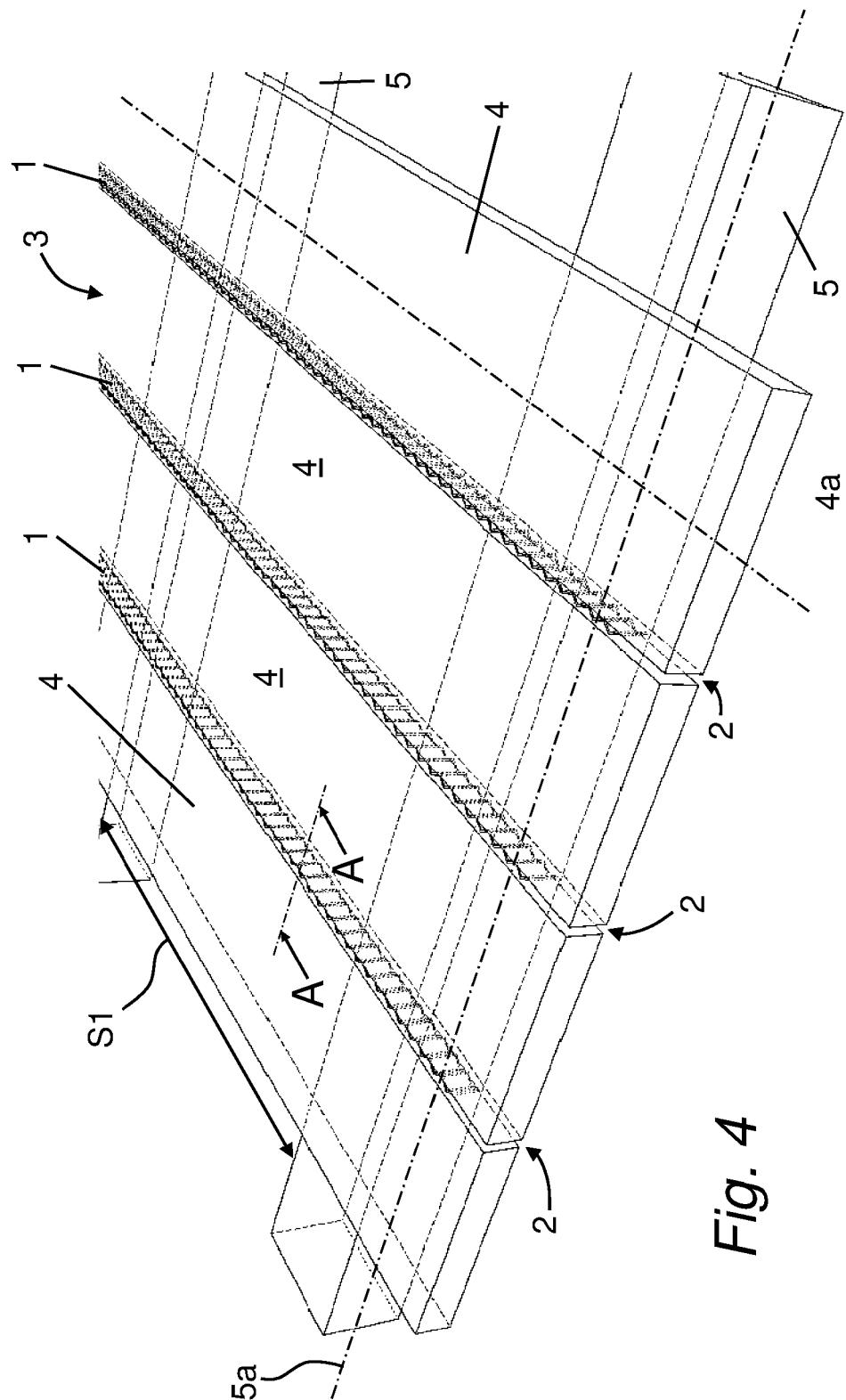


Fig. 4