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(54) **NOISE BARRIER WITH WAVE-SHAPED-SOUND-ABSORBING PANELS AND ASSOCIATED ASSEMBLY METHOD**

LÄRMSCHUTZWAND MIT WELLENFÖRMIGEN SCHALLABSORBIERENDEN PLATTEN UND ZUGEHÖRIGES MONTAGEVERFAHREN

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(73) Proprietor: **Anas S.p.A.**
00185 Rome (IT)

(72) Inventors:
- **DE MARCO, Marcello**
  00185 ROMA (IT)
- **BELLUCCI, Patrizia**
  00185 ROMA (IT)
- **GRECCO, Raffaella**
  00185 ROMA (IT)
- **PERUZZI, Laura**
  00185 ROMA (IT)
- **BONOLI, Gianluca**
  00185 ROMA (IT)

(74) Representative: **Colombo, Stefano Paolo et al**
Marchi & Partners S.r.l.
Via Vittor Pisani, 13
20124 Milano (IT)

(56) References cited:
WO-A1-2010/092606
DE-U- 7 519 462
KR-A- 20090 006 306
KR-B1- 101 177 068

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Description

TECHNICAL SECTOR

[0001] The present invention relates to the sector of structures, typically installed in the vicinity of roads or motorways, for protection against noise and/or noise pollution. In particular, it relates to a noise barrier and the associated method with which such a noise barrier is assembled. As well as being installed in the vicinity of roads and motorways, the noise barriers may be installed close to railways, factories or any other infrastructure where noise and/or noise pollution is generated.

PRIOR ART

[0002] As is known, the transit of vehicles along a road or a motorway creates noise. The noise is typically generated by the rolling movement of tyres, by air streams and aerodynamic noise, by vehicle engine noise and by the use of acoustic signalling devices or the like.

[0003] Along roads where there is particularly heavy traffic or in any case high noise levels it is known to install noise barriers in order to limit the noise in the area close to these roads. For example, when a roadway section is located close to a receiver (residence, school, hospital, etc.), a noise barrier is installed in order to limit the noise coming from the road and make the noise level acceptable for those persons living in the affected receiver.

[0004] The noise barriers may be installed close to roads and motorways, but also close to other sources of noise and/or noise pollution. For example, they may be installed close to railways lines or airport runways or industrial zones.

[0005] Typically, a known noise barrier is composed of panels installed on a special structure which is secured and/or fixed onto a suitable support.

[0006] The panels may be of the sound-insulating and/or sound-absorbing type. Sound-insulating panels are able to lessen the noise levels produced by the sound source in the region of the receivers affected by the noise. In some cases, sound-insulating panels may also be characterized by sound-absorbing properties, i.e. the capacity to absorb the sound energy generated by the noise source. The effectiveness of the screening system depends on the sound characteristics of the panels and the geometric structure of the noise barrier.

[0007] KR 20090006306 A, KR 101177068B1, KR 100882219 B1, KR 101448439B1, KR 200195893 Y1 and WO 2010/092606 A1 disclose sound-insulating barriers.

SUMMARY OF THE INVENTION

[0008] The object defined by the Applicant is that of imparting also sound-absorbing properties to sound-insulating barriers. This object, together with other objects, is achieved by adding modules which are fastened to the screening wall elements and which are able to absorb and spread the incident sound energy over a wide frequency range. According to embodiments, the modules have a wave-shaped form.

[0009] According to a first aspect the present invention provides a noise barrier as defined in claim 1. At least one of the sound-absorbing panels has a wavy profile in cross-section along its length, with a single peak corresponding to a maximum thickness and two half valleys corresponding to the minimum thickness and a height lower than the height of the support uprights. The aforementioned shape of the sound-absorbing panel is able to spread the incident sound energy and disperse it in multiple directions, avoiding the concentration of sound energy by reflection on the front receivers.

[0010] According to embodiments, the single peak is in correspondence with a central section of at least one of the sound-absorbing panels and each of the two half-valleys is near a respective end of the sound-absorbing panel.

[0011] According to embodiments, at least one of the sound-absorbing panels comprises a layer of sound-absorbing material. Advantageously, the layer of sound-absorbing material has a substantially constant thickness and is arranged so as to follow the wavy profile.

[0012] According to embodiments, at least one of the sound-absorbing panels comprises a box-like body.

[0013] According to embodiments, the layer of sound-absorbing material is arranged inside the box-like body. According to embodiments, a substantially empty gap is formed in the box-like body between the layer of sound-absorbing material and the sound-insulating wall, at least at the peak. The cavity is advantageous for enhancing the sound absorption characteristics and extending the sound absorption properties even at low frequencies.

[0014] According to embodiments, the surface exposed to a noise source is perforated and/or comprises an expanded metal sheet and/or comprises a mesh or the like.

[0015] According to embodiments, at least one sound-absorbing panel is hooked onto and suspended from the wall elements by means of a bracket fixed to the wall elements. The suspended hooked arrangement of the sound-absorbing panels is particularly advantageous as it allows the replacement of the single sound-absorbing panel, typically to perform maintenance activities, without the need to disassemble the adjacent panels.

[0016] According to embodiments, the bracket comprises an upper slot and a lower hook and wherein the panel comprises an upper L-shaped plate configured to engage with the slot of the bracket and a lower L-shaped plate configured to engage with the lower hook of the bracket.

[0017] According to another aspect, the present invention provides a method for assembling a noise barrier as defined in claim 9.

[0018] According to embodiments, the sound-absorbing panels are arranged staggered or unstaggered with

respect to the immediately adjacent panels.

BRIEF DESCRIPTION OF THE FIGURES

[0019] The present invention will become entirely clear from the following detailed description, provided purely by way of a non-limiting example, to be read with reference to the attached sets of drawings in which:

- Fig. 1.1 shows in schematic form a sound-insulating base wall section;
- Figs. 1.2 and 1.3 show, respectively, a plurality of sound-absorbing panels of a first type, which are made by way of example from expanded sheet metal and which are partially or fully superimposed on the wall according to Fig. 1.1;
- Figs. 2.1 and 2.2 show, respectively, a plurality of sound-absorbing panels of a second type, which are made by way of example from Krion and which are partially or fully superimposed on the wall according to Fig. 1.1;
- Fig. 2.3 is an enlarged view of the central part of Figs. 2.1 and 2,2;
- Fig. 3 is an exploded view of a wave-shaped sound-absorbing panel according to an embodiment of the invention;
- Figs. 4.1 and 4.2 are, respectively, a front view and a top plan view of the wave-shaped sound-absorbing panel according to Fig. 3;
- Figs. 4.3 and 4.4 are, respectively, cross-sectional views along the lines A-A and B-B of Figure 4.1;
- Fig. 5 is an axonometric view of a curved half-shell of expanded sheet metal, which forms the visible face of the panel according to an embodiment of the invention;
- Figs. 6.1, 6.2 and 6.3 are views of a support bracket according to an embodiment of the invention; and
- Figs. 7.1 - 7.5 show the steps of engaging the panel with the support bracket according to Figs. 6.

DETAILED DESCRIPTION

[0020] Fig. 1.1 shows in schematic form a sound-insulating base wall section. According to embodiments, the sound-insulating wall 20 may comprise wall elements 22 and support uprights 24.

[0021] The support uprights 24 may be metal uprights placed at a predetermined distance from each other. Advantageously, the support uprights 24 are arranged in a vertical position and may be stably fixed to the ground, for example to a concrete base.

[0022] According to embodiments, the metal uprights 24 are iron or steel sections with an "I" (or double "T") cross-section of the type HEB 160, 180 or 200.

[0023] According to embodiments, the wall elements 22 are rectangular elements with a thickness, at least along their short sides, such that the can be inserted between the flanges of the HEB 24 upright.

[0024] The wall elements 22 may be made of any type of material, such as concrete, wood, polymethyl methacrylate (PMMA) and steel.

[0025] According to the present invention sound-absorbing panels 50 are superimposed on the sound-insulating base wall 20. As will become clear below, the sound-absorbing panels 50 may be made of various materials. Fig. 1.2 shows the sound-insulating wall 20 with a plurality of wave-shaped panels which cover it partially and Fig. 1.3 shows the sound-insulating wall 20 which is completed lined with wave-shaped panels.

[0026] The sound-absorbing panels 50 may be made of different materials such as expanded sheet metal, as shown in Fig. 1.2 and 1.3

[0027] The sound-absorbing panels 50 may be made of different materials such as Krion, as shown in Figs. 2.1 and 2.

[0028] Each wall element 22 may be made as one piece or consist of two or more modules.

[0029] According to the embodiments of the present invention, the sound-absorbing panels 50 have a substantially elongated form, with a variable cross-section having a sinusoidal progression. In other words, the visible surface of the panel 50 does not lie in one plane, but extends so as to form peaks and valleys. Preferably, the progression of the panels 50 is very curvy, very "gentle", with very rounded peaks and valleys.

[0030] According to embodiments, panels 50 with different lengths are provided. According to other embodiments, most (or all) of the panels 50 have the same length.

[0031] The sound-absorbing panels may be mounted on a wall 22 so that they are aligned, i.e. with the peaks of all the panels 50 aligned with each other. In other embodiments, the peaks may be unaligned. For example, opposite the peak of one panel, there could be a valley of the adjacent upper (or lower) panel. This staggered configuration is considered to be advantageous for favouring the diffusion of the reflected sound. Furthermore it provides a pleasing aesthetic "moving" effect.

[0032] The sound-absorbing panels 50 may have the same height or may have different heights.

[0033] Preferably, the panels 50 have dimensions which are substantially fractions or multiples of the dimensions of the walls.

[0034] Fig. 3 is an exploded view of a wave-shaped sound-absorbing panel 50 according to embodiments of the invention.

[0035] The panel 50 comprises, by way of example, a box-like body 51 and a layer 60 of sound-absorbing material inside the box-like body 51. The panel 50 is configured to be secured to a bracket 70 which is in turn fastened to a wall 22.

[0036] The box-like body 51 typically comprises a perforated front face, for example made of expanded sheet metal or Krion. The box-like body 51 preferably comprises side walls 53, 54 and a top closing part 55 and bottom closing part 56. According to preferred embodiments, the

box-like body 51 comprises reinforcing partitions 57.

[0037] The sound-absorbing material 60 may comprise a layer of natural and/or synthetic sound-absorbing material with a thickness which is suitable for the desired absorption characteristics. For example, the sound-absorbing material 60 may comprise a material such as rockwool, polystyrene or polyester. According to embodiments, the thickness of the sound-absorbing material 60 may be between 50 mm and 100 mm.

[0038] According to the embodiment shown in Fig. 4.3, the front face 58 comprises an expanded metal sheet made of steel, or a mesh. According to embodiments, the holes in the expanded metal sheet or mesh are substantially hexagonal, circular, rhombus-shaped or oval. According to other embodiments, the front face 58 of the sound-absorbing panel 50 comprises a metal sheet suitably perforated with a predefined pattern.

[0039] The sound-absorbing panels 50 may be fastened using any means to the sound-insulating base walls 22. According to embodiments, securing brackets 70 are provided, these being fixed to the sound-insulating base walls 22 so that a panel 50 may be fastened to two or brackets 70, in a suspended (projecting) configuration.

[0040] Figures 6.1, 6.2 and 6.3 show by way of example a bracket 70 for securing sound-absorbing panels 50 to a sound-insulating base wall 20. The bracket 70, advantageously, has a C-shaped form in cross-section, with two flanges 71 and a central strip 72 provided with holes (Fig. 6.1) for connection (for example by means of screws) to the sound-insulating wall. The bracket 70 may be made of metallic material such as steel, aluminium or alloys thereof.

[0041] At the top end, each of the two flanges 71 has a slot 73, as shown in Figures 6.2 and 6.3.

[0042] At the bottom end, each of the two flanges 71 has a hook 71 with a nose 75, as shown in Figures 6.2 and 6.3.

[0043] Figures 7 illustrate, in schematic form, the steps of securing a sound-absorbing panel 50 to a bracket 70. Typically the rear face of the sound-absorbing panel 50 comprises an upper L-shaped plate 63 and a lower L-shaped plate 64 facing each other.

[0044] During a first step (Fig. 7.1) the rear of the sound-absorbing panel 50 is moved towards the bracket 70.

[0045] During a second step (Fig. 7.2), the lower L-shaped plate 64 is pushed so as to engage with the lower hook 74 of the bracket 60.

[0046] During a third step (Fig. 7.3), the sound-absorbing panel 50 is pushed upwards and at the same time rotated so that the upper L-shaped plate 63 is situated opposite the upper slot 73 of the bracket 70. The rotational movement is possible also owing to the shape of the nose 75 of the lower hook 74, as can be seen from the series of figures.

[0047] During a fourth step (Fig. 7.4), the sound-absorbing panel 50 is pushed downwards so that the upper L-shaped plate 63 fully engages inside the upper slot 73. During this step, the lower L-shaped plate 64 remains engaged with the lower hook 74.

[0048] Fig. 7.5 shows the panel 50 suspended by means of the bracket 70.

[0049] Means may be provided for preventing the sound-absorbing panels from being disengaged, for example following acts of vandalism.

[0050] As will be clear from the description above, the noise barrier 10 according to the present invention, compared to the known noise barriers, has the particular feature that, geometrically speaking, it has a novel design owing to the combination, on two different levels, of a sound-insulating base wall and sound-absorbing panels superimposed thereon. This twin-panel superimposed arrangement gives the noise barrier a three-dimensional appearance on the road.

[0051] The sound-absorbing panels 50 according to the invention may be installed, if necessary, also on a barrier already present along the road, without resulting in any structural deterioration thereof.

[0052] Depending on the surrounding landscape in the which the barrier must be inserted, a basic material which best characterizes the surroundings may be chosen.

[0053] The nose barrier according to the invention is intended for applications in which a partial or total sound-absorbing performance is required. The different levels of sound absorbance may be achieved by varying the number of sound-absorbing panels which are inserted and the characteristics of the sound-absorbing material included inside the panels (material, thickness and density).

[0054] This noise barrier with a novel design is extremely modular and versatile and, where necessary, its acoustic performance features may be extended also to the rear side of the barrier by means of the positioning of further sound-absorbing panels, so as to provide suitable screening and acoustic comfort where neighbouring noise sources are present.

[0055] The strong visual identity represented by the design of the barriers according to the invention is increased by the possibility of including a company logo in its various formulations and sizes.

[0056] When used on roads managed by different operators the logos of the different companies may be displayed depending on their role.

Claims

1. A noise barrier (10) comprising a sound-insulating base wall (20) comprising a plurality of support uprights (24) and a plurality of wall elements (22) supported by said support uprights (24), the noise barrier (10) further comprising elongated sound-absorbing panels (50) superimposed on the sound-insulating base wall (20), **characterized in that** the elongated sound-absorbing panels (50) have a non-uniform thickness along their length, wherein at least one of

the elongated sound-absorbing panels (50) has a wavy profile in cross-section along its length with a single peak corresponding to a maximum thickness and two half valleys corresponding to the minimum thickness and a height lower than the height of the support uprights (24).

2. The noise barrier (10) of claim 1, wherein the single peak is in correspondence with a central section of said at least one of the sound-absorbing panels (50) and wherein each of the two half-valleys is near a respective end of said at least one of the sound-absorbing panels (50).

3. The noise barrier (10) of claim 1 or 2, wherein said at least one of the sound-absorbing panels (50) comprises a layer (60) of sound-absorbing material, wherein the layer (60) of sound-absorbing material is arranged so as to follow the wavy profile.

4. The noise barrier (10) of claim 3, wherein at least one of the sound-absorbing panels (50) comprises a box-like body (51).

5. The noise barrier (10) of claim 4, wherein the layer (60) of sound-absorbing material is arranged inside the box-like body (51) and wherein a gap is formed between the layer (60) of sound-absorbing material and the sound-insulating wall (20) at least in correspondence with said peak.

6. The noise barrier (10) of any of claims 2-5, wherein the surface (58) exposed to a noise source is perforated and/or comprises an expanded metal sheet and/or comprises a mesh or the like.

7. The noise barrier (10) of any one of the preceding claims, wherein at least one sound-absorbing panel (50) is hooked onto and suspended from the wall elements (22) by means of a bracket (70) fixed to the wall elements (22).

8. The noise barrier (10) of claim 7, wherein the bracket (70) comprises an upper slot (73) and a lower hook (74) and wherein the panel comprises an upper L-shaped plate (63) configured to engage with the slot (73) of the bracket and a lower L-shaped plate (64) configured to engage with the lower hook (74) of the bracket (70).

9. A method for assembling a noise barrier (10), comprising: providing a sound-insulating base wall (20) comprising a plurality of support uprights (24) and a plurality of wall elements (22) supported by the support uprights (24), providing a plurality of sound-absorbing panels (50) with wavy profile in cross-section along its length and brackets (70) according to any one of claims 7-8 attaching the brackets (70) to the wall elements (22) and hanging the sound-absorbing panels (50) by means of the brackets (70).

10. The method of claim 9, wherein the sound-absorbing panels (50) are arranged aligned or unaligned with respect to the immediately adjacent panels.

Patentansprüche

1. Lärmschutzbarriere (10) mit einer schallisolierenden Basiswand (20), die mehrere Stützpfosten (24) und mehrere von den Stützpfosten (24) getragene Wandelemente (22) umfasst, wobei die Lärmschutzbarriere (10) zusätzlich längliche schallabsorbierende Platten (50) umfasst, die auf der schallisolierenden Basiswand (20) aufgebracht sind,
dadurch gekennzeichnet,
dass die länglichen schallabsorbierenden Platten (50) eine nicht gleichmäßige Dicke entlang ihrer Länge aufweisen, wobei mindestens eine der langgestreckten schallabsorbierenden Platten (50) ein wellenförmiges Profil im Querschnitt entlang ihrer Länge mit einer einzelnen Erhebung aufweist, die einer maximalen Dicke entspricht, und zwei halben Tälern, die der minimalen Dicke entsprechen, und einer Höhe, die geringer ist als die Höhe der Stützpfosten (24).

2. Lärmschutzbarriere (10) nach Anspruch 1, wobei die einzelne Erhebung einem Mittelabschnitt der mindestens einen der schallabsorbierenden Platten (50) entspricht und wobei jedes der beiden Halbtäler in der Nähe eines jeweiligen Endes der mindestens einen der schallabsorbierenden Platten (50) liegt.

3. Lärmschutzbarriere (10) nach Anspruch 1 oder 2, wobei die mindestens eine der schallabsorbierenden Platten (50) eine Schicht (60) aus schallabsorbierendem Material umfasst, wobei die Schicht (60) aus schallabsorbierendem Material so angeordnet ist, dass sie dem wellenförmigen Profil folgt.

4. Lärmschutzbarriere (10) nach Anspruch 3, wobei mindestens eine der schallabsorbierenden Platten (50) einen kastenförmigen Körper (51) umfasst.

5. Lärmschutzbarriere (10) nach Anspruch 4,

wobei die Schicht (60) aus schallabsorbierendem Material im Inneren des kastenförmigen Körpers (51) angeordnet ist und
wobei ein Spalt zwischen der Schicht (60) aus schallabsorbierendem Material und der schalldämmenden Wand (20) zumindest in Übereinstimmung mit der Erhebung gebildet ist.

6. Lärmschutzbarriere (10) nach einem der Ansprüche 2 bis 5,
wobei die einer Lärmquelle ausgesetzte Oberfläche (58) perforiert ist und/oder ein Streckmetallblech und/oder ein Netz oder ähnliches umfasst.

7. Lärmschutzbarriere (10) nach einem der bisherigen Ansprüche,
wobei mindestens eine schallabsorbierende Platte (50) an den Wandelementen (22) mittels einer an den Wandelementen (22) befestigten Halterung (70) eingehängt und aufgehängt ist.

8. Lärmschutzbarriere (10) nach Anspruch 7,
wobei die Halterung (70) einen oberen Schlitz (73) und einen unteren Haken (74) umfasst und wobei die Platte eine obere L-förmige Platte (63) umfasst, die ausgebildet ist, um in den Schlitz (73) der Halterung einzugreifen, und eine untere L-förmige Platte (64), die ausgebildet ist, um in den unteren Haken (74) der Halterung (70) einzugreifen.

9. Verfahren zum Aufbau einer Lärmschutzbarriere (10), mit:
Bereitstellen einer schalldämmenden Basiswand (20) mit mehreren Stützpfosten (24) und mehreren Wandelementen (22), die von den Stützpfosten (24) getragen werden, Bereitstellen mehrerer schallabsorbierender Platten (50) mit wellenförmigem Profil im Querschnitt entlang ihrer Länge und Klammern (70) nach einem der Ansprüche 7 bis 8, Anbringen der Klammern (70) an den Wandelementen (22) und Aufhängen der schallabsorbierenden Platten (50) mittels der Klammern (70).

10. Verfahren nach Anspruch 9,
wobei die schallabsorbierenden Platten (50) in Bezug auf die unmittelbar benachbarten Platten ausgerichtet oder nicht ausgerichtet angeordnet werden.

Revendications

1. Barrière anti-bruit (10) comprenant une paroi de base insonorisante (20) comprenant une pluralité de montants de support (24) et une pluralité d'éléments de paroi (22) supportés par lesdits montants de support (24), la barrière anti-bruit (10) comprenant en outre des panneaux allongés absorbant les sons (50) superposés sur la paroi de base insonorisante (20), **caractérisée en ce que** les panneaux allongés absorbant les sons (50) ont une épaisseur non uniforme le long de leur longueur, dans laquelle au moins l'un des panneaux allongés absorbant les sons (50) a un profil ondulé en section transversale le long de sa longueur avec un pic unique correspondant à une épaisseur maximum et deux demi-creux correspondant à l'épaisseur minimum et une hauteur inférieure à la hauteur des montants de support (24).

2. Barrière anti-bruit (10) selon la revendication 1, dans laquelle le pic unique est en correspondance avec une section centrale dudit au moins un des panneaux absorbant les sons (50) et dans laquelle chacun des deux demi-creux est à proximité d'une extrémité respective dudit au moins un des panneaux absorbant les sons (50).

3. Barrière anti-bruit (10) selon la revendication 1 ou 2, dans laquelle ledit au moins un des panneaux absorbant les sons (50) comprend une couche (60) de matériau absorbant les sons, dans laquelle la couche (60) de matériau absorbant les sons est agencée pour suivre le profil ondulé.

4. Barrière anti-bruit (10) selon la revendication 3, dans laquelle au moins l'un des panneaux absorbant les sons (50) comprend un corps en forme de boîte (51).

5. Barrière anti-bruit (10) selon la revendication 4, dans laquelle la couche (60) de matériau absorbant les sons est agencée à l'intérieur du corps en forme de boîte (51) et dans laquelle un interstice est formé entre la couche (60) de matériau absorbant les sons et la paroi insonorisante (20) au moins en correspondance avec ledit pic.

6. Barrière anti-bruit (10) selon l'une quelconque des revendications 2 à 5, dans laquelle la surface (58) exposée à une source de bruit est perforée et/ou comprend une feuille de métal expansé et/ou comprend une maille ou similaire.

7. Barrière anti-bruit (10) selon l'une quelconque des revendications précédentes, dans laquelle au moins un panneau absorbant les sons (50) est accroché sur et suspendu aux éléments de paroi (22) au moyen d'un support (70) fixé sur les éléments de paroi (22).

8. Barrière anti-bruit (10) selon la revendication 7, dans laquelle le support (70) comprend une fente supérieure (73) et un crochet inférieur (74) et dans laquelle le panneau comprend une plaque supérieure en forme de L (63) configurée pour se mettre en prise avec la fente (73) du support et une plaque inférieure en forme de L (64) configurée pour se mettre en prise avec le crochet inférieur (74) du support (70).

9. Procédé pour assembler une barrière anti-bruit (10) comprenant les étapes consistant à : prévoir une paroi de base insonorisante (20) comprenant une pluralité de montants de support (24) et une pluralité d'éléments de paroi (22) supportés par les montants

de support (24), prévoir une pluralité de panneaux absorbant les sons (50) avec un profil ondulé en section transversale le long de leur longueur et des supports (70) selon l'une quelconque des revendications 7 à 8, fixer les supports (70) aux éléments de paroi (22) et accrocher les panneaux absorbant les sons (50) au moyen des supports (70).

10. Procédé selon la revendication 9, dans lequel les panneaux absorbant les sons (50) sont agencés en étant alignés ou désalignés par rapport aux panneaux immédiatement adjacents.

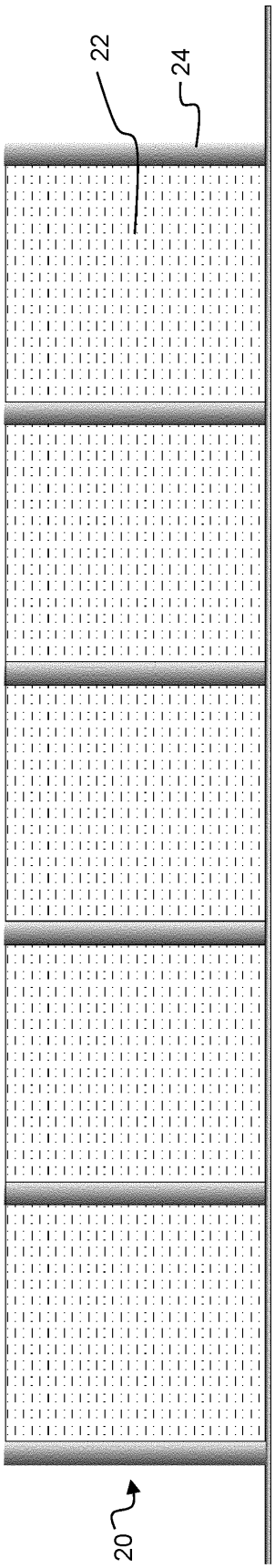


Fig. 1.1

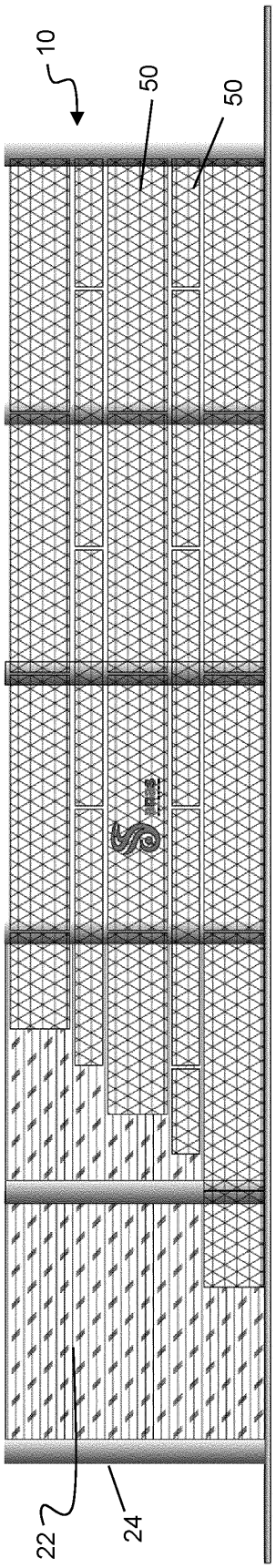


Fig. 1.2

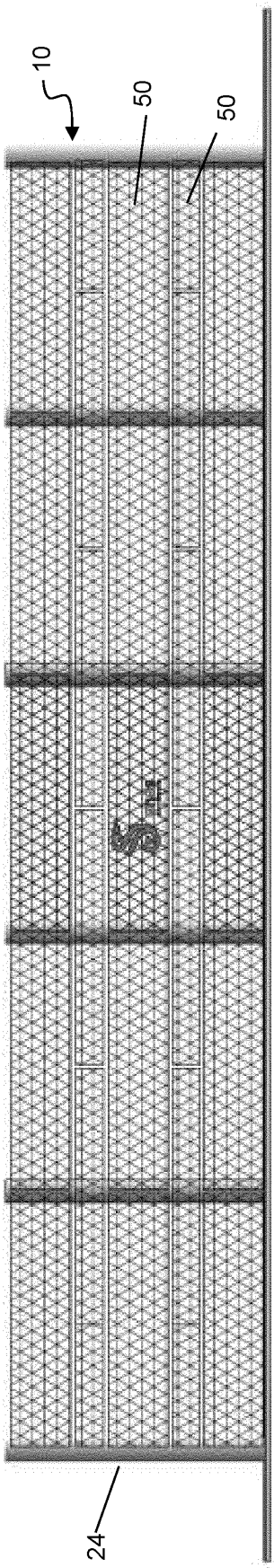


Fig. 1.3

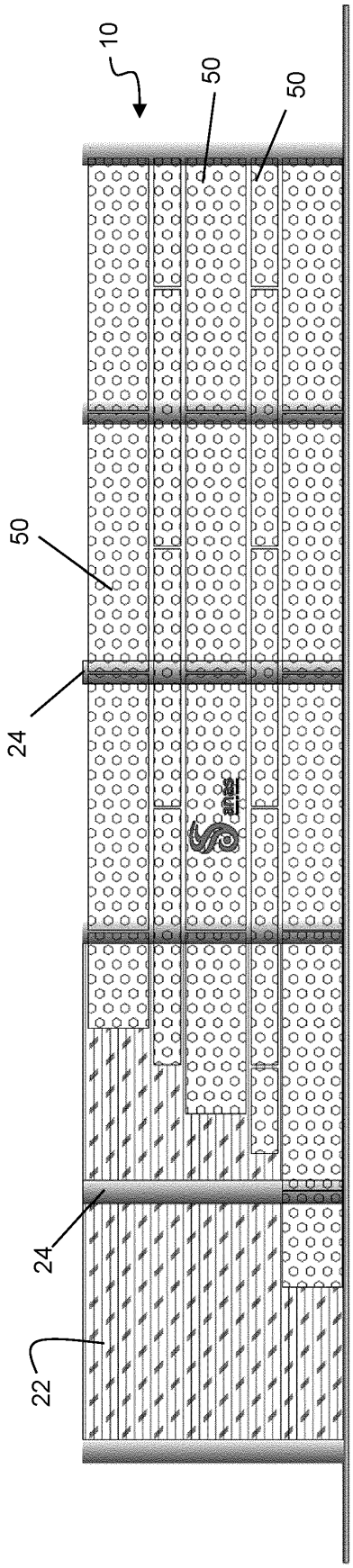


Fig. 2.1

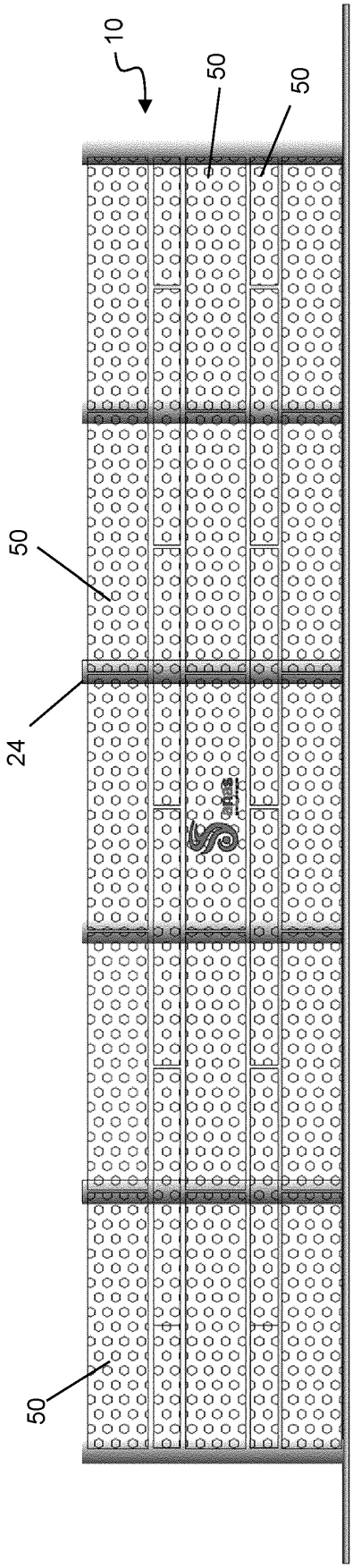


Fig. 2.2

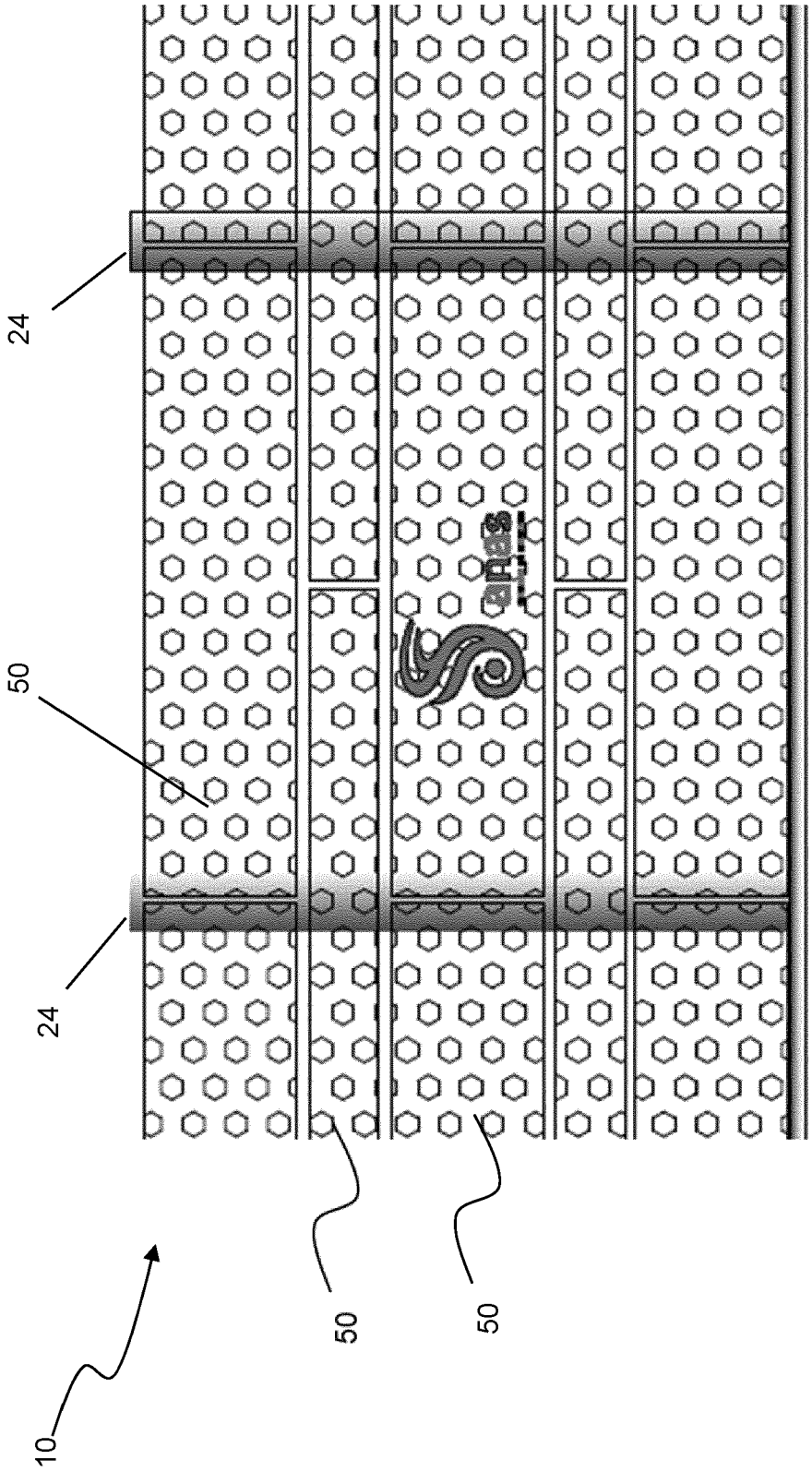


Fig. 2.3

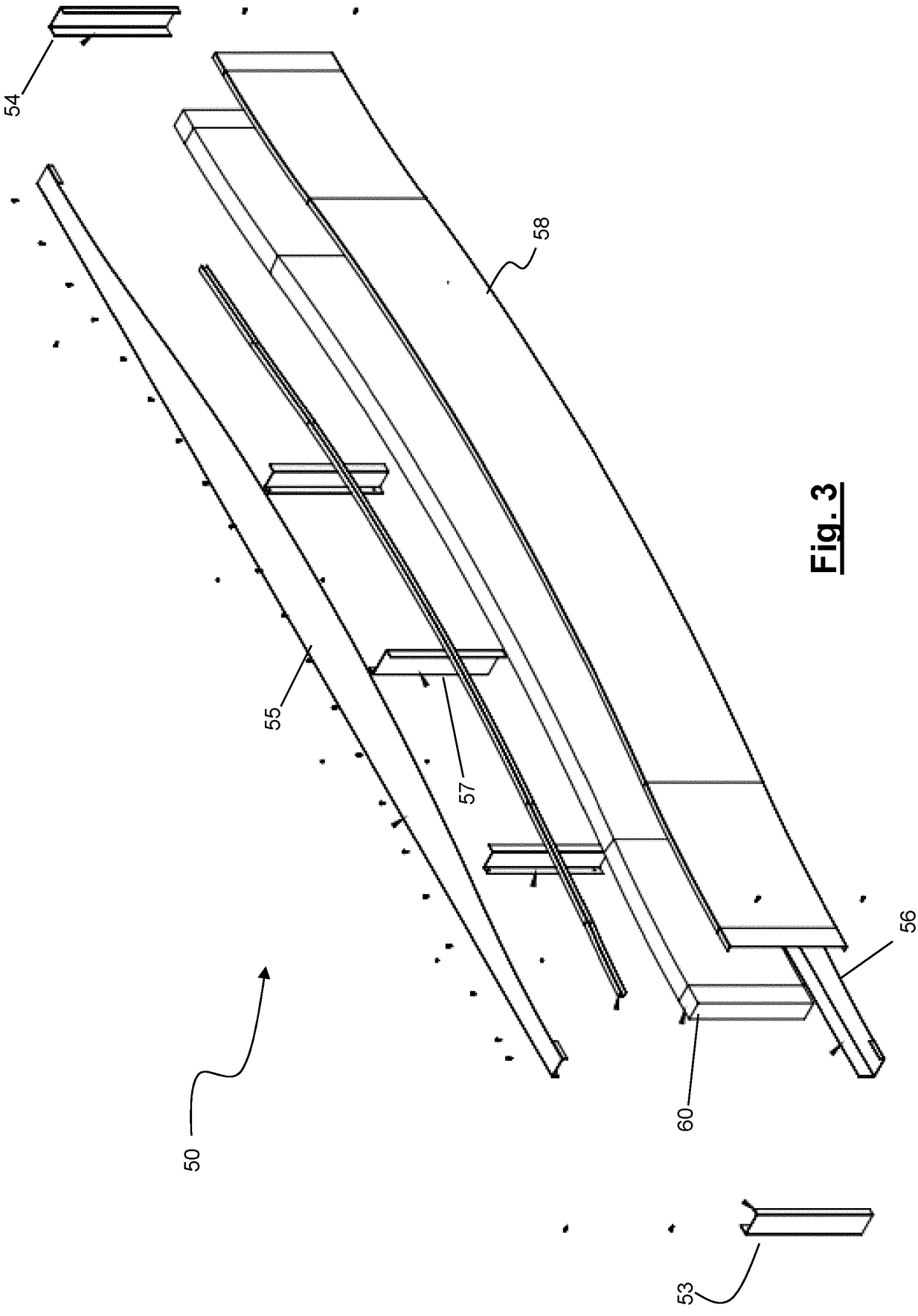


Fig. 3

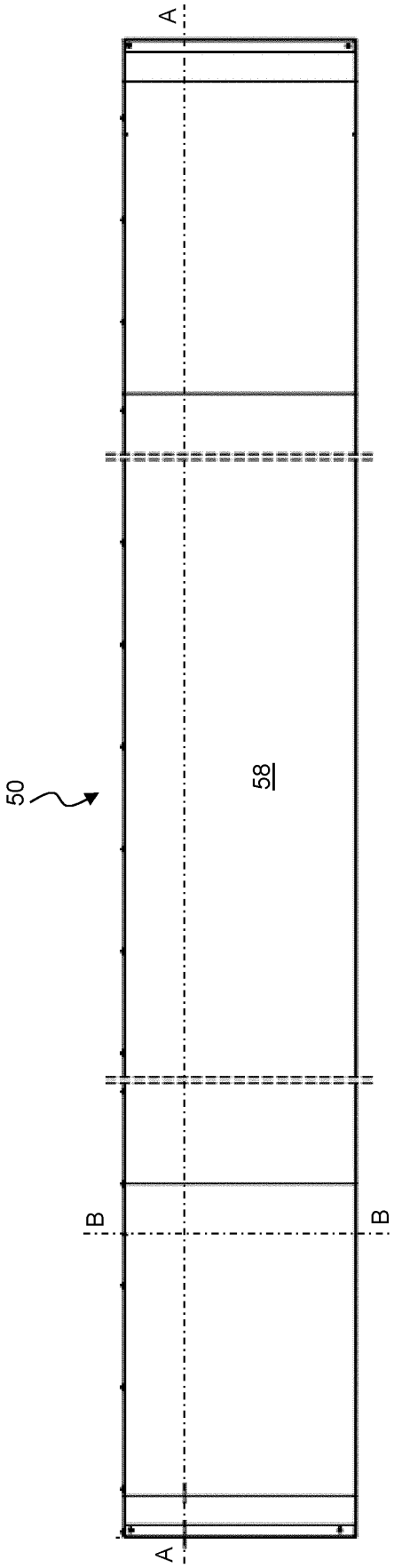
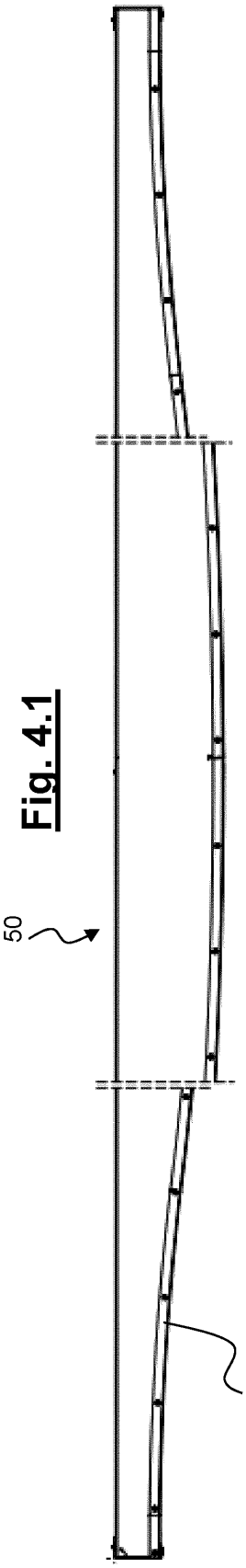


Fig. 4.1



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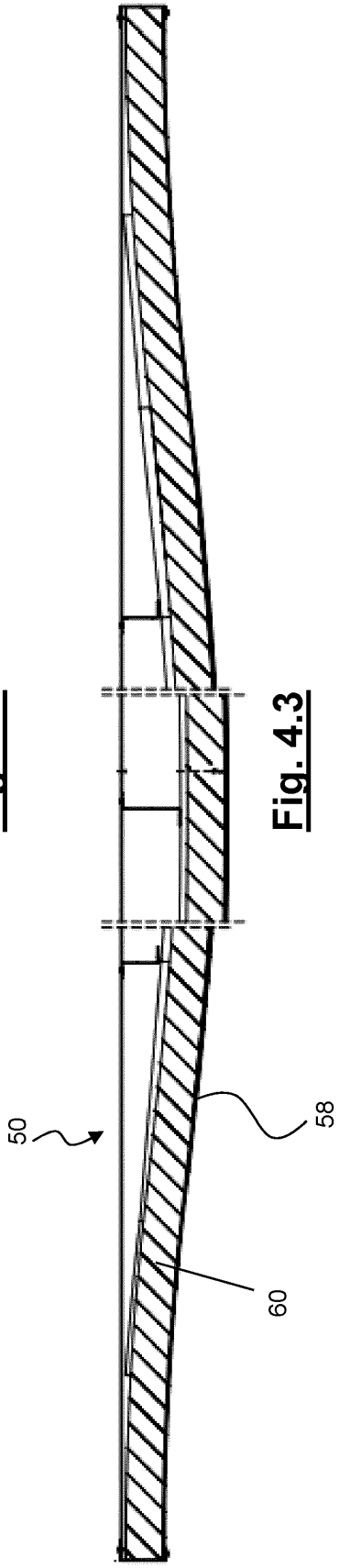

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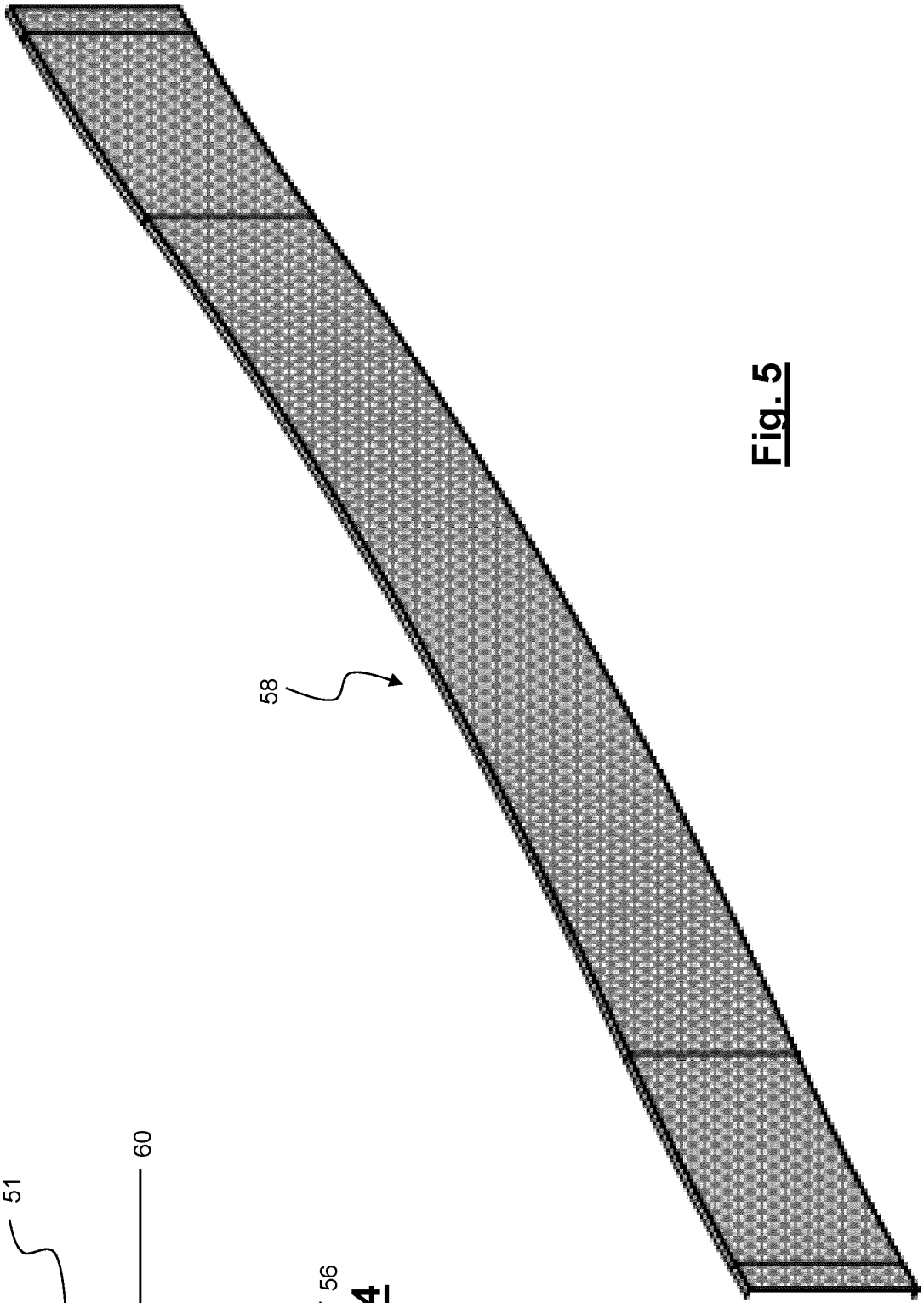

Fig. 5

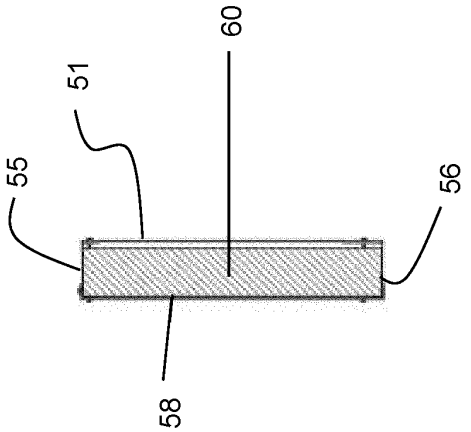

Fig. 4.4

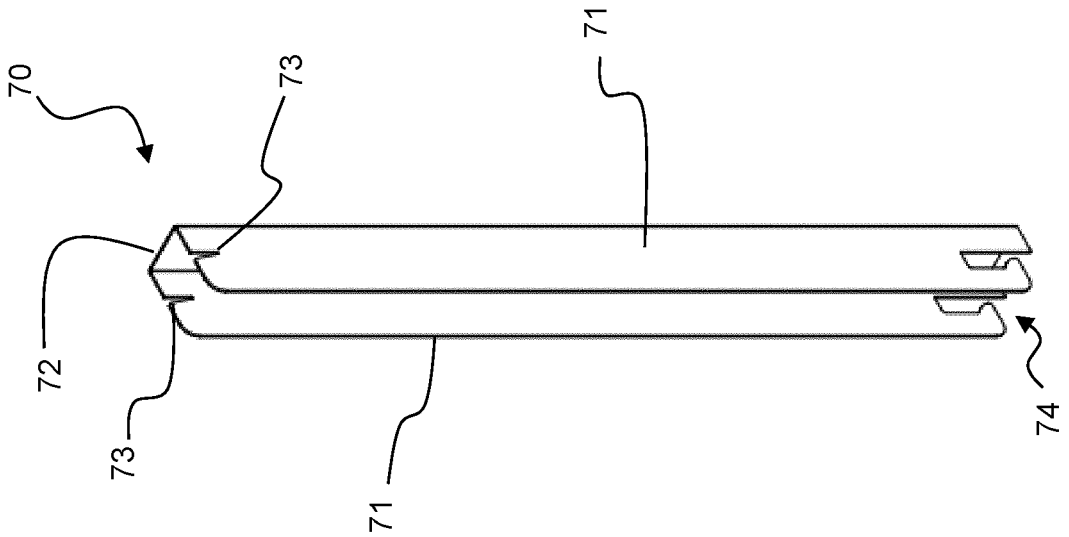

Fig. 6.3

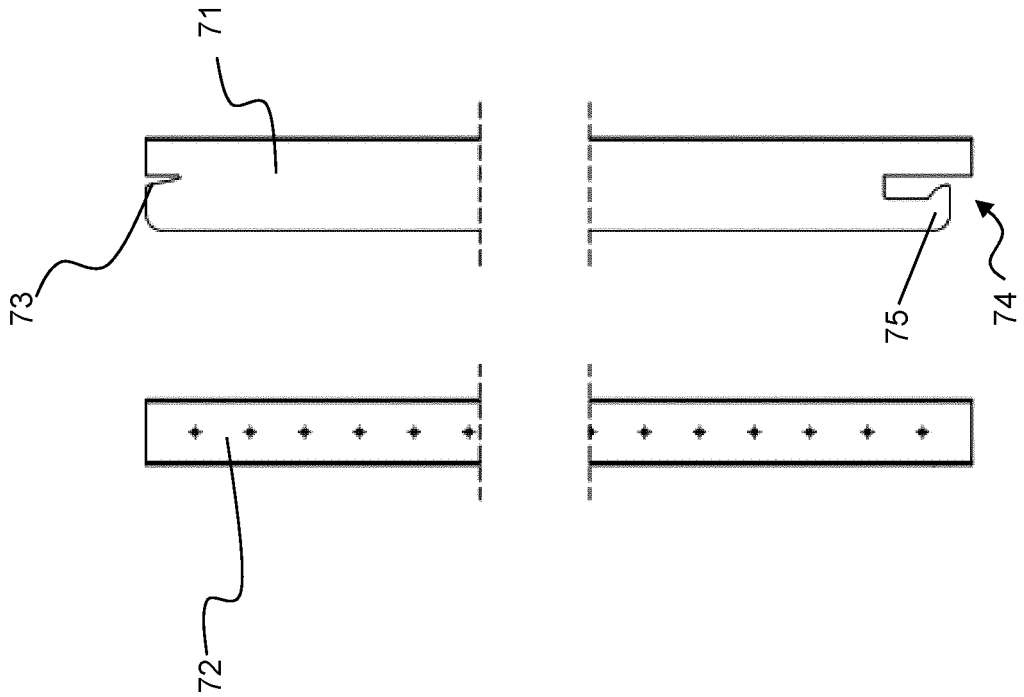

Fig. 6.2

Fig. 6.1

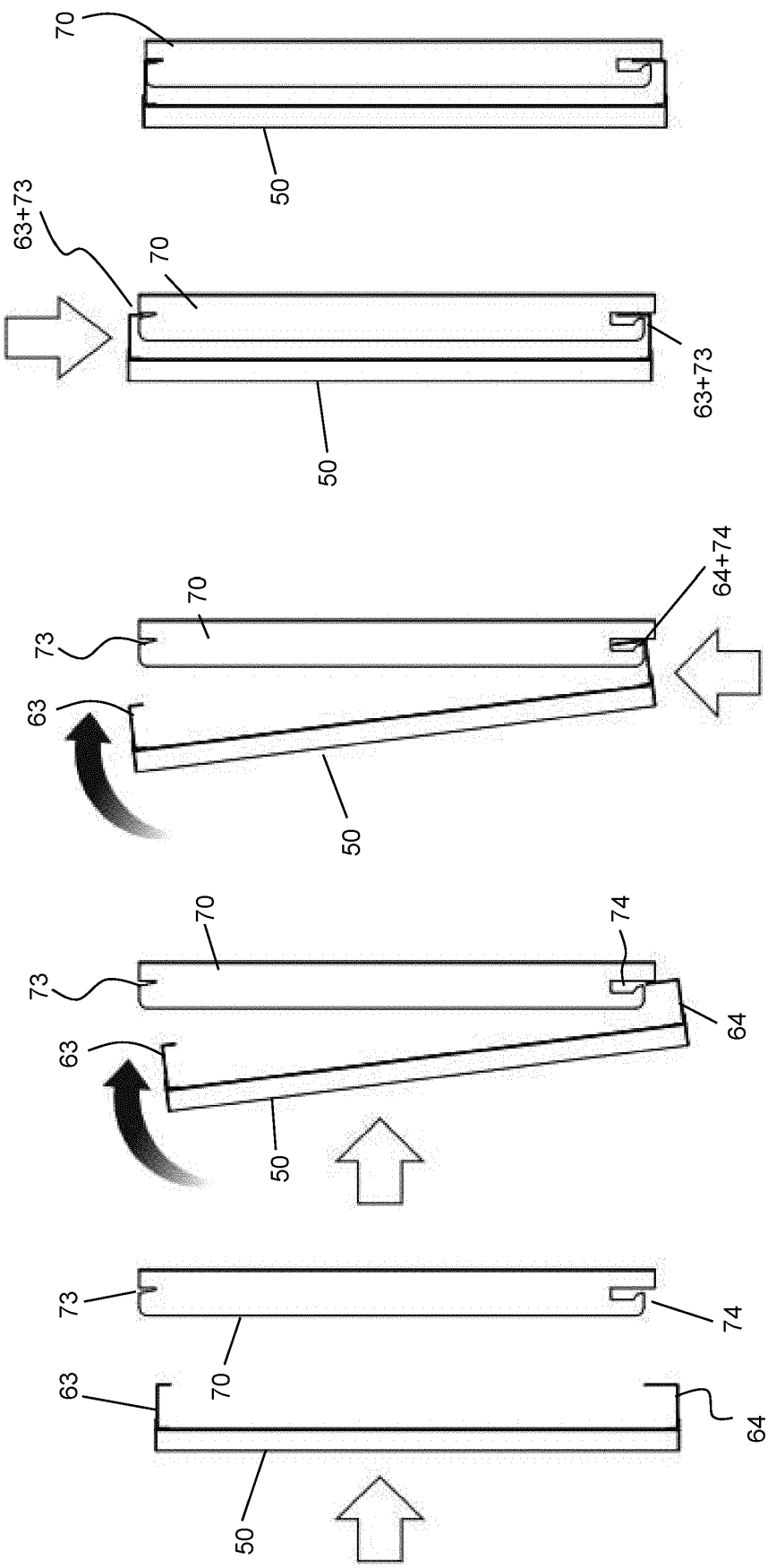

Fig. 7.5

Fig. 7.4

Fig. 7.3

Fig. 7.2

Fig. 7.1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20090006306 A **[0007]**
- KR 101177068 B1 **[0007]**
- KR 100882219 B1 **[0007]**
- KR 101448439 B1 **[0007]**
- KR 200195893 Y1 **[0007]**
- WO 2010092606 A1 **[0007]**