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(54) **A NOISE ABSORBING PANEL FOR USE IN A SOUND ABSORBING GUARD RAIL SYSTEM**

GERÄUSCHDÄMMENDES PANEEL ZUR VERWENDUNG IN EINEM SCHALLDÄMPFENDEN SCHUTZPLANKENSYSTEM

PANNEAU D'ABSORPTION DE BRUIT DESTINÉ À ÊTRE UTILISÉ DANS UN SYSTÈME DE GLISSIÈRE DE SÉCURITÉ ABSORBANT LES SONS

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EP 3 482 002 B1

Description

[0001] The present invention relates to a noise absorbing panel for use in a sound absorbing guard rail.

[0002] A guard rail is provided at the lateral side of a road with the object of limiting personal injuries by absorbing the energy of a vehicle veering off the road by catching and slowing down the vehicle. Added to this primary function it is also found attractive to provide the guard rails with noise reducing means.

[0003] Accordingly, a sound absorbing guard rail of such kind is known from EP 1 528 158 A1. Herein the sound absorbing panels are made of aluminium or made transparent.

[0004] Another example of a guard rail with noise reducing measures is known from WO 2010/018028 A1, where a perforated plate is provided behind the guard rail beam.

[0005] WO 2007/132964 discloses a soundproofing board which is constructed such that several soundproofing boards can be engaged together in vertical and horizontal directions without a separate connection member.

[0006] JP 2000 225322 A discloses a fixture consisting of plural brackets fitted to an existing pillar supporting a sound barrier. A wall face structure is also fitted to the pillar through plural fitting bolts.

[0007] In order to ensure road safety and to reduce the risk of personal injuries it is required that a guard rail must be able to absorb the impact of a collision without disintegrating. This requirement is also applicable to the noise reducing means. This requirement is to avoid flying objects and/or sharp fractures which can cause severe personal injuries in case of a collision. In the guard rails with noise-reducing measures mentioned above, the casing in aluminium or transparent materials, such as glass or plastic, is brittle, costly and may not withstand a vehicle impact without breaking apart.

[0008] By providing noise-reducing panels described above, the risk of disintegrating the panel during an impact is considered too high and it is therefore an object of the present invention to provide a guard rail with noise reducing means which can withstand the impact of a vehicle colliding with the guard rail.

[0009] According to the invention, this object is achieved by a guard rail of the initially mentioned kind, wherein the noise absorbing panel comprises a noise absorbing material board which is encased in an energy absorbing material as defined in claim 1.

[0010] By the invention it is found advantageous that the noise absorbing panel is contained in an energy absorbing material, e.g. said mesh, whereby an improved noise absorbing panel in a guard rail system may be achieved, which also meets the requirements concerning impact absorption and avoids disintegration at an impact with a vehicle. The noise absorbing material is preferably a mineral wool fibre board, which has very good noise-absorbing characteristics. However, it is realised that the noise absorbing panels can also be made with other materials like foam material, integrated or partial rubber material, integrated or partial plastic material, or other noise absorbing material resistant in regard to weather conditions and wear effects next to traffic ways.

[0011] According to the invention, the energy absorbing material is a stretch-metal netting encasing said noise absorbing material board. Stretch-metal or expanded metal provide very good energy-absorbing characteristics as the netting made of stretch-metal can be deformed to a large degree when impacted. Depending on the design of the stretch metal netting it is possible to provide different stretch behaviour in respective stress directions. E.g. it is possible to provide a higher stress resistance and thereby a higher energy absorption in an impact situation in longitudinal direction of the traffic way than in vertical direction. In those directions, where the stretch metal netting provides a higher stress resistance, the meshes of the stretch metal netting may provide a higher amount of deformation. In those directions where the stretch metal netting has less stress resistance, the meshes of the stretch metal netting deform less. This can be achieved e.g. by rhombus formed meshes, which have a longer diagonal in vertical direction and a shorter diagonal in the horizontal direction. Thereby, the ability of deformation of the rhombus formed meshes in horizontal direction is higher than in vertical direction. Braking of the panels in any situation, in particular in a crash-situation, is to be avoided.

[0012] Moreover, in addition to the mechanical behaviour of the netting made of stretch-metal, in particular in a stress situation, such a material can also provide additional beneficial optical and/or mechanical effects. The stretch metal may provide a surface structure with different groups of surfaces which are intentionally oriented into a particular direction. Thereby, it is possible to achieve particular optical reflection effects such that impacting light from a vehicle is reflected in preferred directions by certain groups of surfaces of the net material, whereas the impacting light is being dispersed in other less preferred directions. Moreover, inclining the groups of surfaces in preferred directions may also support that particular objects colliding with the net material may slide along the surface of the material with less friction in certain preferred directions, whereas objects impacting from another direction experience higher friction.

[0013] Besides that the mineral wool fibre board, and more preferably a stone wool material, has very good noise-absorbing characteristics, another advantage by in particular stone wool as the material is that this material fire-resistant. The energy absorbing material, i.e. the stretch-metal netting, provides protection of the mineral wool and can further contribute to the energy absorption at an impact due to a collision into the guard rail and the energy absorbing material, i.e. stretch-metal netting, also ensures that the sound absorbing panel does not disintegrate at such an impact. This synergy between the sound absorbing material formed e.g. by a mineral wool fibre board and the energy absorbing material, is advan-

tageous and results in an improved noise absorbing panel in a guard rail, which also meets the requirements concerning impact absorption and avoids disintegration at an impact with a vehicle.

[0014] By the term stretch-metal netting is meant an expanded metal sheet, which is made by a process of slit and stretch. The process may involve a precision die which slits and stretches the sheet material in a single operation. Expanded metal is manufactured through cutting and expanding a solid sheet of metal in special machines. The machines cut and stretch the metal, expand it to a seamless mesh without joints. The production contains no welded joints and no woven threads, which contributes to the unique qualities of expanded metal. The mesh that is produced after expansion of the cut metal gives the material an excellent carrying capacity.

[0015] The material is then processed through a set of rollers, which adjusts the final thickness. The stretch-metal in the netting is a ductile metal capable of absorbing energy while being plastically deformed.

[0016] Preferably, the stretch-metal is galvanised steel. This is advantageous as it is weather resistant and inexpensive to produce and very ductile and deformable by deforming the mesh structure of the stretch metal netting when impacted. By galvanising the stretched metal sharp edges will also be rounded. However, it is by the invention realised that other types of protective coatings, such as plastic coating, paint or the like, may be used.

[0017] As an alternative or as a supplement to stretch-metal, the energy absorbing mesh could be a perforated metal sheet, a plastic netting or the like and/or a combination thereof, encasing said noise absorbing material board.

[0018] In an embodiment, the netting is a panel which encloses at least the main sides and the top side of the mineral wool fibre board. Preferably, the encasing is made from the stretch-metal netting panel which is bent into a box-like shape around the mineral wool fibre board and with mounting panels provided at each of the end sides.

[0019] By the invention it is realised that the stretch-metal netting panel may be produced with non-stretched areas at each of the end sections for receiving the mounting panels at each end for mounting the sound absorber to the supporting posts. Hereby, any sharp edges or pointy ends in the netting structure may be avoided, thereby reducing any risk of personal injuries to persons when handling the noise absorbing panel or during a collision with the guard rail. Moreover, as the noise absorbing panel may be installed in cities e.g. at parapets, this feature of the invention prevents the risk of injuring pedestrians or cyclists.

[0020] The noise absorbing panel is preferably approx. 90 cm in height and approx. 260 cm in length. This means that the panels may fit between posts in the usual guard rail structure designs. Alternatively, the panels may be positioned behind the post, as viewed from the traffic way, wherein a pair of two consecutive posts can be arranged in a distance of approx. 1 m, 1.3 m, 2 m or 4 m, respectively. However, any dimensioning of the noise absorbing panel is encountered by the present invention. In particular, it is preferred to provide noise absorbing panels in predetermined standardized dimensions which match to the usual pre-confectioned guardrail sets for different applications. By the invention it is realised that the panels may alternatively also be mounted in front of the posts, i.e. between the posts and the guard rail. According to one embodiment of the invention, the panels are not directly interconnected or mechanically fixed to one another. Instead, they are mounted to the posts or the guard rail and arranged next to one another without a mutual fixation. In other instances, the panels can be mechanically connected.

[0021] In preferred embodiments, the sound absorbing material board, in particular the mineral wool fibre board, may also be provided with a density within the range of 60-150 kg/m^3, preferably 80-120 kg/m^3, more preferably 80-100 kg/m^3. Hereby, noise absorbing panels are provided in a size which is easy to handle during mounting.

[0022] In an embodiment, the board is preferably provided with a protective fabric on its road-facing side. Hereby, the mineral fibre board is protected from salt, dirt and the like from the road. The fabric may be a fleece, i.e. a non-woven fabric, which is weather and UV resistant ensuring a long lifetime of the sound absorbing panel.

[0023] In addition to this feature, it is possible to provide the protective fabric with a structured surface having different appearances depending on the perspective. Thereby it is possible to provide optical effects depending on an actual line of vision. For example, the fleece and thereby the noise absorbing panel may reflect incident light more or less intensely depending on the actual incident angle. It is also possible to provide the protective fabric with particular light absorbing effects such that it has a different colour depending on the actual incident angle of light or line of vision. Thereby, the fleece may reflect light when illuminated from one driving direction of a traffic way and fully or partially absorb or deflect light when illuminated from the other driving direction of said traffic way. Besides design features, this feature may also provide functional benefits when the sound absorbing panel is installed next to a traffic way.

[0024] By the present invention, it is found advantageous that the noise absorbing panel is provided in either a planar configuration or a curved configuration. Another advantage of the stretch-metal netting encasing the mineral fibre board is also that the stretch metal netting is manually deformable so that the noise panel is bendable into a preferred curved shape. As an alternative, if using more rigid less bendable panels, shorter panels can be used and arranged in a polygonal course for an installation at curved traffic ways.

[0025] In an embodiment of the invention, the guard rail is made of a beam, preferably made of a steel profile in a predetermined cross-sectional shape. The beam may be provided with sound reducing means, such as

one or more sections of perforations.

[0026] As an alternative to a profile beam, the guard rail could be a tube or a wire.

[0027] According to a further embodiment of the present invention, the noise absorbing panel can be provided at the respective axial end portions with end profiles. Such end profiles may have I-, H-, U- or C- shape. Using end profiles with I-, H-shape allows a connection of two consecutive noise absorbing panels which can be introduced in the respective recesses provided by this shape profile. U- or C- shaped profiles can be used as end profiles of respective noise absorbing panels in case no further noise absorbing panel is to be connected.

[0028] According to a further embodiment of the invention, end portions of noise absorbing panels can be at least partially covered by cover elements. Those cover elements can be formed from material which is elastically deformable and which has good noise absorbing characteristics, e.g from rubber material. It is possible to fix such singular elements to the energy absorbing mesh material on both sides of the noise absorbing panel, respectively. As an alternative, it is possible to provide cover elements which cover an end portion of the noise absorbing panel by surrounding or encompassing this end portion partially or completely. The cover element can be fixed by additional fixing means or it can be clamped to the noise absorbing panel. Holding ribs increasing friction or providing a form fit can be formed to the cover elements in order to engage with the noise absorbing panel, in particular with the end portions of the energy absorbing mesh material. The cover element can provide an elastically deformable structure, preferably rounded, in the center of the end face which can be brought in contact with the corresponding elastically deformable structure at an opposing cover element of an approximate noise absorbing panel. The elastically deformable structure can be formed by a rounded projection integrally formed within the cover, e.g. with a rounded projection surface. This allows to compensate tolerances when mounting or assembling the system and moreover provides additional noise absorbing characteristics also in the interfaces between two approximate noise absorbing panels.

[0029] In the following the invention is described in more detail with reference to the accompanying drawings, in which:

Fig. 1	is a schematic perspective view of a sound absorbing guard rail system according to a first embodiment of the invention;
Fig. 2	is a schematic front view of said guard rail system of the first embodiment of the invention,
Fig. 3	is a side view thereof, and
Fig. 4	is a top view thereof;
Fig. 5	is a schematic perspective view of a sound absorbing guard rail system according to a second embodiment of the invention, and
Fig. 6	is a schematic front view thereof;
Fig. 7 a)-c)	is a series of cross-section views illustrating the absorption of an impact by a guard rail system according to the invention;
Figs. 8-10	are cross-section views of three embodiments of a noise absorbing panel according to the invention;
Figs. 11-14	are cross-section views of elements of each of said three embodiments;
Fig. 15	is a detailed front view of a preferred embodiment of a stretch-metal netting according to a preferred embodiment of the invention; and
Fig. 16	is a side view of the stretch-metal netting of fig. 15;
Fig. 17	is a schematic perspective view of an assembly profile for use between two adjacent noise-absorbing panels;
Fig. 18	is a front view of a guard rail beam according to an embodiment of the invention with areas of perforations;
Fig. 19	is a detailed perspective view of the beam of fig. 18; and
Fig. 20 is	a cross-sectional view thereof;
Figs. 21 and 22	are views of a second embodiment of a guard rail beam; and
Figs. 23 and 24	are views of a third embodiment of a guard rail beam;
Fig. 25 and 26	are two cross-sectional shapes of guard rail beams;
Figs. 27-30	are schematic views of different perforation patterns for the perforations in the guard rail beams of the invention; and
Figs. 31-39	show different embodiments for designs for end elements covering end surfaces of noise absorbing panels.

[0030] With reference to figures 1 to 4, a first embodiment of a sound absorbing guard rail system according to the invention is shown. The guard rail system is installed at a lateral or median side of a road 2 and comprises a series of vertically oriented supporting posts 4. A series of noise absorbing panels 6 are mounted to one side of the supporting posts 4 facing away from the road and a series of longitudinal guard rails 8 are mounted on the other side of the posts 4 facing the road 2. Between the noise absorbing panels 6 assembly profiles 14 (see figures 1 and 2) are provided to ensure the noise absorbing panels 6 are suitably positioned and aligned.

[0031] The noise absorbing panel 6 comprises a noise absorbing material board 10 which is encased in an energy absorbing mesh 12 (see fig. 3).

[0032] In figures 5 and 6 a second embodiment of a sound absorbing guard rail system according to the invention is shown. According to this embodiment, the

guard rails 8 are provided with perforated sections 81, 82 to further increase the sound absorbing characteristics of the guard rail system.

[0033] In figures 7 a) to c) the absorption of an impact by a guard rail system according to the invention is shown. As vehicle comes from the road 2 and collides with the guard rail 8, as indicated by the arrow in the figures, the posts 4 deflects at ground level and the noise absorbing panel 6 is tilted backwards, i.e. away from the road 2, as well as deformed as the energy in the impact is absorbed in this deformation of the noise absorbing panel 6. As the energy is taken out of the impact the guard rail 8 breaks away from the posts 4 as shown in fig. 7 c).

[0034] Three embodiments of the noise absorbing panel 6 are shown in figures 8-10. Common for these three embodiments is that a noise absorbing material board 10 is encased in an energy absorbing mesh 12. The material of the noise absorbing material board 10 is preferably a mineral fibre wool, and in particular stone wool material. This material has good sound absorbing characteristics just as the material is fire resistant and the noise absorbing panel 6 made of stone wool can thereby contribute to that the guard rail system can prevent any fire from spreading in case a fire occurs in relation to a road accident with or without vehicle impact in the guard rail.

[0035] Protective profiles 16, 16', 16" are provided between the noise absorbing material board 10 and the energy absorbing mesh 12. In fig. 11 the noise absorbing material board 10 is shown alone and in figures 12-14 the three different designs of the protective profiles 16, 16', 16" are shown. The protective profile 16, 16' or 16" may be made of a transparent or non-transparent polymeric material, such as polypropylene, polycarbonate or the like.

[0036] As mentioned above, the noise absorbing material board 10 is encased in an energy absorbing mesh 12. This mesh 12 is provided as a netting and is preferably made of stretch-metal or also called expanded metal. Such a netting of expanded metal is manufactured through cutting and expanding a solid sheet of metal in special machines. The machines cut and stretch the metal, expand it to a seamless mesh without joints. The mesh is hereby made up by ribs 12' and rhombus-like shaped openings 12" as shown in figures 15 and 16.

[0037] The mesh 12 of expanded metal is advantageous as this type of mesh is highly deformable without breaking and can therefore absorb a high amount of energy in case of an impact and at the same time prevent the noise absorbing material 10 encased in the mesh 12 from being disintegrated and scattered around the in the event of a vehicle impact of the guard rail system. The expanded metal mesh is formed such that it is more deformable in the longitudinal direction along the road than in the vertical direction. The expanded metal mesh 12 is preferably bent into shape so as to form cover for the front and back sides of the noise absorbing board 10 as well as at least the top side. Preferably, the mesh 12 is also formed so it covers at least a portion of the bottom side of the noise absorbing board 10.

[0038] As mentioned in relation to figures 1 and 2, an assembly profile 14 is provided between the noise absorbing panels 6. In fig. 17 an embodiment of the assembly profile 14 is shown. The profile 14 is made as an H-profile with two exterior flanges 142 and a web flange 144 therebetween. Hereby, two receiving slots 146 are formed on each side of the web flange 144 for receiving the ends of two neighbouring noise absorbing panels 6. Alternatively two U-profiles, or Z-Profiles can be used.

[0039] In the following figures 18-30 various embodiments of the guard rail beams 8 are illustrated. The guard rail beams 8 are formed from a sheet of metal which is bent into a desired cross-sectional shape. In the embodiment shown in figures 18-20, the guard rail beam 8 is shaped with upper and lower longitudinal flange portions facing the road and a central flange portion therebetween. The upper and lower flange portions are provided with perforated sections 81 and the central flange portion is also provided with a perforated section 82. Mounting holes 80 are provided at least at the end portions of the beams 8.

[0040] In figures 21 and 22 another embodiment is shown of the beam design. This second design differs from the design shown in figs. 18-20 by having non-perforated sections 83 along the beam 8.

[0041] In figs. 23-24, yet another variant of the design of the perforations is shown, where only areas 84 around the mounting holes 80 are non-perforated.

[0042] Figures 25 and 26 show cross-sections of two alternative shapes of the guard rail beam 8 relative to the shape shown in fig. 20, which could be used for the road-facing guard rail beams 8 in a guard rail system according to the invention.

[0043] The perforations may be provided in the guard rail beams 8 with different patterns. In figures 27-30 some different perforation patterns are shown.

[0044] Figure 31 shows a detailed view of an end region of a noise absorbing panels 6 as described above. At the end region of the noise absorbing panel 6, two rubber elements 200 are fixed to the edges of the energy absorbing mesh material 12. Each of the rubber elements 200 in cross-section provides a profile with a U-shaped receiving part 202 with rib-like projections 204 and 206. Moreover, each of the rubber elements 200 has a hollow oval ring part 208. The rubber elements 200 are fixed to the free edge of the mesh material 12 by means of the receiving parts 202, wherein the rib-like projections 204 and 206 engage the mesh material 12 in order to retain the rubber elements 200 on the free edge of the mesh material 12. The hollow oval ring parts 208, which can be elastically deformed, project from the front surface 210 of the noise absorbing panel 6. Thereby, the rubber elements 200 provide a noise damping and mechanically cushioning interface to an approximate wall element or to another noise absorbing panel 6 formed with corre-

sponding rubber elements 200. Moreover, tolerances can be compensated thereby.

[0045] It is to be added that the noise absorbing panel 6 also shows an additional protection layer 212 formed between the noise absorbing material board 10 and the energy absorbing mesh material 12. This additional protection layer 212 can be provided for protecting the noise absorbing material board 10 from dirt, water, or other external influences. Moreover, it can provide optical effects, e.g. particular reflection effects or light absorbing effects depending certain angular ranges. This additional protection layer can be provided in each embodiment as described above, independent from other structural features described.

[0046] Figure 32 shows an alternative embodiment for the design of an end cover design of a noise absorbing panel 6. The noise absorbing panel 6 at its free and is provided with a cover 220 formed from rubber material. The cover has bent edge regions 222 which encompass the free ends of the noise absorbing panel 6 and are held by elastic deformation and friction to the end regions of the energy absorbing mesh material 12.

[0047] Fig. 33 shows an embodiment for another cover 230 according to the invention which basically corresponds to the embodiment as described in regard to figure 32. Figure 35 additionally shows, how two opposing noise absorbing panels 6 and 6' are arranged against one another equipped with covers 230, respectively. Moreover, figure 36 additionally shows a perspective view of the cover 230. According to this embodiment, the cover 230 has basically the same shape as shown in figure 32 in regard the cover 220 and it is also formed from elastically deformable material, e.g. rubber. Additionally, the cover 230 provides in its central region a rounded projection 232 with a hollow interior 234, which makes the rounded projection 232 elastically deformable. The general shape of the cover 230 is adapted to the geometry of the end side of a noise absorbing panel 6, as can be seen in figure 36. When fixed onto the end of two opposing noise absorbing panels 6 and 6', as shown in figure 35, the two corresponding rounded projections 232 and 232' of the respective covers 230 and 230' contact one another and under elastic deformation provide a tight engagement of the two end covers 230 and 230'. This allows to compensate tolerances and provides a tight connection and additional noise damping effects also in the interface between two approximate noise absorbing panels 6 and 6'.

[0048] Figure 34 shows another embodiment which is based on the embodiment according to figure 33. The end cover 240 corresponds in its shape to the end cover 230 as described above, i.e. it also has a rounded projection 242 with a hollow interior 244. In the interior of the projection 242 a partition wall 246 is provided extending from the inner surface of the projection 242 into the noise absorbing material board 10. The partition wall 246 additionally stabilizes the structure of the projection 242.

[0049] Figure 37 shows a further embodiment which is also based on the embodiment according to figure 33. In this embodiment, in the central area of the cover 250 the projection is formed by a closed ring-like structure 252 as can be seen in the cross-section with a hollow interior 254. The cover 250 is plugged onto the end portion of the noise absorbing panel 6 such that a part, in the example about one fourth of the circumference, of the inner portion 256 of the closed ring-like structure 252 engages the front surface of the noise absorbing material board 10 and protrudes into it to a certain degree. This further stabilizes the cover 250 and allows to compensate tolerances. As can be seen in figure 39, the shape of the cover 250 is similar to the shape as already described in regard to figure 36.

[0050] Finally, as can be seen in figure 38, this embodiment provides a similar interface between two opposing or approximate noise absorbing panels 6 and 6' wherein the two ring-like structures 252 contact each other under a demanded elastic deformation in order to provide a tight fit with beneficial noise dampening and cushioning characteristics.

[0051] Above, the invention is described with reference to some currently preferred embodiments. However, it is realised that other embodiments may be provided without departing from the scope of the invention as defined in the accompanying claims.

Claims

1. A noise absorbing panel (6) for guard rail system for installation at a lateral side or median of a road (2), said guard rail system comprises a series of supporting posts (4), that are preferably vertically oriented, where at least one noise absorbing panel (6) can be mounted to said supporting posts (4), and a series of longitudinal guard rails (8) mounted on the side of the guard rail system facing the road (2), wherein

   said noise absorbing panel (6) comprises a noise absorbing material board (10) which is encased in an energy absorbing material (12) provided with openings
   characterised in that
   the energy absorbing material (12) is a stretch-metal netting encasing said noise absorbing material board (10).

2. A noise absorbing panel according to claim 1, wherein the noise absorbing material (10) is a mineral wool fibre material preferably provided as a foam material, integrated or partial rubber material, integrated or partial plastic material, or other noise absorbing material (10) resistant in regard to weather conditions and wear effects next to traffic ways.

3. A noise absorbing panel according to claim 1 or 2, wherein said energy absorbing material (12) provid-

ed with openings comprises a mesh, a grid or a perforated material.

4. A noise absorbing panel according to claim 3, wherein the stretch-metal is a ductile metal capable of absorbing energy while being plastically deformed.

5. A noise absorbing panel according to claim 3 or 4, wherein the stretch-metal is galvanised steel.

6. A noise absorbing panel according to any one of the preceding claims, wherein the energy absorbing material (12) is a combination of plastic netting and said stretch-metal netting.

7. A noise absorbing panel according to any one of the preceding claims, wherein the netting is a panel which encloses at least the main sides and the top side of the noise absorbing material board.

8. A noise absorbing panel according to any one of the preceding claims, wherein the encasing is made from stretch-metal netting panel which is bent into the box-like shape around the noise absorbing material board and with mounting panels provided at each of the end sides.

9. A noise absorbing panel according to claim 7 or 8, wherein the encasing is made from stretch-metal netting panel which is cast into an insulation material made by a wet-felt process and with mounting panels provided at each of the end sides of the stretch-metal netting panel.

10. A noise absorbing panel according to any one of the preceding claims, wherein the stretch-metal netting panel is provided with non-stretched areas at each of the end sections for receiving the mounting panels at each end for mounting the sound absorber to the supporting posts.

11. A noise absorbing panel according to any one of the preceding claims, wherein said noise absorbing panel is approx. 90 cm in height and in length approx. 130 cm, approx. 260 cm or approx. 520 cm or approx. 530 cm.

12. A noise absorbing panel according to any one of the preceding claims, wherein the mineral wool fibre board is stone wool and provided with a density within the range of 60-150 kg/m^3, preferably 80-120 kg/m^3, more preferably 80-100 kg/m^3.

13. A noise absorbing panel according to any one of the preceding claims, wherein the board is preferably provided with a protective fabric (212) on its road-facing side.

14. A noise absorbing panel according to claim 13, wherein the protective fabric (212) has a structured surface having different appearances depending on an actual line of vision.

15. A noise absorbing panel according to any one of the preceding claims, wherein said noise absorbing panel (10) is provided in a planar configuration or a curved or polygonal configuration.

16. A noise absorbing panel according to any one of the preceding claims, wherein the noise absorbing panel (10) is provided at the respective axial end portions with end profiles, wherein the end profiles may have I-, H-, U- or C- shape.

Patentansprüche

1. Geräuschabsorbierendes Paneel (6) für ein Schutzplankensystem zur Installation auf einer lateralen Seite oder in der Mitte einer Straße (2), wobei das Schutzplankensystem eine Reihe an Stützpfosten (4), die bevorzugt vertikal ausgerichtet sind, wobei zumindest ein geräuschabsorbierendes Paneel (6) an den Stützpfosten (4) montiert sein kann, und eine Reihe an länglichen Schutzplanken (8) umfasst, die an der Seite des Schutzplankensystems montiert sind, die der Straße (2) zugewandt ist, wobei das geräuschabsorbierende Paneel (6) eine geräuschabsorbierende Materialplatte (10) umfasst, die in ein energieabsorbierendes Material (12) eingeschlossen ist, das mit Öffnungen bereitgestellt ist,

dadurch gekennzeichnet, dass
das energieabsorbierende Material (12) ein Streckmetallgeflecht ist, das die geräuschabsorbierende Materialplatte (10) einschließt.

2. Geräuschabsorbierendes Paneel nach Anspruch 1, wobei das geräuschabsorbierende Material (10) ein Mineralwollfasermaterial ist, das bevorzugt als Schaummaterial, integriertes oder partielles Gummimaterial, integriertes oder partielles Kunststoffmaterial oder anderes geräuschabsorbierendes Material (10) bereitgestellt ist, das in Bezug auf Wetterbedingungen und Abnutzungseffekte neben Verkehrswegen widerstandsfähig ist.

3. Geräuschabsorbierendes Paneel nach Anspruch 1 oder 2, wobei das energieabsorbierende Material (12), das mit Öffnungen bereitgestellt ist, ein Netz, ein Gitter oder ein perforiertes Material umfasst.

4. Geräuschabsorbierendes Paneel nach Anspruch 3, wobei das Streckmetall ein duktiles Metall ist, das dazu in der Lage ist, Energie zu absorbieren, während es plastisch verformt wird.

5. Geräuschabsorbierendes Paneel nach Anspruch 3 oder 4, wobei das Streckmetall galvanisierter Stahl ist.

6. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das energieabsorbierende Material (12) eine Kombination aus Kunststoffgeflecht und dem Streckmetallgeflecht ist.

7. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das Geflecht ein Paneel ist, das zumindest die Hauptseiten und die Oberseite der geräuschabsorbierenden Materialplatte einschließt.

8. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das Gehäuse aus Streckmetallgeflechtpaneel hergestellt ist, das in die kastenartige Form um die geräuschabsorbierende Materialplatte gebogen ist und wobei Montagepaneele an jeder der Endseiten bereitgestellt sind.

9. Geräuschabsorbierendes Paneel nach Anspruch 7 oder 8, wobei das Gehäuse aus Streckmetallgeflechtpaneel hergestellt ist, das in ein Isoliermaterial gegossen ist, das durch einen Nassfilzprozess hergestellt ist und wobei Montagepaneele an jeder der Endseiten des Streckmetallgeflechtpaneels bereitgestellt sind.

10. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das Streckmetallgeflechtpaneel mit nicht gestreckten Bereichen an jedem der Endabschnitte bereitgestellt ist, um die Montagepaneele an jedem Ende aufzunehmen, um den Schallabsorber an den Stützpfosten zu montieren.

11. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das geräuschabsorbierende Paneel ungefähr 90 cm hoch und ungefähr 130 cm, ungefähr 260 cm oder ungefähr 520 cm oder ungefähr 530 cm lang ist.

12. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei die Mineralwollfaserplatte Steinwolle und mit einer Dichte innerhalb der Spanne von 60-150 kg/m^3, bevorzugt 80-120 kg/m^3, bevorzugter 80-100 kg/m^3 bereitgestellt ist.

13. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei die Platte bevorzugt mit einem Schutzstoff (212) auf ihrer der Straße zugewandten Seite bereitgestellt ist.

14. Geräuschabsorbierendes Paneel nach Anspruch 13, wobei der Schutzstoff (212) eine strukturierte Oberfläche aufweist, die unterschiedliches Aussehen abhängig von einer tatsächlichen Sichtlinie aufweist.

15. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das geräuschabsorbierende Paneel (10) in einer planaren Konfiguration oder einer gekrümmten oder polygonalen Konfiguration bereitgestellt ist.

16. Geräuschabsorbierendes Paneel nach einem der vorhergehenden Ansprüche, wobei das geräuschabsorbierende Paneel (10) an den jeweiligen axialen Endabschnitten mit Endprofilen bereitgestellt ist, wobei die Endprofile I-, H-, U-oder C-Form aufweisen können.

Revendications

1. Panneau d'absorption de bruit (6) pour un système de glissière de sécurité à installer sur un côté latéral ou au milieu d'une route (2), ledit système de glissière de sécurité comprenant une série de montants de soutien (4), qui sont de préférence orientés verticalement, où au moins un panneau d'absorption de bruit (6) peut être monté sur lesdits montants de soutien (4), et une série de glissières de sécurité longitudinales (8) montées sur le côté du système de glissière de sécurité faisant face à la route (2), dans lequel ledit panneau d'absorption de bruit (6) comprend une plaque de matériau d'absorption de bruit (10) qui est enfermée dans un matériau d'absorption d'énergie (12) pourvu d'ouvertures

   caractérisé en ce que
   le matériau d'absorption d'énergie (12) est un filet en métal étirable enfermant ladite plaque de matériau d'absorption de bruit (10).

2. Panneau d'absorption de bruit selon la revendication 1, dans lequel le matériau d'absorption de bruit (10) est un matériau de fibres de laine minérale prévu de préférence sous forme de matériau en mousse, de matériau en caoutchouc intégral ou partiel, de matériau plastique intégral ou partiel ou d'un autre matériau d'absorption de bruit (10) résistant aux conditions météorologiques et aux phénomènes d'usure à proximité des voies de circulation.

3. Panneau d'absorption de bruit selon la revendication 1 ou 2, dans lequel ledit matériau d'absorption d'énergie (12) pourvu d'ouvertures comprend un maillage, une grille ou un matériau perforé.

4. Panneau d'absorption de bruit selon la revendication 3, dans lequel le métal étirable est un métal ductile pouvant absorber l'énergie tout en étant déformé plastiquement.

5. Panneau d'absorption de bruit selon la revendication 3 ou 4, dans lequel le métal étirable est de l'acier galvanisé.

6. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel le matériau d'absorption d'énergie (12) est une combinaison d'un filet en plastique et dudit filet en métal étirable.

7. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel le filet est un panneau qui enferme au moins les côtés principaux et le côté supérieur de la plaque de matériau d'absorption de bruit.

8. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel l'enceinte est constituée d'un panneau de filet en métal étirable qui est plié en une forme de boîte autour de la plaque de matériau d'absorption de bruit et avec des panneaux de montage prévus à chacun des côtés d'extrémité.

9. Panneau d'absorption de bruit selon la revendication 7 ou 8, dans lequel l'enceinte est constituée d'un panneau de filet en métal étirable qui est coulé dans un matériau isolant réalisé par un processus par voie humide et avec des panneaux de montage prévus à chacun des côtés d'extrémité du panneau de filet en métal étirable.

10. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel le panneau de filet en métal étirable est pourvu de zones non étirées à chacune des sections d'extrémité pour recevoir les panneaux de montage à chaque extrémité pour monter l'absorbeur de son sur les montants de soutien.

11. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel ledit panneau d'absorption de bruit est haut de 90 cm environ et long de 130 cm environ, de 260 cm environ, de 520 cm environ ou de 530 cm environ.

12. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel la plaque de fibres de laine minérale est de la laine de roche et présente une densité dans la plage comprise entre 60 et 150 kg/m^3, de préférence entre 80 et 120 kg/m^3, et de manière encore plus préférable entre 80 et 100 kg/m^3.

13. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel la plaque est de préférence pourvue d'un tissu protecteur (212) sur son côté orienté vers la route.

14. Panneau d'absorption de bruit selon la revendication 13, dans lequel le tissu protecteur (212) présente une surface structurée ayant différentes apparences selon un axe de vision réel.

15. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel ledit panneau d'absorption de bruit (10) est prévu dans une configuration plane ou une configuration incurvée ou polygonale.

16. Panneau d'absorption de bruit selon l'une quelconque des revendications précédentes, dans lequel le panneau d'absorption de bruit (10) est prévu au niveau des parties d'extrémité axiales respectives avec des profils d'extrémité, dans lequel les profils d'extrémité peuvent avoir une forme de I, de H, de U ou de C.

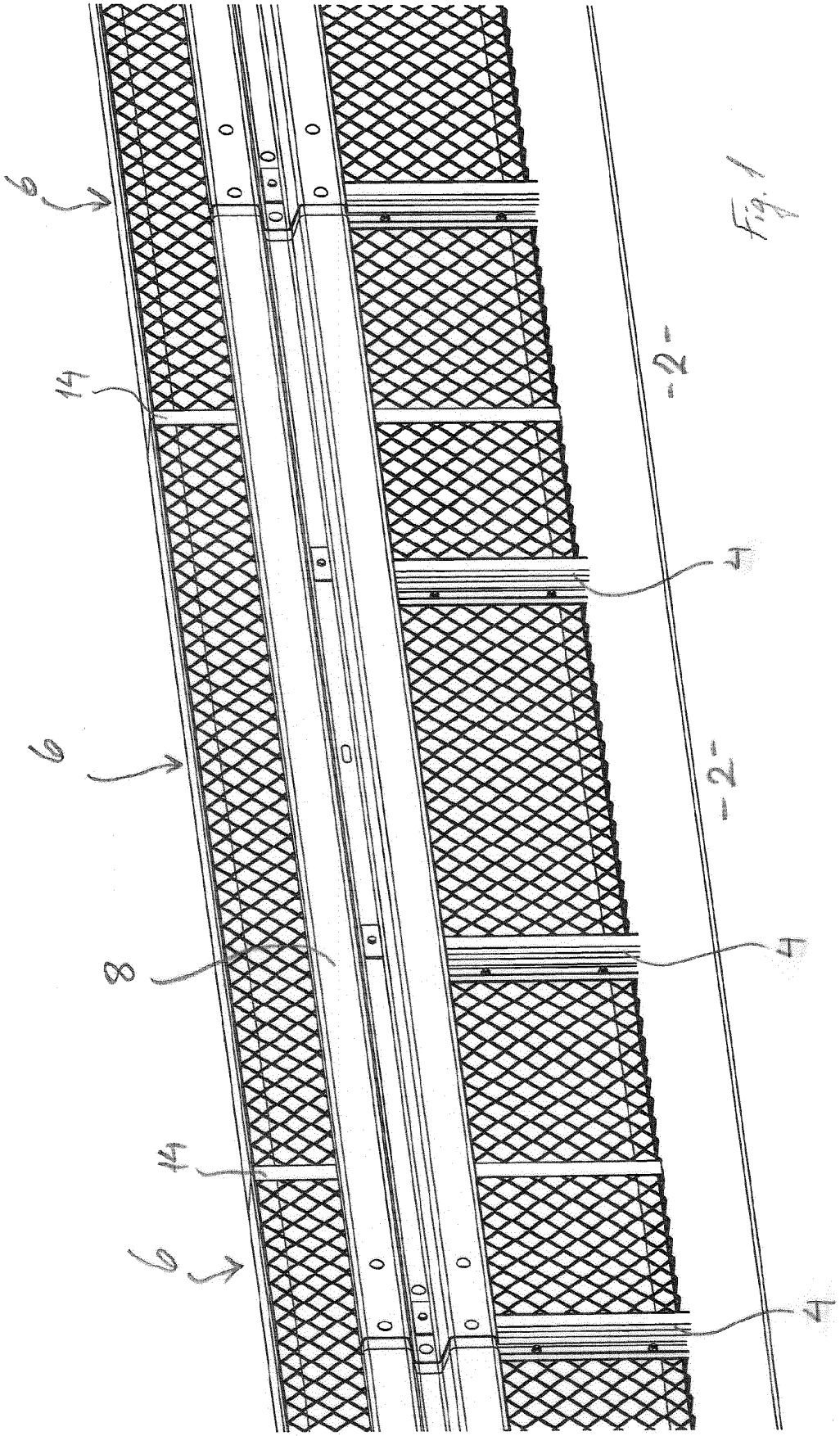
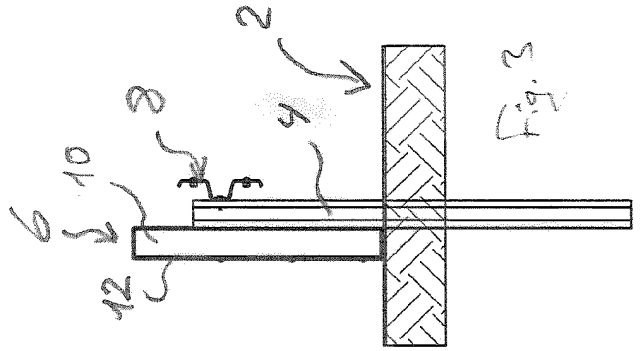


Fig. 1



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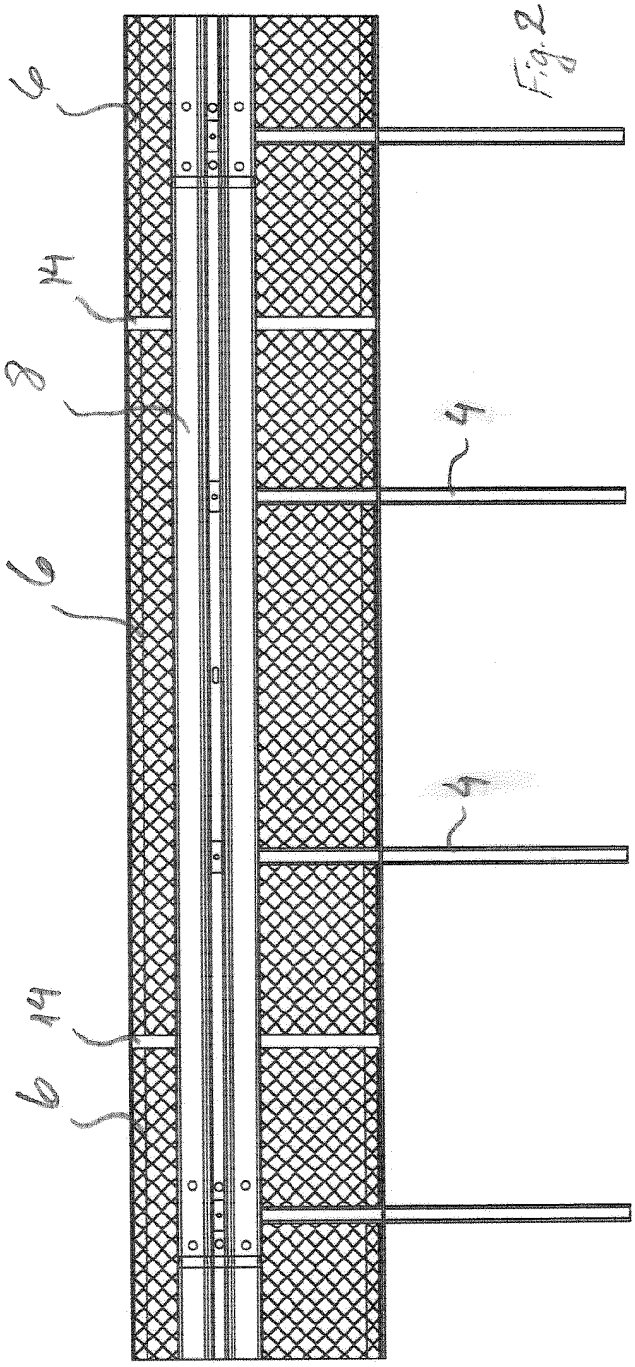

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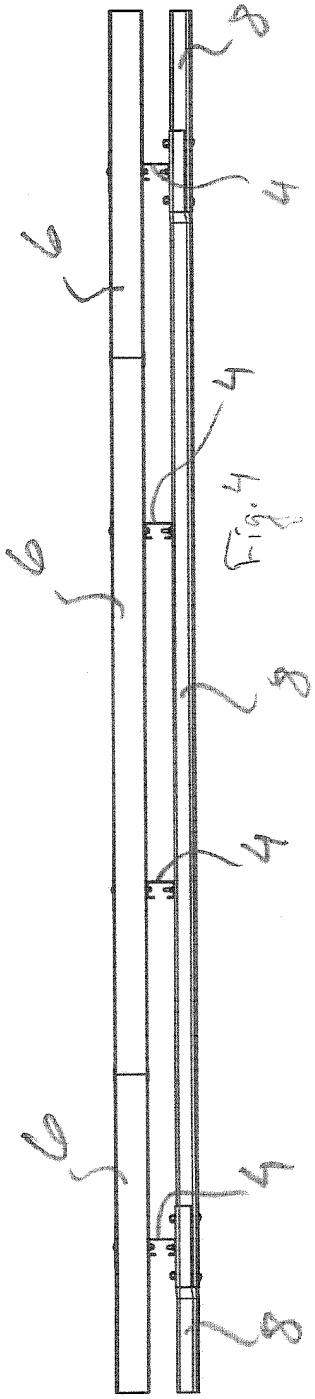
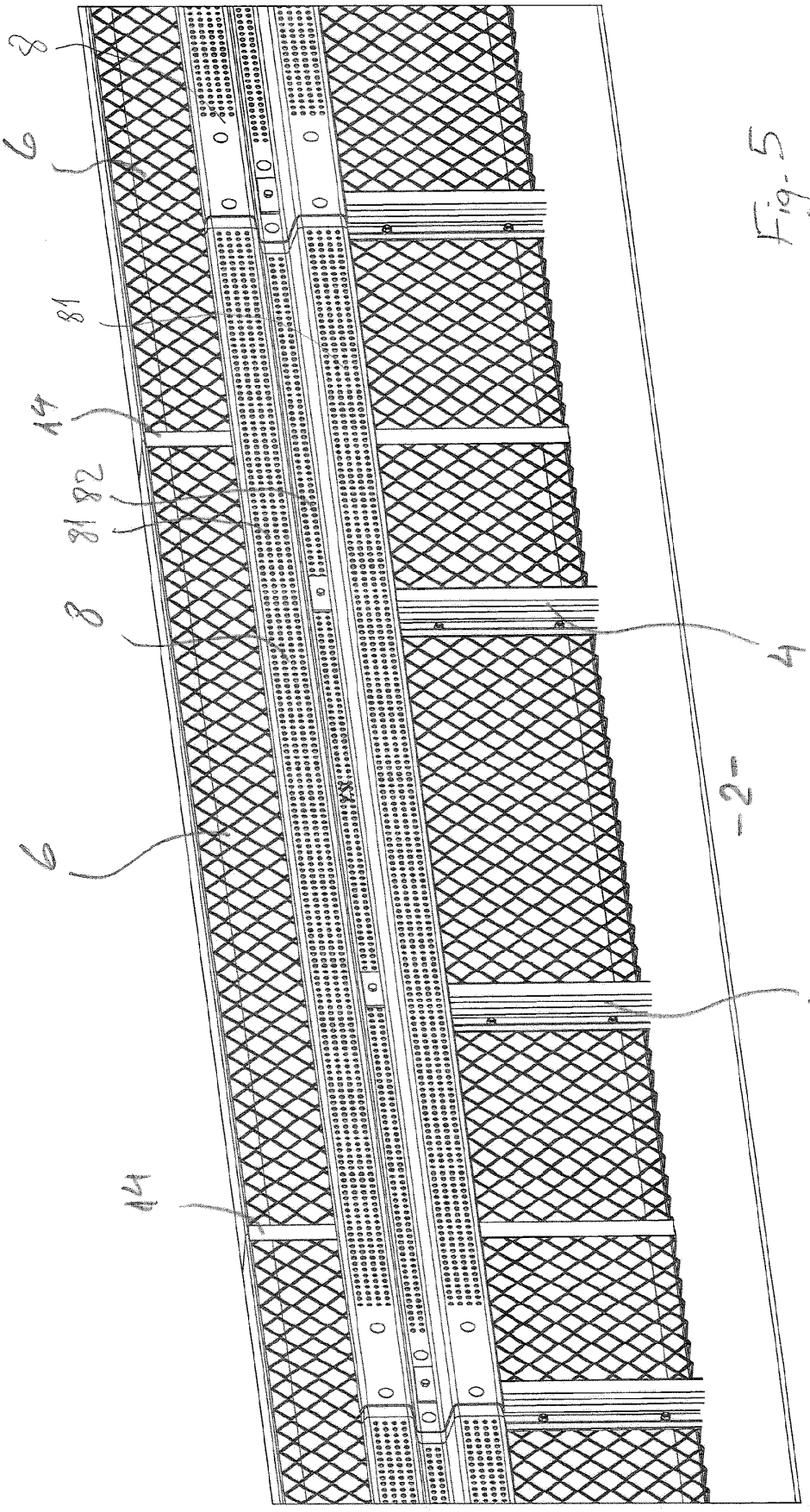


Fig. 4



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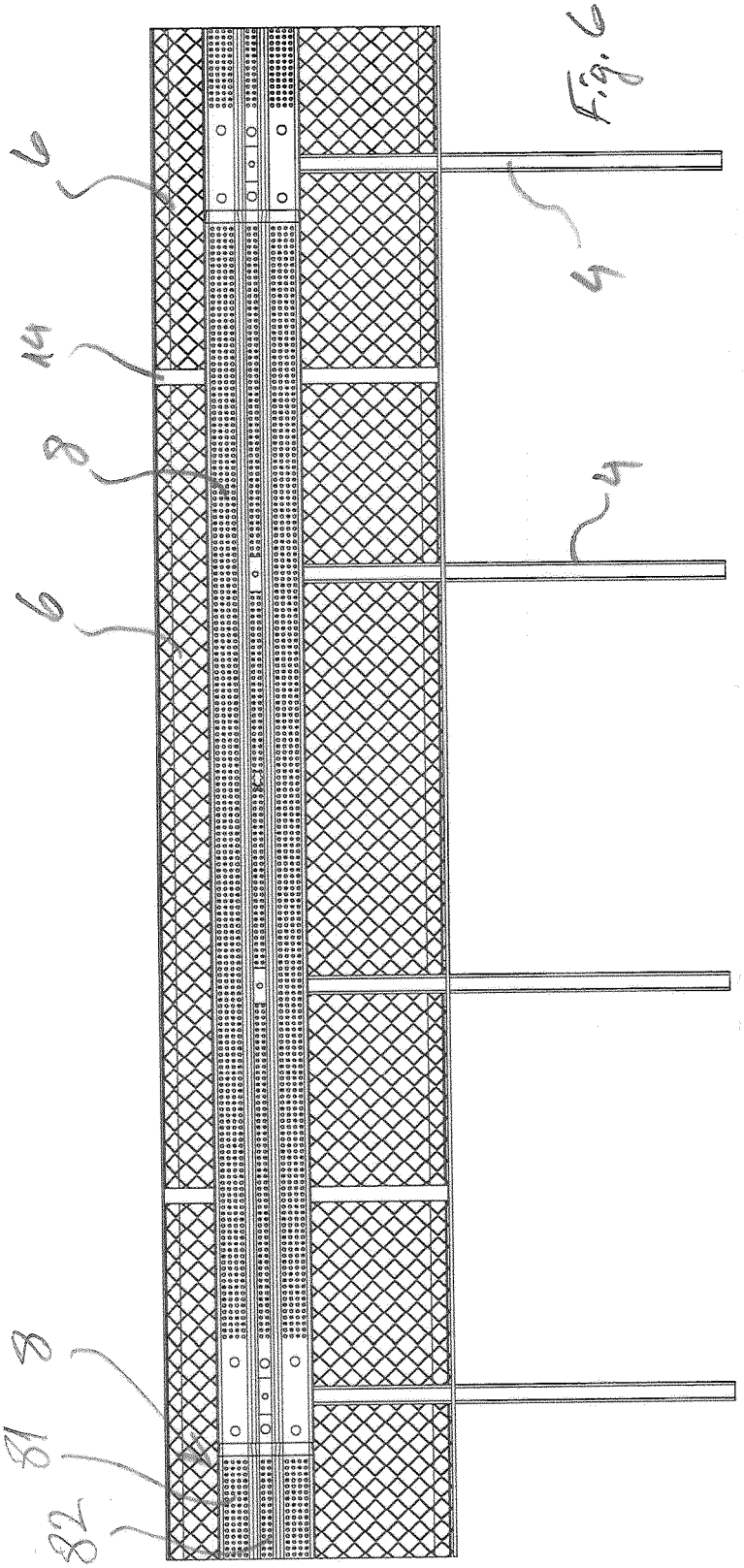
Fig. 6
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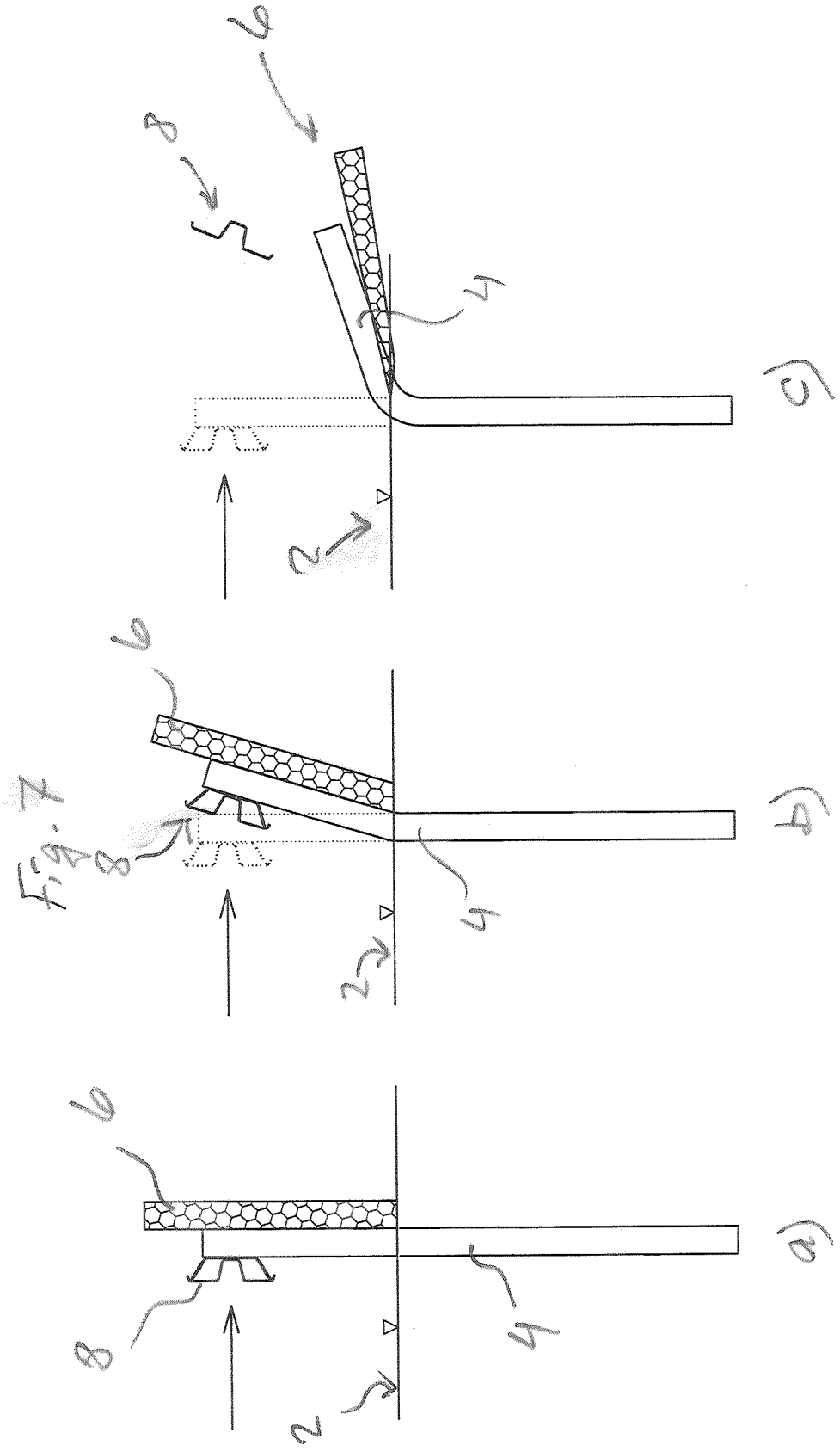

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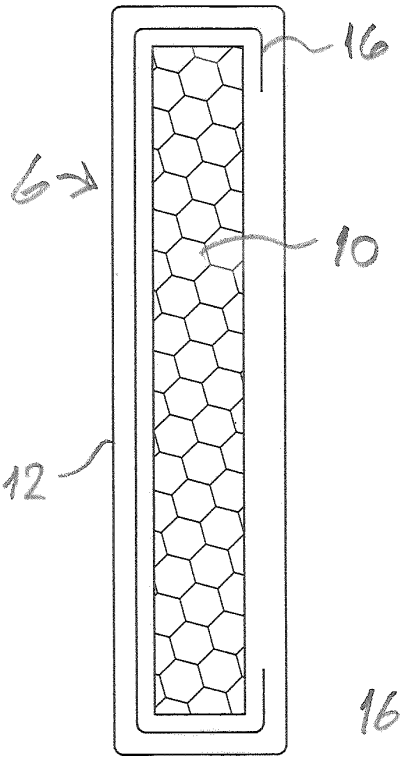

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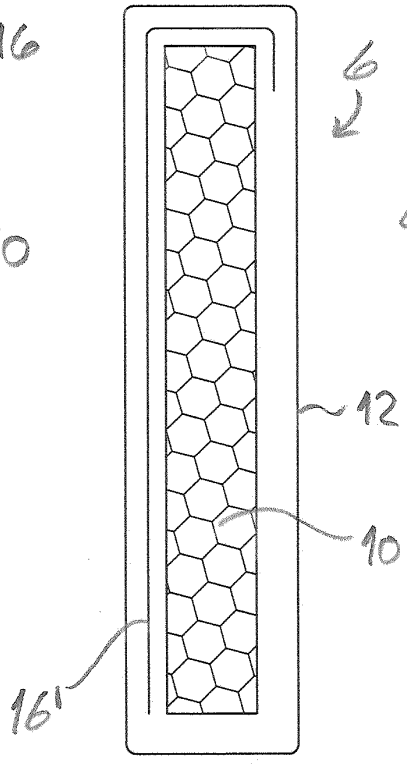
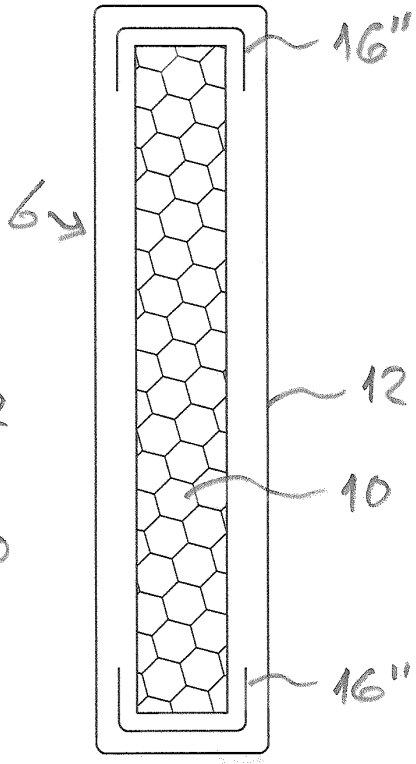


Fig. 9



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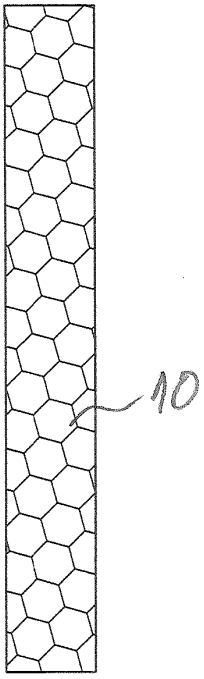

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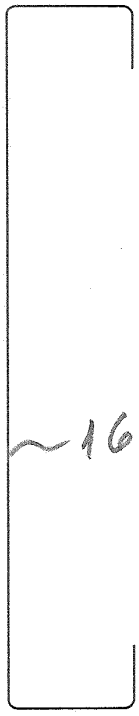

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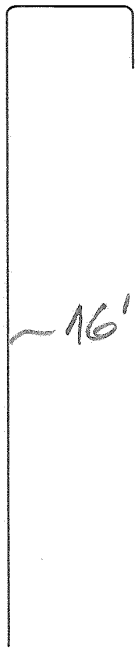
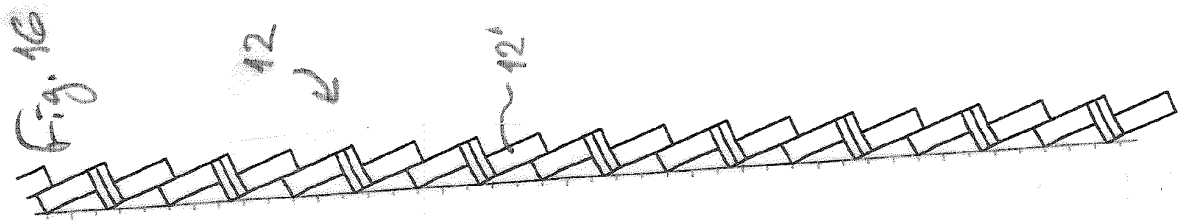


Fig. 13

Fig. 14



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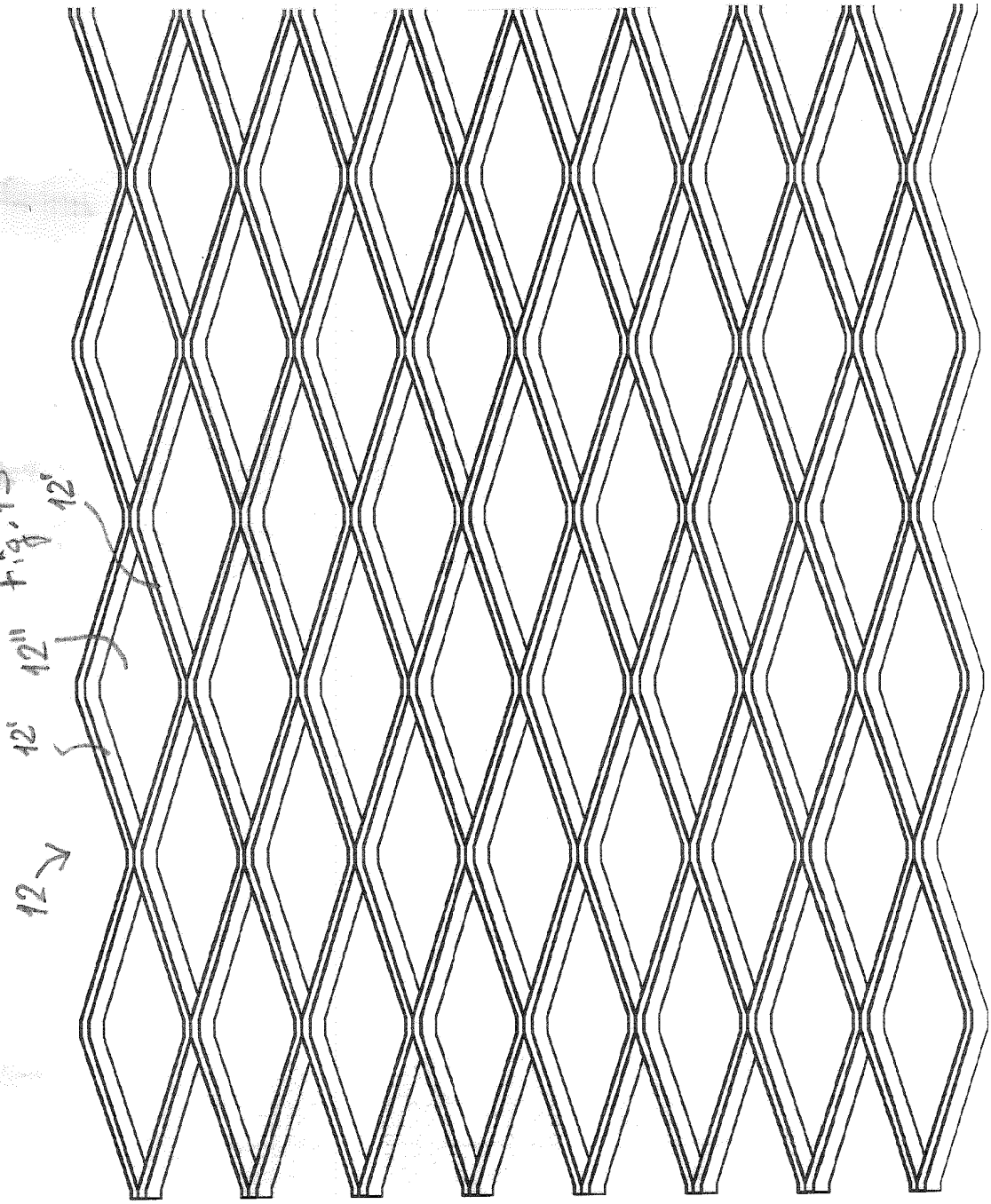

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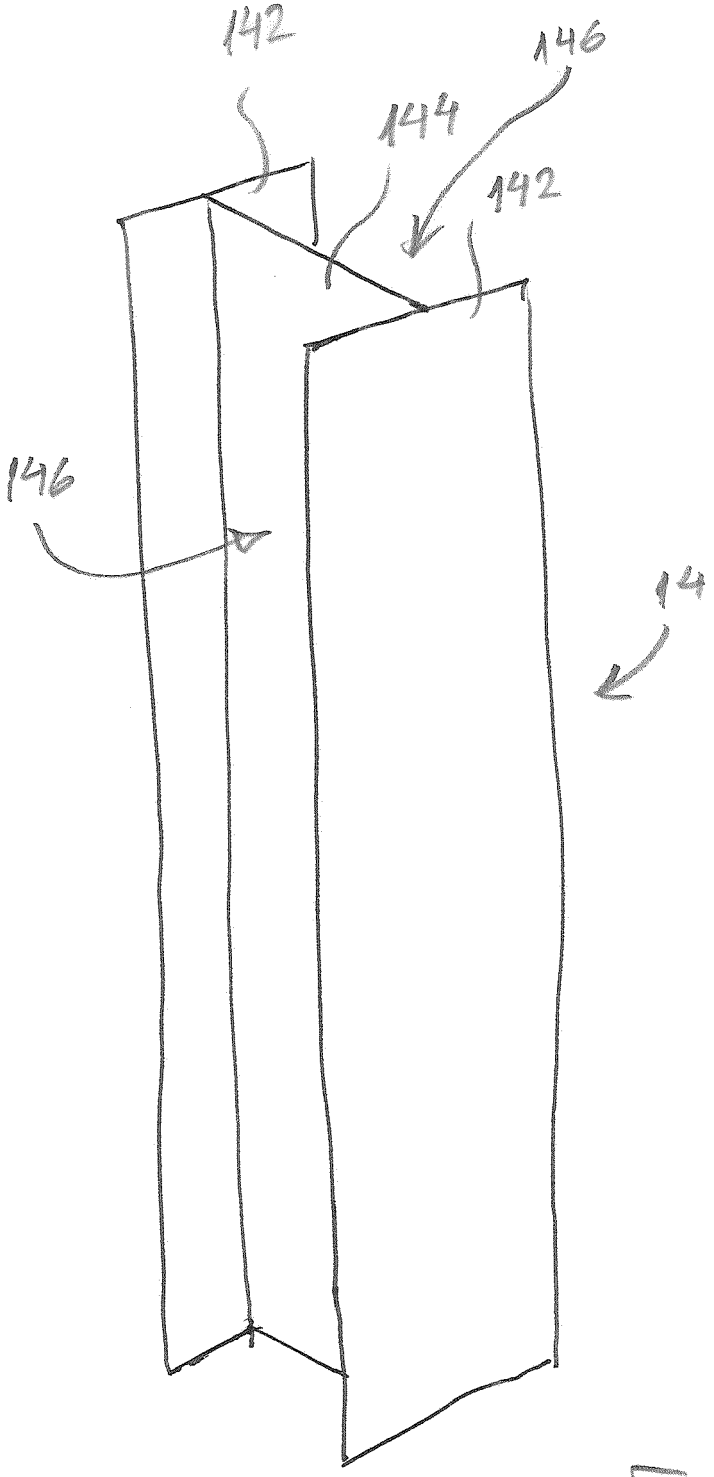

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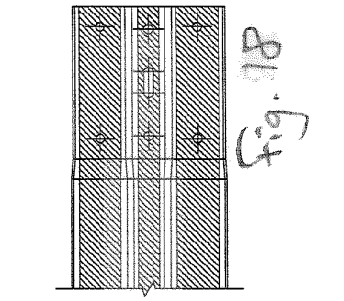

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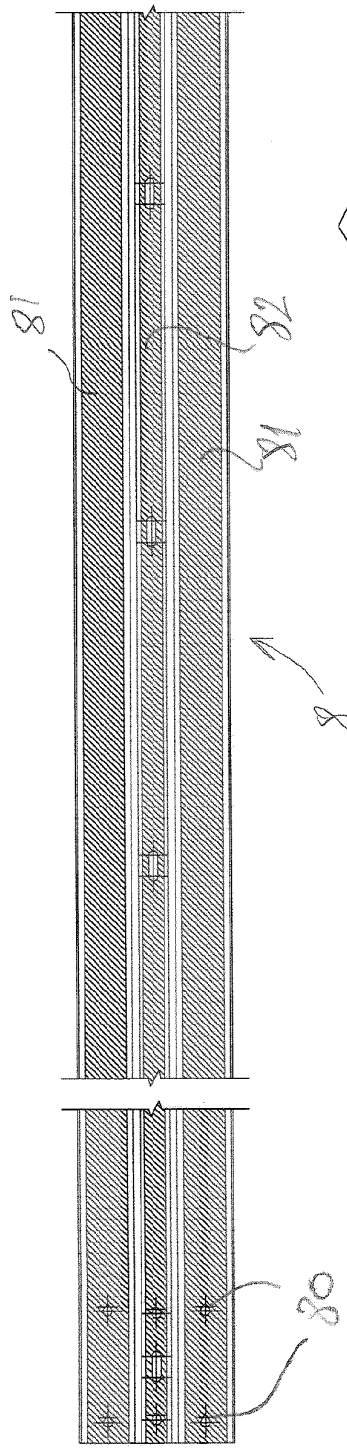

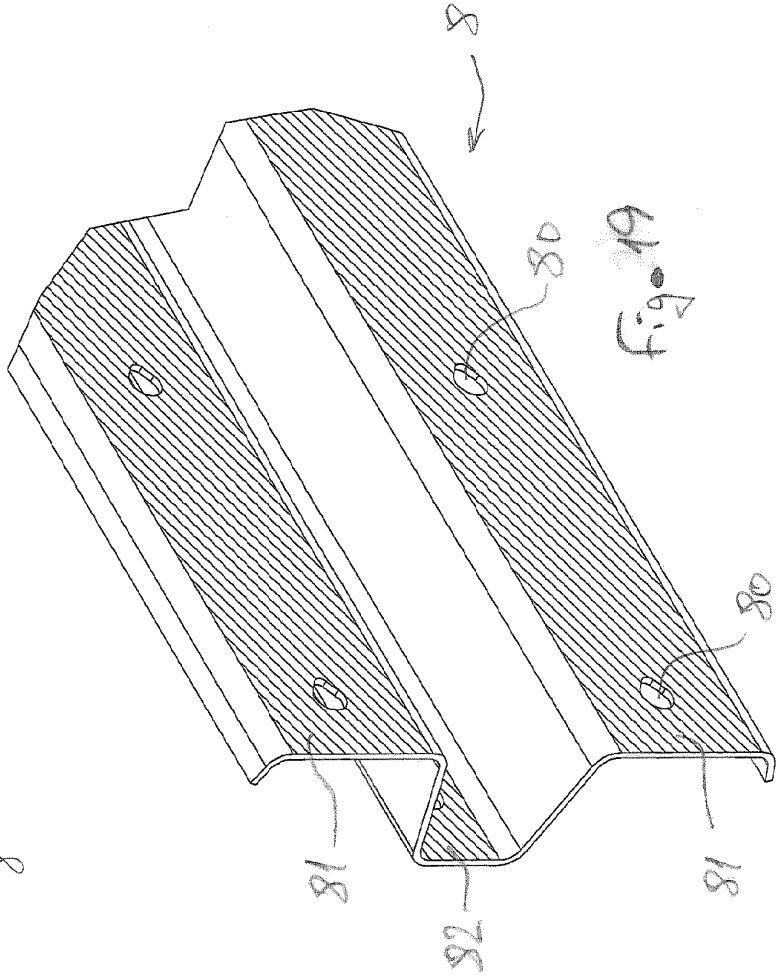

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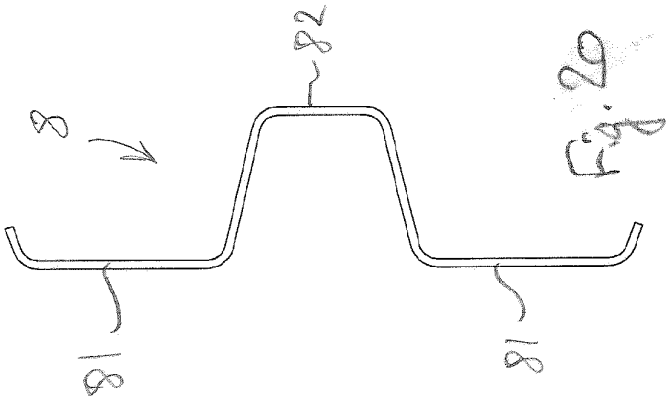
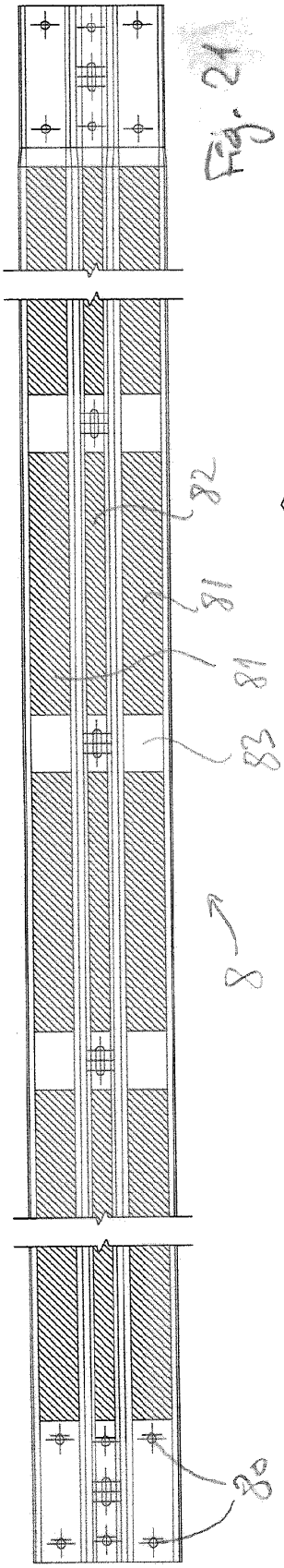


Fig. 20



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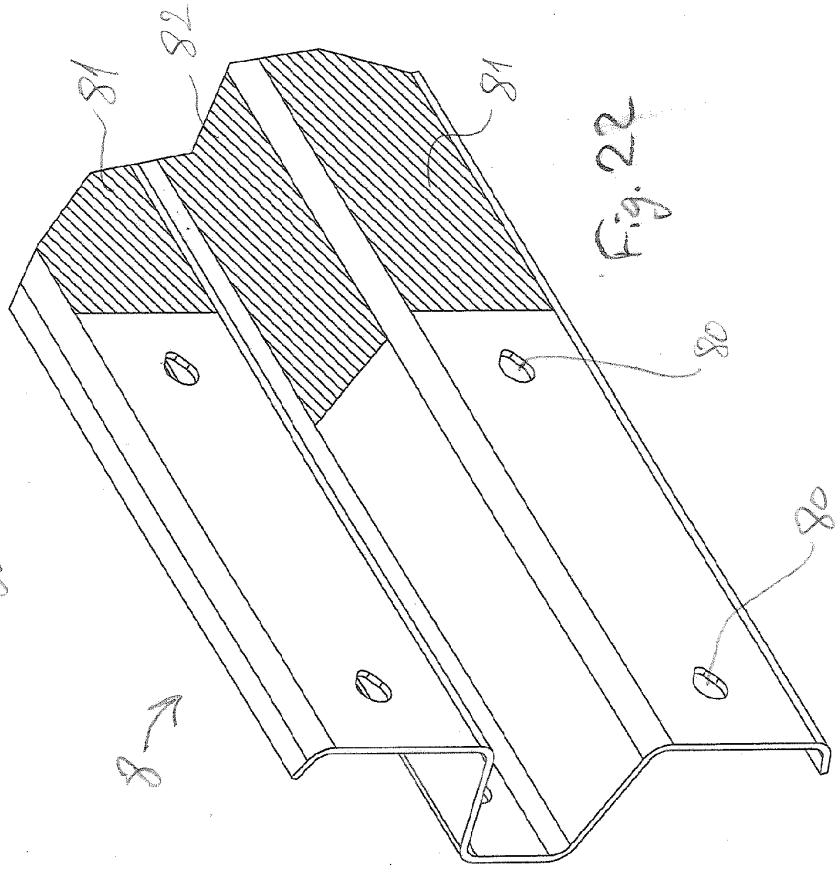

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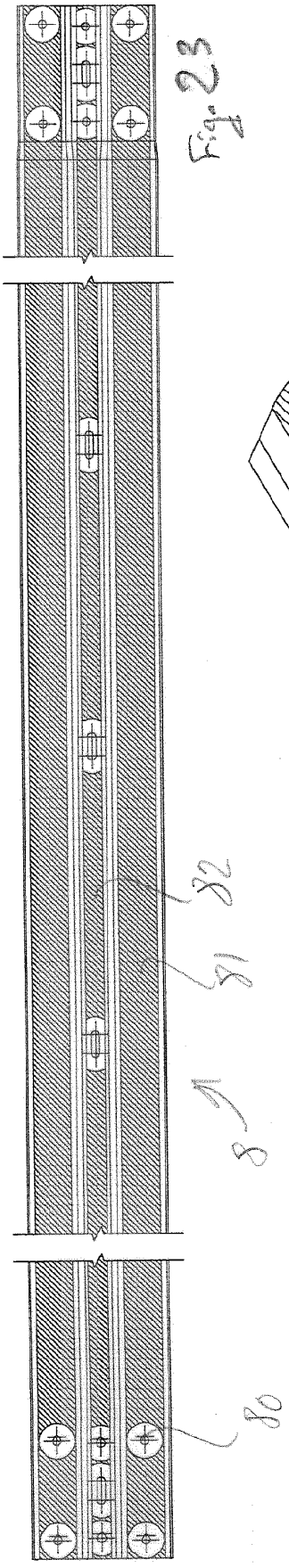

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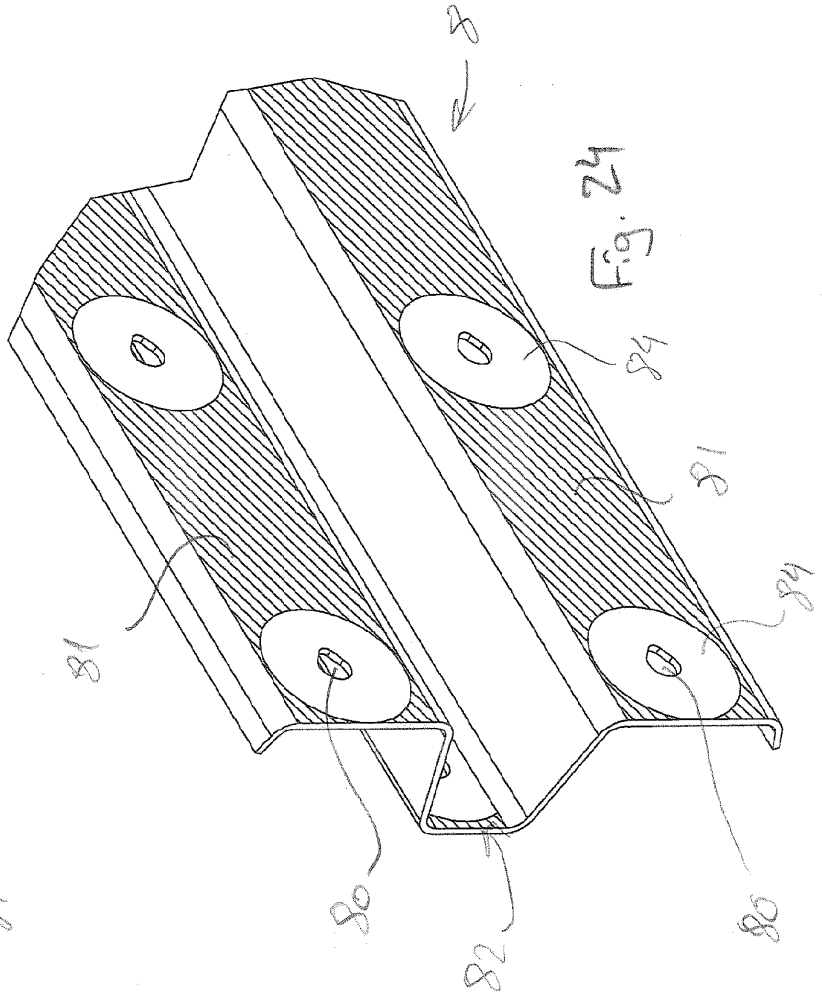

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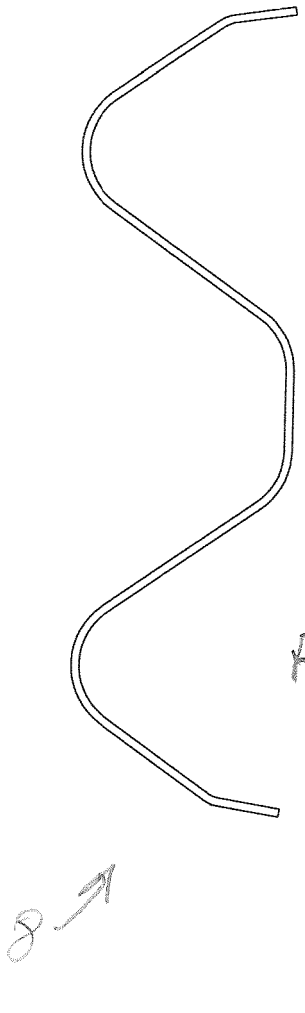

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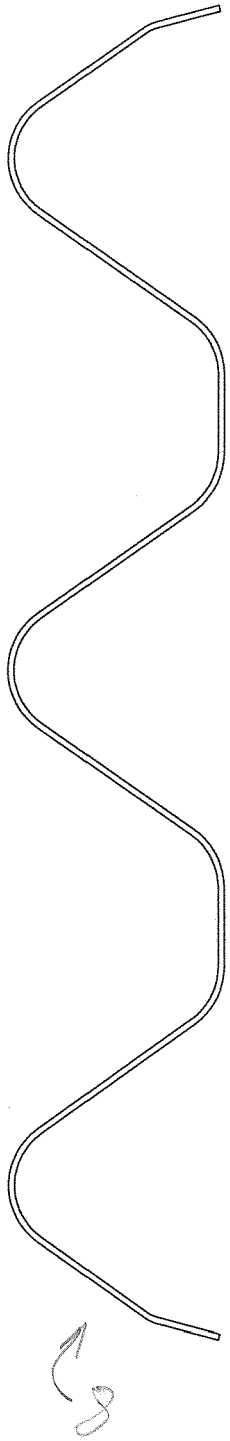

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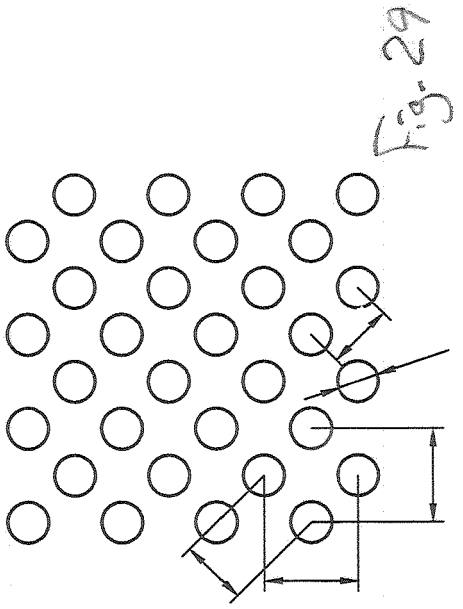

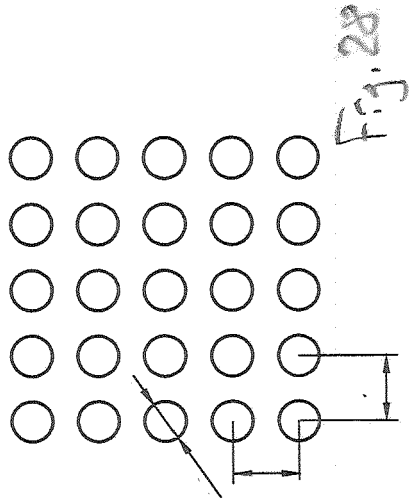

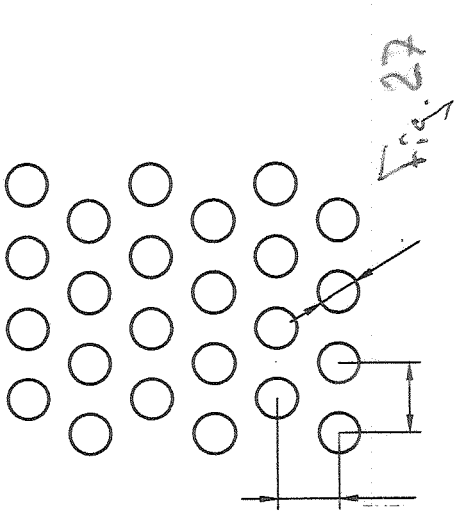

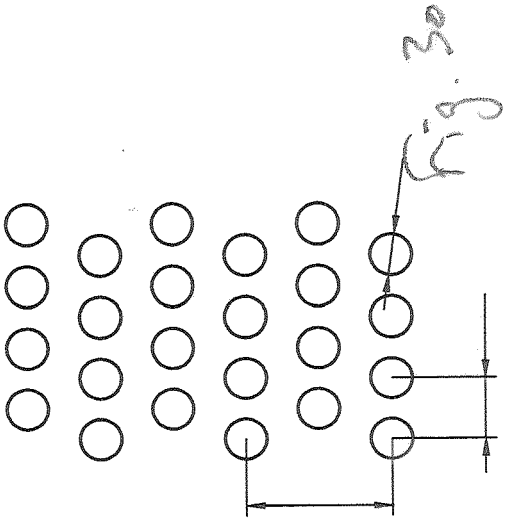

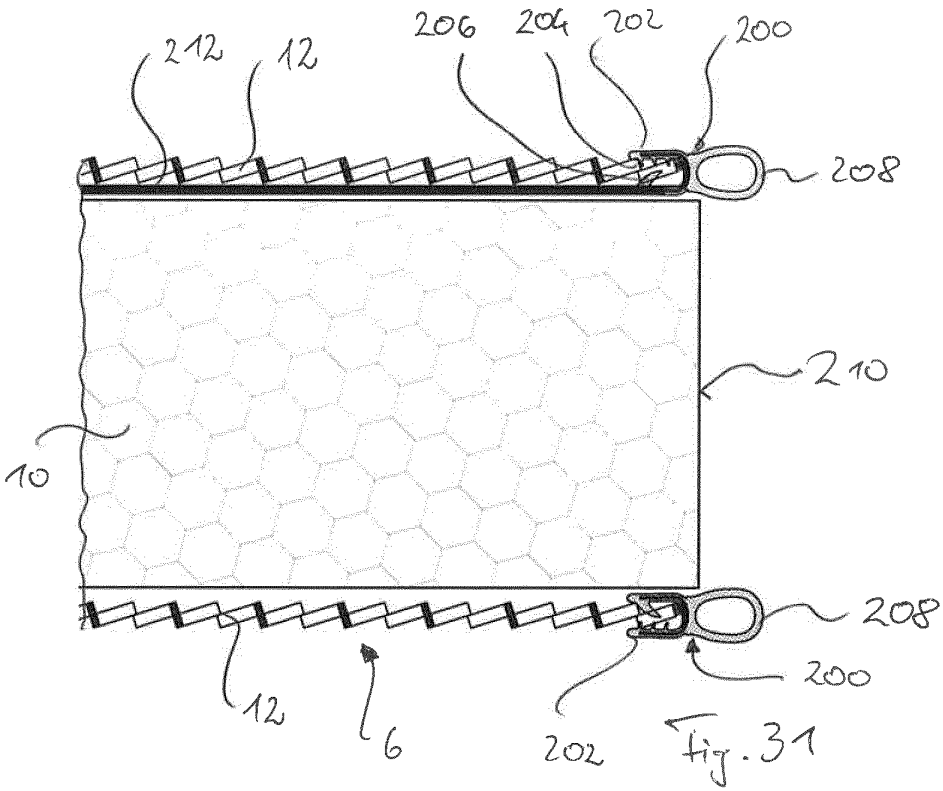
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Fig. 31

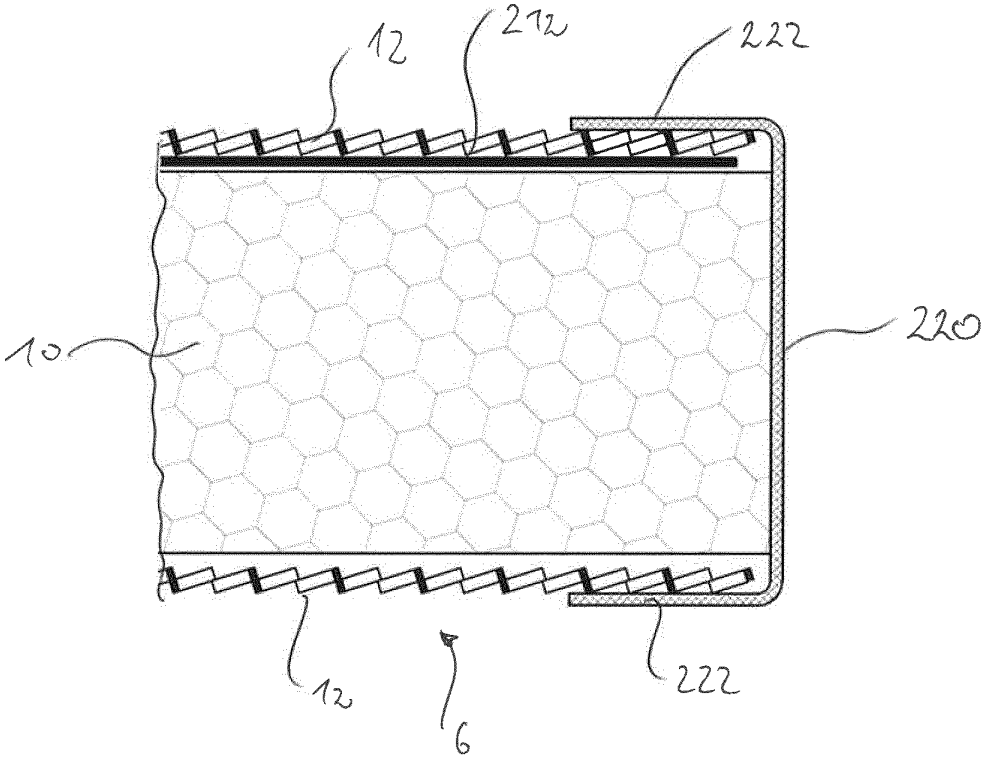
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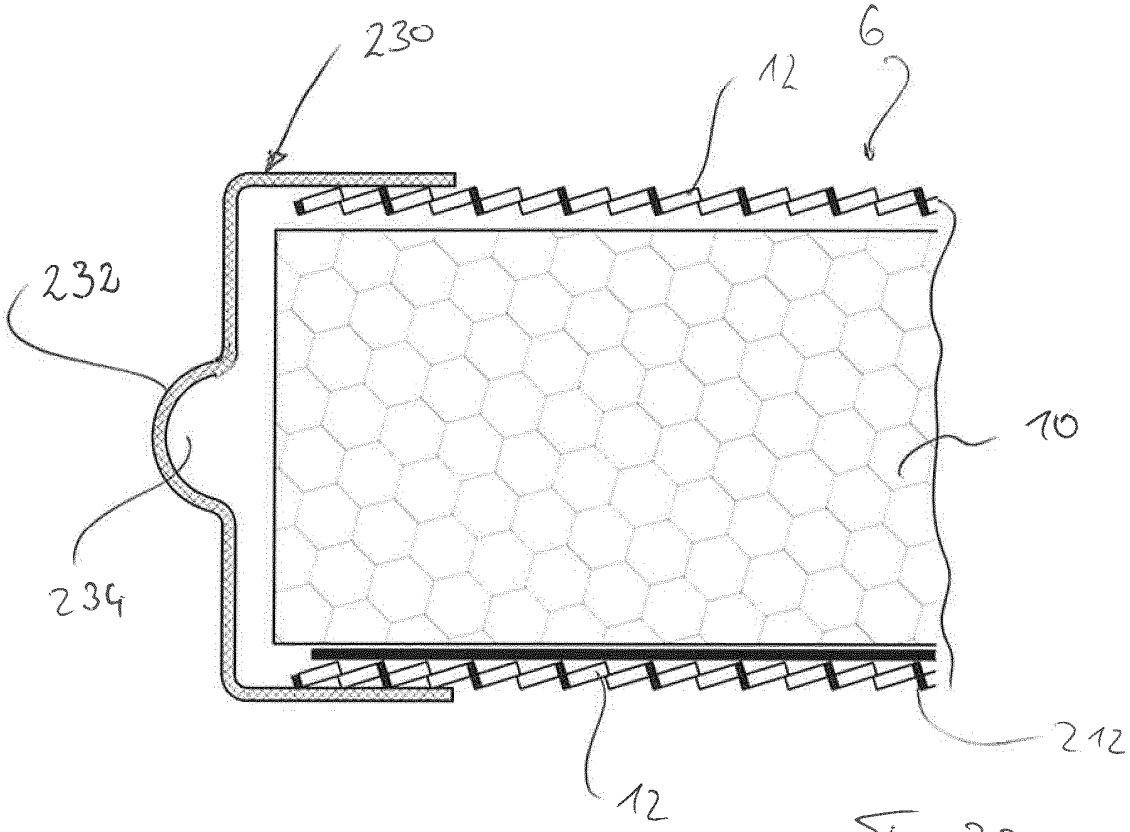
Fig. 32



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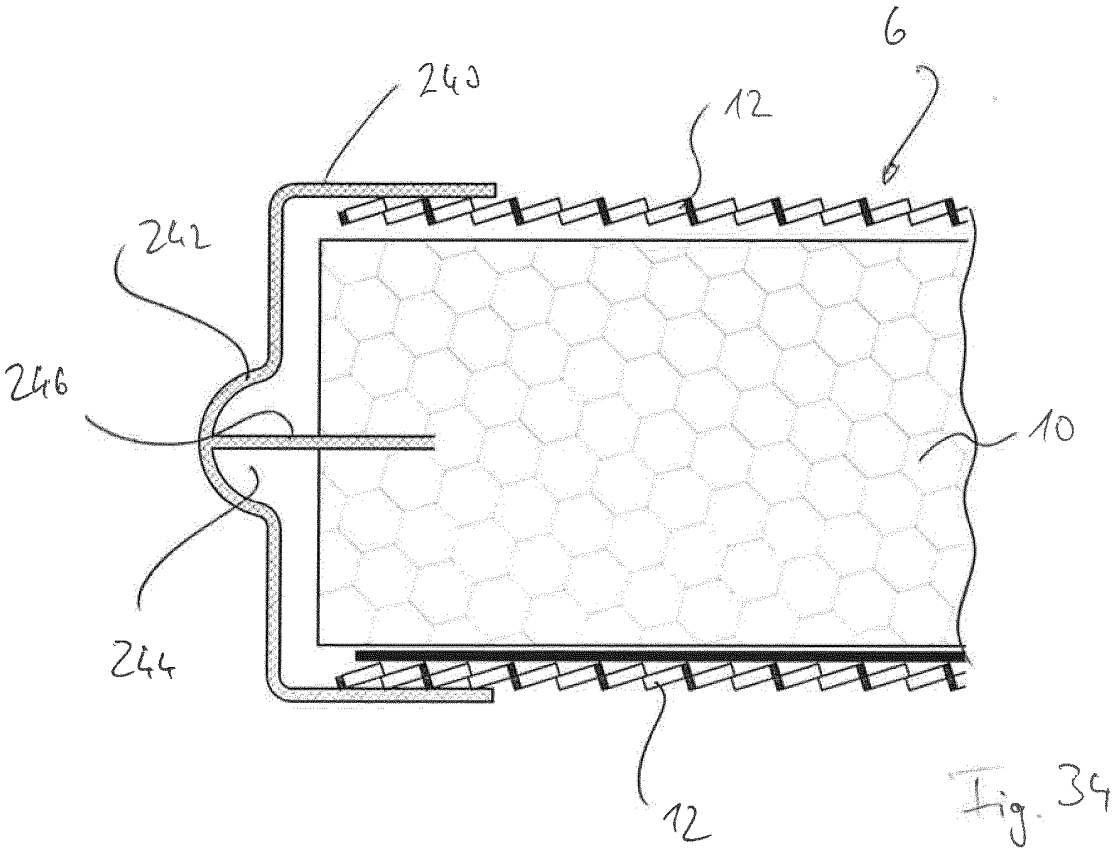

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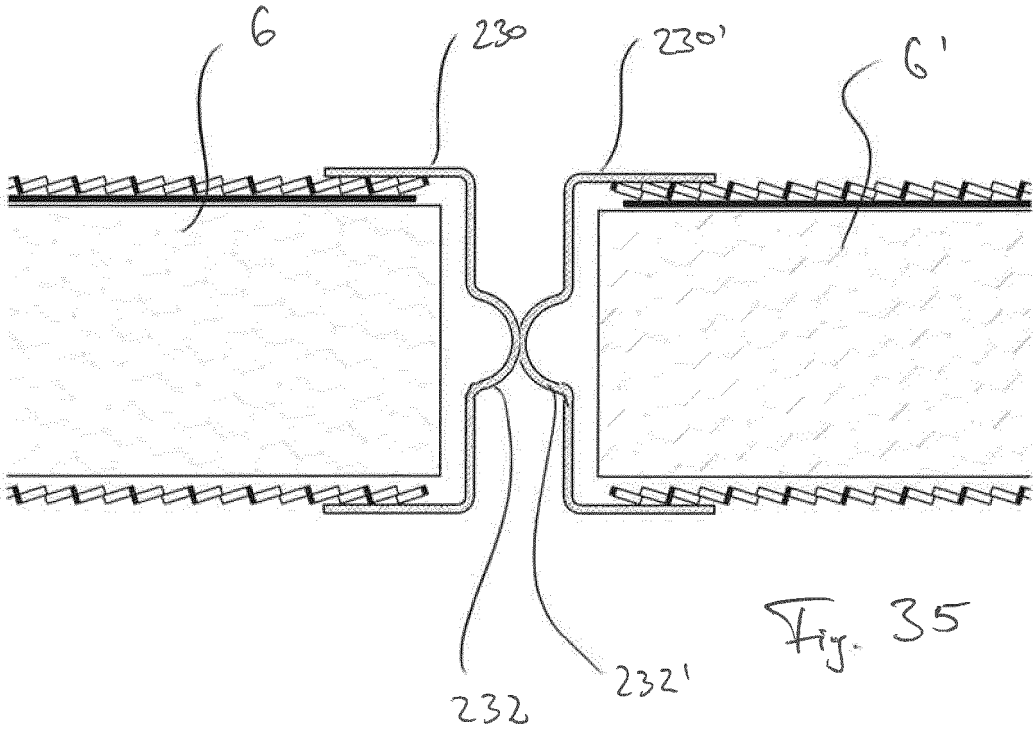

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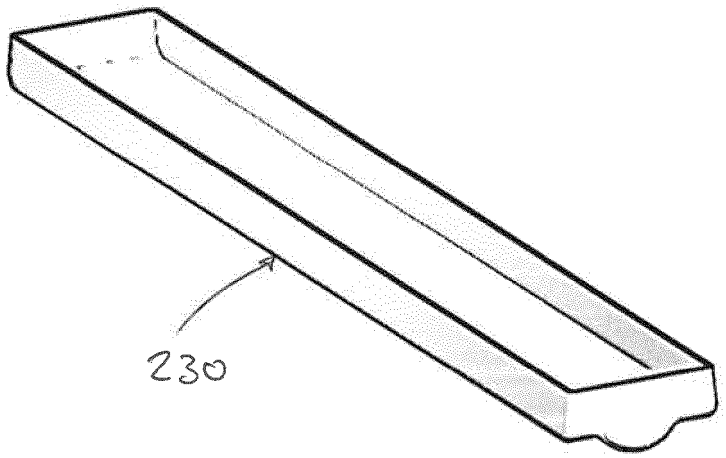
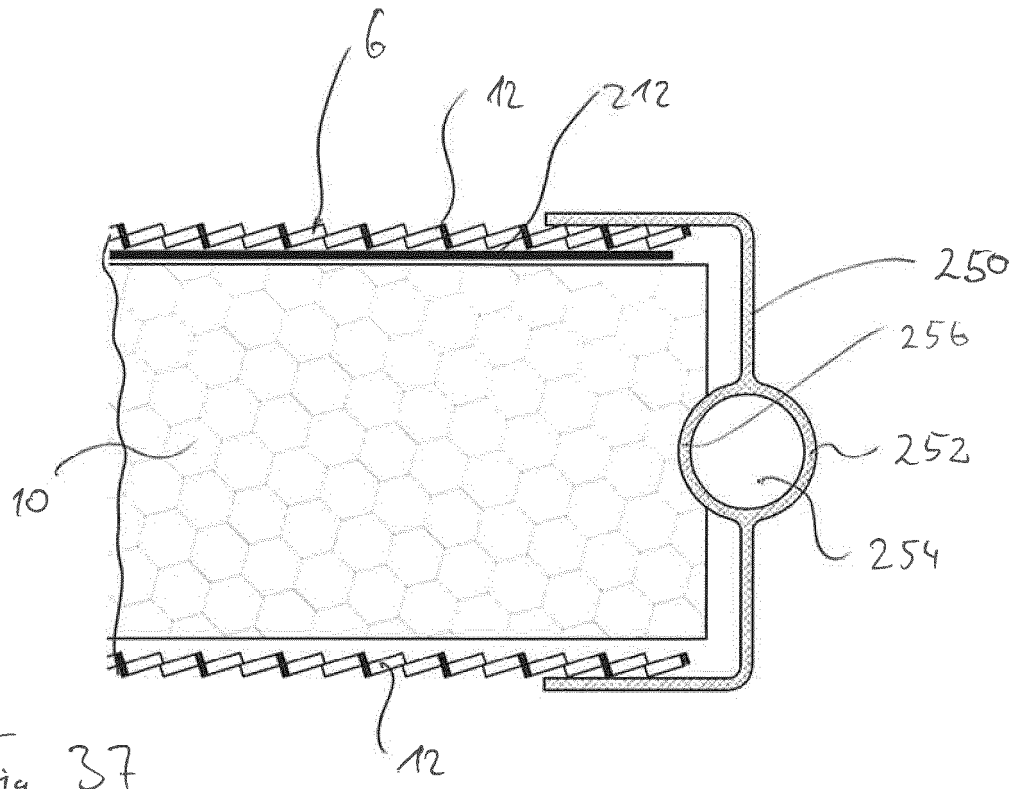


Fig. 36



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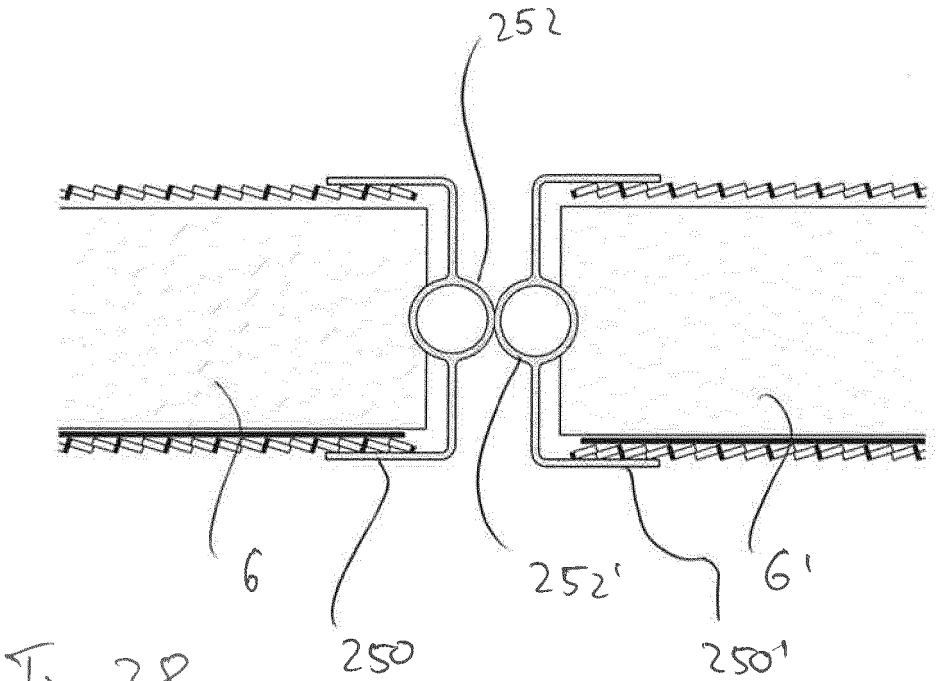

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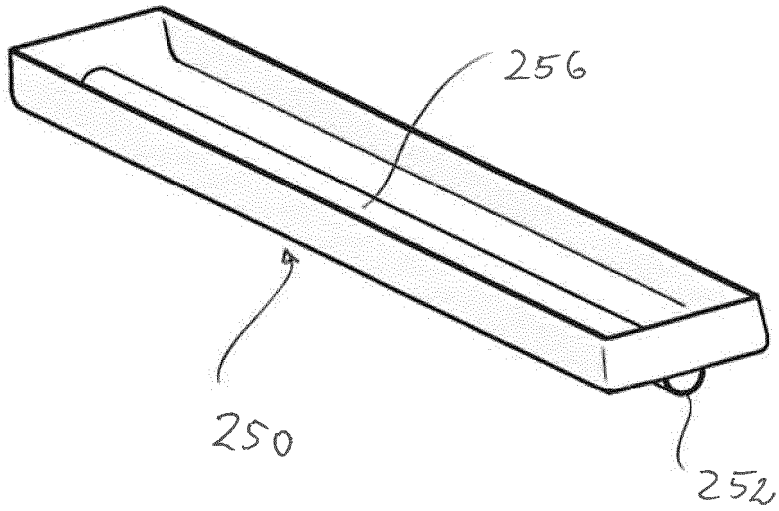

Fig. 39

REFERENCES CITED IN THE DESCRIPTION

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