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(54) **Gabion**

Gabion

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Description

[0001] The invention relates to a gabion module comprising a number of metal wire panels connected to one another, and to a gabion comprising a number of metal wire panels connected to one another in order to form at least one first compartment, provided to be filled with stones and/or sand and/or soil and/or any other filling material.

[0002] A similar gabion in which the wire panels are hingeably connected to one another along hinge lines so that they can be folded open in a concertina-like manner from a closed position of the gabion to an open position of the gabion, in which they form successive first compartments, wherein first compartments next to one another have in common at most one hinge line has already been claimed by the applicant in European patent application no. 08158716.4. The gabions as claimed earlier are herein disclaimed.

[0003] The term "gabions" refers to baskets made of interconnected metal wire panels which in the open position define a block form which is filled with stones and/or sand and/or soil and/or any other filling material. When filled, these gabions form sturdy blocks which can be used as building material. Gabions of this type are used in a broad range of constructional applications in roads, railways, rivers and canals, buildings, etc. as an embankment, dam, bank protection, bedding and the like. They were designed to shore up soil or other materials, in the event of opposing elemental forces such as flood waters, erosion, avalanches, etc., and are also used as free-standing walls, sound barriers, etc.

[0004] GB 845,863 describes a gabion which is constructed from woven metal wire panels comprising a bottom panel and side panels, the side panels being hingeably connected to the bottom panel. On site, these gabions are brought from a closed position to an open position in which they can be filled. For this purpose, the side panels are rotated relative to the bottom panel until they stand perpendicularly to the bottom panel and these side panels are joined together.

[0005] The gabions as described in EP 0 466 726 and WO 2007/060476 were developed to simplify the erecting of gabions. These gabions comprise a number of welded metal wire panels which are hingeably connected to one another, so that they can be folded open in a concertina-like manner from a closed position to an open position in which they form side and end panels of a series of successive compartments. These compartments are provided to be filled with stones and/or sand and/or soil and/or any other filling material.

[0006] US 2005/0284080 discloses gabions, comprising all features of the preamble of claim 1, made as a foldable multi-cell structure, conformed by hinged welded wire panels lined with knitted wire or expanded metal mesh, which together form cells which are pivotally connected at their corners.

[0007] It is an object of this invention to provide an al-

ternative gabion with which such a gabion can be erected, that is as sturdy or even sturdier than the gabions from the state of the art, using a same amount of metal wire panels or even less metal wire panels, for a same area, in which several additional functions, such as being soundproof, having an esthetical appearance, being sturdy, etc. can easily be integrated.

[0008] The object of this invention is achieved by providing a gabion according to claim 1, comprising a number of metal wire panels connected to one another in order to form at least one first compartment, provided to be filled with stones and/or sand and/or soil and/or any other filling material - not being a gabion in which the wire panels are hingeably connected to one another along hinge lines so that they can be folded open in a concertina-like manner from a closed position of the gabion to an open position of the gabion, in which they form successive first compartments, wherein first compartments next to one another have in common at most one hinge line - wherein said gabion comprises a textile, such as a geotextile, and/or a metal gauze, the textile and/or metal gauze being fastened to the metal wire panels and extending at least partly on the outer circumference of the gabion, in such a way as to form at least one second compartment, provided to be filled with stones and/or sand and/or soil and/or any other filling material, which is delimited by on the one hand only the textile and/or metal gauze and on the other hand only wire panels.

[0009] Preferably, these gabions will be filled with locally available filling material, such as for example locally available rocks or sand or soil, etc. The first and the second compartments can in this case be filled with the same material. Equally, they can be filled with different materials. Thus, the first compartments can for example be filled with inexpensive filling material serving as ballast, whereas the second compartments are filled with more expensive decorative material or with soundproofing material, etc. Thus, various materials can be added in such a way that adapted properties are obtained in the successive compartments.

[0010] The metal wire panels of a gabion according to this invention are preferably welded metal wire panels, since sturdier gabions can be obtained with welded metal wire panels of this type than with wire panels consisting of a metal frame filled in with woven or knotted metal gauzes.

[0011] A gabion according to this invention comprises a textile, such as a geotextile. With such a textile, the gabion can be made permeable to water, seeping of solid particles through the textile being prevented. As an alternative to textile, where the filling material of the gabions is larger than the mesh size of a metal gauze, or in addition to the textile, where additional sturdiness of the second compartments of the gabions is required, or where it is desirable to integrate protection in order to prevent the textile from becoming torn or cut to pieces, a gabion according to this invention comprises a metal gauze.

[0012] A metal gauze of this type is preferably a gauze which is woven from metal wires and offers the necessary flexibility to be folded up or rolled up, and even more preferably from a double-twisted woven gauze. This metal gauze can also be configured as a gauze knotted from metal wires.

[0013] As an alternative to the metal gauze, it is equally possible to provide, for example, a textile in which metal wires have been woven, or a textile which is strengthened differently while remaining sufficiently flexible to be able to be folded up or to be able to be folded open together with the gabion.

[0014] Furthermore, these gabions form a better buffer to stem water than the known comparable gabions, since when the known gabions become damaged, a breach in a compartment also means a breach in the gabion. In the gabions according to the invention, second compartments are provided, so that in the event of a breach in one compartment, a following compartment is still provided as a buffer, so that a breach in a compartment does not necessarily mean a breach through the gabion as a whole.

[0015] In a specific embodiment of a gabion according to this invention, at least one wire panel extends at least partly from said first compartment, forming at least one extending part, and geotextile and/or metal gauze is fastened to the extending part in order to form said second compartment. Even more specifically, the said first compartment is delimited by four metal wire panels of the gabion.

[0016] Said first compartment is then preferably delimited by on the one hand two inner wire panels and on the other hand two outer wire panels, which are connected to opposite ends of the inner wire panels in such a way that at least one end part of said outer wire panels extends from the first compartment, forming the at least one extending part.

[0017] Gabions as described hereinbefore, which take up the same volume as the known comparable gabions, require over the same length less metal to ensure the same strength and stability. These gabions are even sturdier still than the known gabions, thus allowing them to be stacked up higher.

[0018] In a preferred embodiment, the metal wire panels are hingeably connected to one another and are more preferably connected to one another along hinge lines so that they can be folded open in a zigzag-like manner from a closed position of the gabion to an open position of the gabion in which they form successive first compartments.

[0019] In a still more preferable embodiment of a gabion according to this invention, the geotextile and/or the metal gauze can be folded open along with the metal wire panels from the open position of the gabion to the closed position and, conversely, be folded out from the closed position of the gabion to the open position.

[0020] Furthermore, the metal wire panels of gabions according to this invention are preferably connected to

one another in order to form successive first compartments which are placed in respect to one another in a zigzag formation.

[0021] With such a zigzag formation, extra stability and sound reduction is obtained.

[0022] The metal wire panels are furthermore preferably detachably connected to one another.

[0023] This invention will now be commented on in greater depth based on the subsequent detailed description of preferred embodiments of gabions according to this invention. The purpose of this description is exclusively to give illustrative examples and to indicate further advantages and special features of these embodiments of gabions according to this invention, and may thus in no way be interpreted as a limitation of the scope of application of the invention or of the patent rights requested in the claims.

[0024] This detailed description will use reference numerals to refer to the appended drawings, in which:

- Figure 1 is a perspective view of an embodiment of a gabion module for forming a gabion according to this invention;
- Figure 2 is a perspective view of the metal wire panels of an embodiment of a gabion according to this invention;
- Figure 3 is a perspective view of an embodiment of a gabion according to this invention with geotextile;
- Figure 4 is a perspective view of an embodiment of a gabion according to this invention with metal gauze;
- Figure 5 is a perspective view of the metal wire panels of an embodiment of stacked gabions according to this invention;
- Figure 6 is a perspective view of the metal wire panels of an embodiment of a gabion according to this invention forming an obtuse angle;
- Figure 7 is a top view of the metal wire panels of figure 6, with textile and/or metal gauze forming an embodiment of a gabion according to this invention;
- Figure 8 is a perspective view of the metal wire panels of an embodiment of a gabion according to this invention forming an oblique angle;
- Figure 9 is a top view of the metal wire panels of figure 7, with textile and/or metal gauze, forming an embodiment of a gabion according to this invention;
- Figure 10 is a perspective view of the metal wire panels of an embodiment of a gabion according to this invention in zigzag formation;
- Figure 11 is a top view of the metal wire panels of figure 10, with textile and/or metal gauze, forming an embodiment of a gabion according to this invention;
- Figure 12 is a perspective view of the metal wire panels of an embodiment of a gabion according to this invention, in a folded position.

[0025] The embodiment of a gabion module (1) for forming a gabion according to this invention as illustrated

in figure 1, comprises three identical wire panels (2a, 2b), wherein one end of a first inner wire panel (2a) and one end of a second inner wire panel (2a) are each connected to a center part of the outer wire panel (2b). These wire panels (2a, 2b) are hingeably and detachably connected to each other using helical rods. They could equally be fastened to each other with the aid of other fastening methods. The first and second inner wire panel (2a) are connected within the surface of the outer wire panel (2b) and perpendicular to an end of the outer wire panel (2b). Together, these wire panels (2a, 2b) form a pi.

[0026] The wire panels (2a, 2b) of the embodiments of gabions (3) or of the parts of said gabions as illustrated in figures 2 to 12 are connected to one another in order to form a least one first compartment (4), which is delimited by four metal wire panels (2a, 2b) and is provided to be filled with stones and/or sand and/or soil and/or any other filling material.

[0027] These embodiments are obtained by hingeably and detachably interconnecting gabion modules (1) as illustrated in figure 1, using helical rods and hingeably and detachably connecting one or more additional identical wire panels (2b) to the outer ends of these interconnected gabion modules (1), also using helical rods. To interconnect these gabion modules (1) and to connect the additional identical wire panels (2b) other connecting methods could equally well be used. To interconnect the gabion modules (1), the opposite ends of the connected ends of the inner wire panels (2a) of a first gabion module (1) are connected to the outer wire panel (2b) of a second gabion module (1) at the opposite site of the side of this outer wire panel (2b) where the inner wire panels (2a) of the second gabion module (1) are connected, the outer wire panels (2b) of the first and second gabion module (1), together with the inner wire panels (2a) of the first gabion module (1) forming a first compartment (4). This is repeated for interconnecting further gabion modules (1) with these two interconnected gabion modules (1).

[0028] At two opposite sides of the first compartments (4), one end of the outer wire panels (2b) of the gabion modules (1) extend from these first compartments (4), forming extending parts (7).

[0029] In the illustrated embodiments, textile and/or metal gauze (6) is connected to these extending parts (7). For clarity reasons, this textile and/or metal gauze (6) is not in all figures represented. The connections can be done using clamps, but could equally well be done using other fastening methods. This textile and/or metal gauze (6) extends at least partly on the outer circumference of the gabion (3), in such a way as to form at least one second compartment (5), provided to be filled with stones and/or sand and/or soil and/or any other filling material, which are delimited by on the one hand the textile and/or metal gauze (6) and on the other hand wire panels (2a, 2b).

[0030] The embodiments of a gabion (3) as illustrated in figure 3 to 4 comprise successive first compartments (4), which are built from five interconnected gabion mod-

ules (1) as illustrated in figure 1, and connecting an additional identical wire panel (2b) at the free ends of the inner wire panels (2a) of the last interconnected gabion module (1).

[0031] In figure 3, a textile (6), such as a geotextile is attached to the extending parts (7) of the outer wire panels (2b). This textile (6) extends at least partially on the outer circumference of the gabion (3) to make the gabion (3) permeable to water, seeping of solid particles through the textile (6) being prevented.

[0032] In figure 4 a metal gauze (6) is attached to the extending parts (7) of the outer wire panels (2b). This metal gauze (6) offers additional sturdiness to the second compartments (5). This metal gauze (6) is woven or knotted from metal wires and offers the necessary flexibility to be able to fold open or to be able to fold back up this metal gauze (6) in a zigzag manner together with the gabion (3) as a whole.

[0033] Such a metal gauze (6) can also be attached to the gabion (3) of figure 3, additional to the textile (6) on the outside of this textile (6). In that case, it is less easy for the textile (6) to become damaged, since the metal gauze (6) prevents the textile (6) from becoming easily torn out or cut to pieces.

[0034] As an alternative to the metal gauze (6), it is equally possible to provide for example a textile (6) in which metal wires have been woven, or to provide a textile (6) which is strengthened differently while remaining sufficiently flexible to be able to be folded up or to be able to be folded open together with the gabion (3).

[0035] In figure 5 two gabions (3) as illustrated in figures 3 to 4 are stacked by placing a second gabion (3) on top of a first gabion (3), wherein the textile and/or metal gauze (6) is not represented on said figure.

[0036] To obtain a gabion (3) as illustrated in figure 7, two gabions (3) as illustrated in figures 3 to 4 are put next to one another forming an obtuse angle, and are interconnected using a corner wire panel (2c).

[0037] To obtain a gabion (3) as illustrated in figure 9, two gabions (3) as illustrated in figures 3 to 4 are put next to one another forming an oblique angle, and are interconnected using helical rods (8). They could equally well be connected using other connection methods.

[0038] The gabion (3) as illustrated in figure 11 is a gabion (3) which is formed in the same way as the gabions (3) as illustrated in figures 3 to 4, but wherein the successive first compartments (4) are placed in respect to one another in a zigzag formation. With such a zigzag formation, extra stability and sound reduction is obtained.

[0039] In figure 12 is illustrated how a gabion (3) according to this invention wherein the metal wire panels (2a, 2b) are hingeably connected to one another along hinge lines can be folded open in a zigzag-like manner from a closed position of the gabion (3) to an open position of the gabion (3) in which they form successive first compartments (4) and can be folded back in an inverse zigzag-like manner to a closed position. Figure 12 is a perspective view of the metal wire panels (2a, 2b) of a

gabion (3) in a folded position, wherein the textile and/or metal gauze (6) is not represented.

Claims

1. Gabion (3) comprising a number of metal wire panels (2a, 2b) connected to one another in order to form at least one first compartment (4), provided to be filled with stones and/or sand and/or soil and/or any other filling material, not being a gabion (3) in which the wire panels (2a, 2b) are hingeably connected to one another along hinge lines so that they can be folded open in a concertina-like manner from a closed position of the gabion (3) to an open position of the gabion (3), in which they form successive first compartments (4), wherein first compartments (4) next to one another have in common at most one hinge line, said claimed gabion (3) however comprises a textile such as a geotextile and/or a metal gauze (6), the textile and/or metal gauze (6) being fastened to the metal wire panels (2a, 2b) and extending at least partly on the outer circumference of the gabion (3), **characterized in that**, the textile and/or metal gauze (6) is fastened to the metal wire panels (2a, 2b), in such a way as to form at least one second compartment (5) by the fastening of the geotextile and/or the metal gauze to the metal wire panels, said second compartment (5) being provided to be filled with stones and/or sand and/or soil and/or any other filling material, and said second compartment (5) being delimited by on the one hand only the textile and/or metal gauze (6) and on the other hand only wire panels (2a, 2b).
2. Gabion (3) according to claim 1, **characterized in that** at least one said wire panel (2b) extends at least partly from said first compartment, forming at least one extending part (7), and **in that** the textile and/or metal gauze (6) is fastened to the extending part (7) in order to form said second compartment (5).
3. Gabion (3) according to claim 1 or 2, **characterized in that** said first compartment (4) is delimited by four metal wire panels (2a, 2b) of the gabion (3).
4. Gabion (3) according to claim 2 and 3, **characterized in that** said first compartment (4) is delimited by on the one hand two inner wire panels (2a) and on the other hand two outer wire panels (2b), which are connected to opposite ends of the inner wire panels (2a) in such a way that at least one end part of said outer wire panels (2b) extends from the first compartment (4), forming the at least one extending part (7).
5. Gabion (3) according to any of the preceding claims, **characterized in that** the metal wire panels (2a, 2b)

are hingeably connected to one another.

6. Gabion (3) according to claim 5, **characterized in that** the metal wire panels (2a, 2b) are hingeably connected to one another along hinge lines so that they can be folded open in a zigzag-like manner from a closed position of the gabion (3) to an open position of the gabion (3) in which they form successive first compartments (4).
7. Gabion (3) according to any of the preceding claims, **characterized in that** the metal wire panels (2a, 2b) are connected to one another in order to form successive first compartments (4) which are placed in respect to one another in a zigzag formation.
8. Gabion (3) according to any of the preceding claims, **characterized in that** the metal wire panels (2a, 2b)) are detachably connected to one another.

Patentansprüche

1. Gabione (3), die eine Anzahl von Metalldrahtpaneelen (2a, 2b) aufweist, die miteinander verbunden sind, um mindestens eine erste Kammer (4) zu bilden, die bereitgestellt wird, um mit Steinen und/oder Sand und/oder Erdreich und/oder jedwedem anderen Füllmaterial gefüllt zu werden, wobei es sich nicht um eine Gabione (3) handelt, bei der die Drahtpaneelen (2a, 2b) entlang Gelenklinien gelenkig miteinander derart verbunden sind, dass sie auf ziehharmonikaartige Weise von einer geschlossenen Position der Gabione (3) in eine offene Position der Gabione (3) aufgeklappt werden können, in der sie aufeinanderfolgende erste Kammern (4) bilden, wobei nebeneinander angeordnete erste Kammern (4) höchstens eine Gelenklinie gemeinsam haben, wobei die beanspruchte Gabione (3) jedoch eine Textilie, beispielsweise eine Geotextilie, und/oder eine Metallgaze (6) aufweist, wobei die Textilie und/oder die Metallgaze (6) an den Metalldrahtpaneelen (2a, 2b) befestigt ist und sich mindestens zum Teil an dem Außenumfang der Gabione (3) erstreckt, **dadurch gekennzeichnet, dass** die Textilie und/oder die Metallgaze (6) an den Metalldrahtpaneelen (2a, 2b) derart befestigt ist, dass durch das Befestigen der Geotextilie und/oder der Metallgaze an den Metalldrahtpaneelen mindestens eine zweite Kammer (5) gebildet wird, wobei die zweite Kammer (5) bereitgestellt wird, um mit Steinen und/oder Sand und/oder Erdreich und/oder jedwedem anderen Füllmaterial gefüllt zu werden, und die zweite Kammer (5) einerseits nur durch die Textilie und/oder die Metallgaze (6) und andererseits nur durch Drahtpaneelen (2a, 2b) begrenzt wird.
2. Gabione (3) nach Anspruch 1, **dadurch gekennzeichnet**

zeichnet, dass sich mindestens ein Drahtpaneel (2b) mindestens zum Teil von der ersten Kammer erstreckt und mindestens einen sich erstreckenden Teil (7) bildet, und dadurch, dass die Textilie und/oder die Metallgaze (6) an dem sich erstreckenden Teil (7) befestigt ist, um die zweite Kammer (5) zu bilden.

3. Gabione (3) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die erste Kammer (4) durch vier Metalldrahtpaneele (2a, 2b) der Gabione (3) begrenzt ist.
4. Gabione (3) nach Anspruch 2 und 3, **dadurch gekennzeichnet, dass** die erste Kammer (4) begrenzt ist einerseits durch zwei innere Drahtpaneele (2a) und andererseits durch zwei äußere Drahtpaneele (2b), die mit entgegengesetzten Enden der inneren Drahtpaneele (2a) derart verbunden sind, dass sich mindestens ein Endteil der äußeren Drahtpaneele (2b) von der ersten Kammer (4) erstreckt und den mindestens einen sich erstreckenden Teil (7) bildet.
5. Gabione (3) nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Metalldrahtpaneele (2a, 2b) gelenkig miteinander verbunden sind.
6. Gabione (3) nach Anspruch 5, **dadurch gekennzeichnet, dass** die Metalldrahtpaneele (2a, 2b) entlang Gelenklinien derart gelenkig miteinander verbunden sind, dass sie zickzackartig von einer geschlossenen Position der Gabione (3) in eine offene Position der Gabione (3), in der sie aufeinanderfolgende erste Kammern (4) bilden, aufgeklappt werden können.
7. Gabione (3) nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Metalldrahtpaneele (2a, 2b) miteinander verbunden sind, um aufeinanderfolgende erste Kammern (4) zu bilden, die in Bezug aufeinander in einer Zick-Zack-Formation angeordnet sind.
8. Gabione (3) nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Metalldrahtpaneele (2a, 2b) lösbar miteinander verbunden sind.

Revendications

1. Gabion (3) comprenant une pluralité de panneaux de fils métalliques (2a, 2b) connectés les uns aux autres afin de former au moins un premier compartiment (4) prévu pour être rempli avec des pierres et/ou du sable et/ou de la terre et/ou tout autre matériau de remplissage, n'étant pas un gabion (3) dans

lequel les panneaux de fils métalliques (2a, 2b) sont connectés de manière articulée les uns aux autres le long de lignes d'articulation de manière à pouvoir être dépliés en accordéon d'une position fermée du gabion (3) dans une position ouverte du gabion (3) dans laquelle ils forment des premiers compartiments successifs (4), des premiers compartiments (4) juxtaposés ayant en commun au plus une ligne d'articulation, mais ledit gabion revendiqué (3) comprenant un textile tel qu'un géotextile et/ou un grillage métallique (6), le textile et/ou le grillage métallique (6) étant attachés aux panneaux de fils métalliques (2a, 2b) et s'étendant au moins en partie sur la circonférence extérieure du gabion (3), **caractérisé en ce que** le textile et/ou le grillage métallique (6) sont attachés aux panneaux de fils métalliques (2a, 2b) de manière à former au moins un deuxième compartiment (5) par la fixation du géotextile et/ou du grillage métallique aux panneaux de fils métalliques, ledit deuxième compartiment (5) étant prévu pour être rempli de pierres et/ou de sable et/ou de terre et/ou de tout autre matériau de remplissage, et ledit deuxième compartiment (5) étant délimité d'une part par seulement le textile et/ou le grillage métallique (6), et d'autre part par seulement des panneaux de fils métalliques (2a, 2b).

2. Gabion (3) selon la revendication 1, **caractérisé en ce qu'au** moins un dit panneau de fils métalliques (2b) s'étend au moins en partie à partir dudit premier compartiment, en formant au moins une partie prolongée (7) et **en ce que** le textile et/ou le grillage métallique (6) est attaché à la partie prolongée (7) afin de former ledit deuxième compartiment (5).
3. Gabion (3) selon la revendication 1 ou 2, **caractérisé en ce que** ledit premier compartiment (4) est délimité par quatre panneaux de fils métalliques (2a, 2b) du gabion (3).
4. Gabion (3) selon les revendications 2 et 3, **caractérisé en ce que** ledit premier compartiment (4) est délimité d'une part par deux panneaux de fils métalliques intérieurs (2a) et d'autre part par deux panneaux de fils métalliques extérieurs (2b) qui sont connectés à des extrémités opposées des panneaux de fils métalliques intérieurs (2a) de manière à ce qu'au moins une partie d'extrémité desdits panneaux de fils métalliques extérieurs (2b) s'étende à partir du premier compartiment (4), en formant l'au moins une partie prolongée (7).

5. Gabion (3) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les panneaux de fils métalliques (2a, 2b) sont connectés de manière articulée les uns aux autres.

6. Gabion (3) selon la revendication 5, **caractérisé en**

ce que les panneaux de fils métalliques (2a, 2b) sont connectés de manière articulée les uns aux autres le long de lignes d'articulation de manière à pouvoir être dépliés en zigzag à partir d'une position fermée du gabion (3) dans une position ouverte du gabion (3) dans laquelle ils forment des premiers compartiments successifs (4). 5

7. Gabion (3) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les panneaux de fils métalliques (2a, 2b) sont connectés les uns aux autres afin de former des premiers compartiments successifs (4) qui sont placés les uns par rapport aux autres en formation en zigzag. 10

8. Gabion (3) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les panneaux de fils métalliques (2a, 2b) sont connectés de manière détachable les uns aux autres. 15

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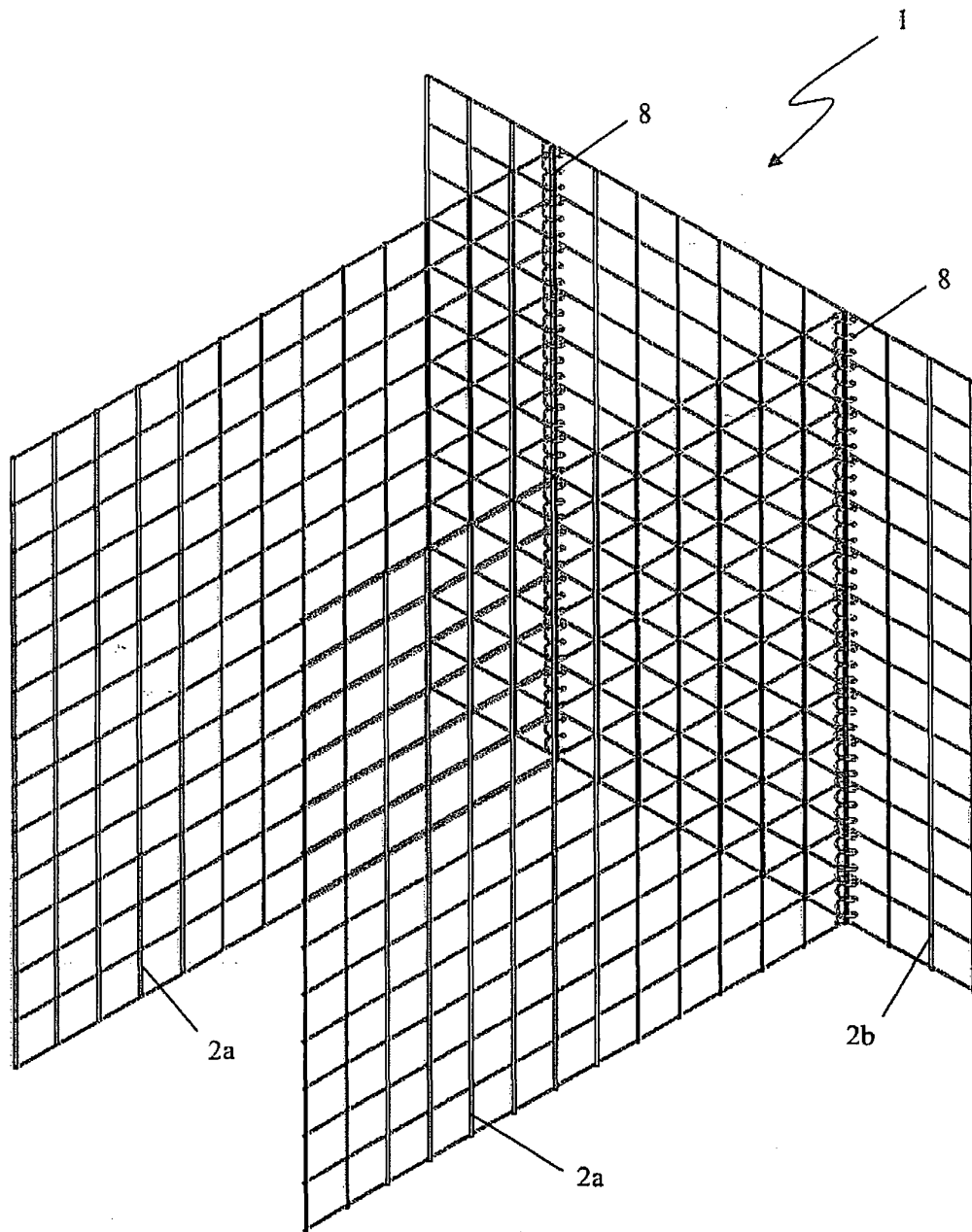


FIG. 1

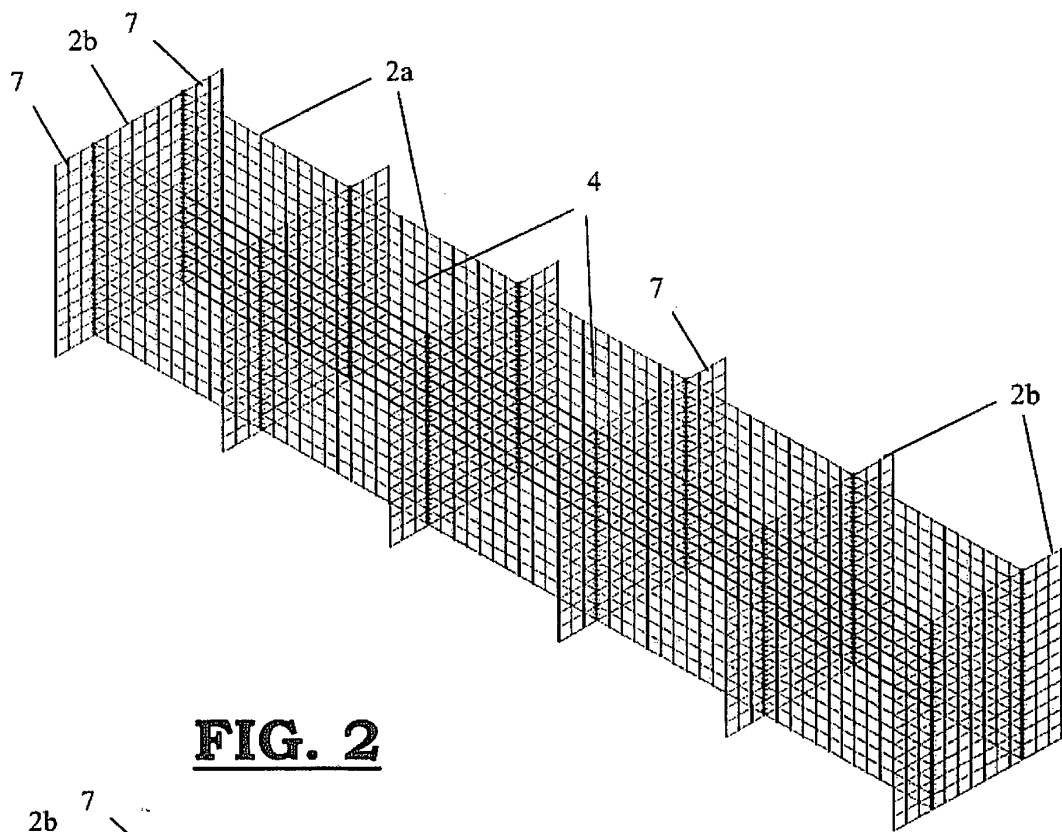


FIG. 2

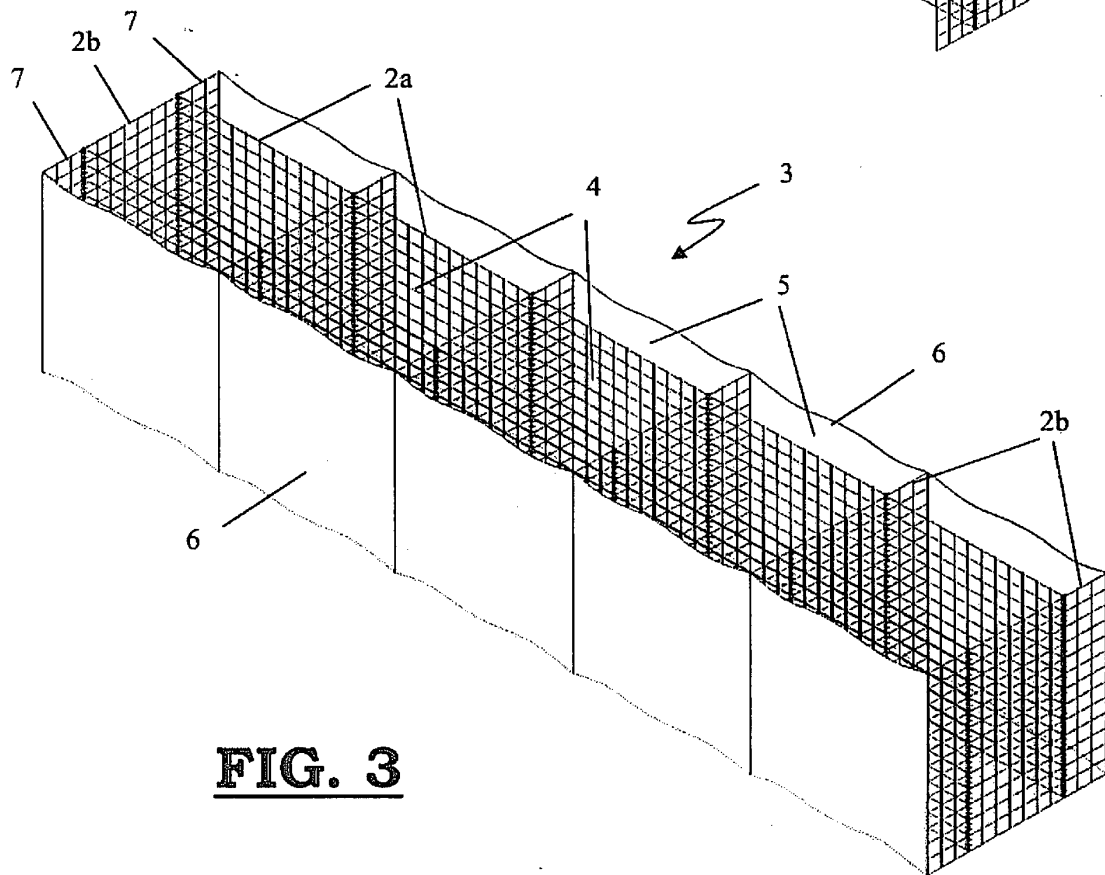


FIG. 3

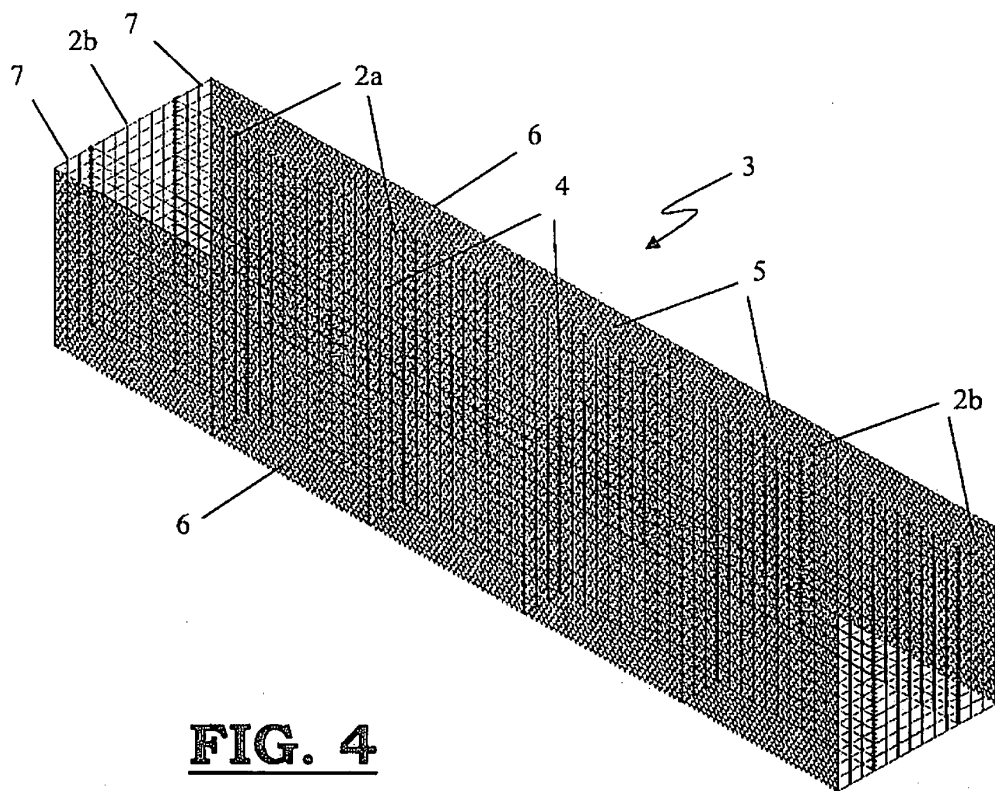


FIG. 4

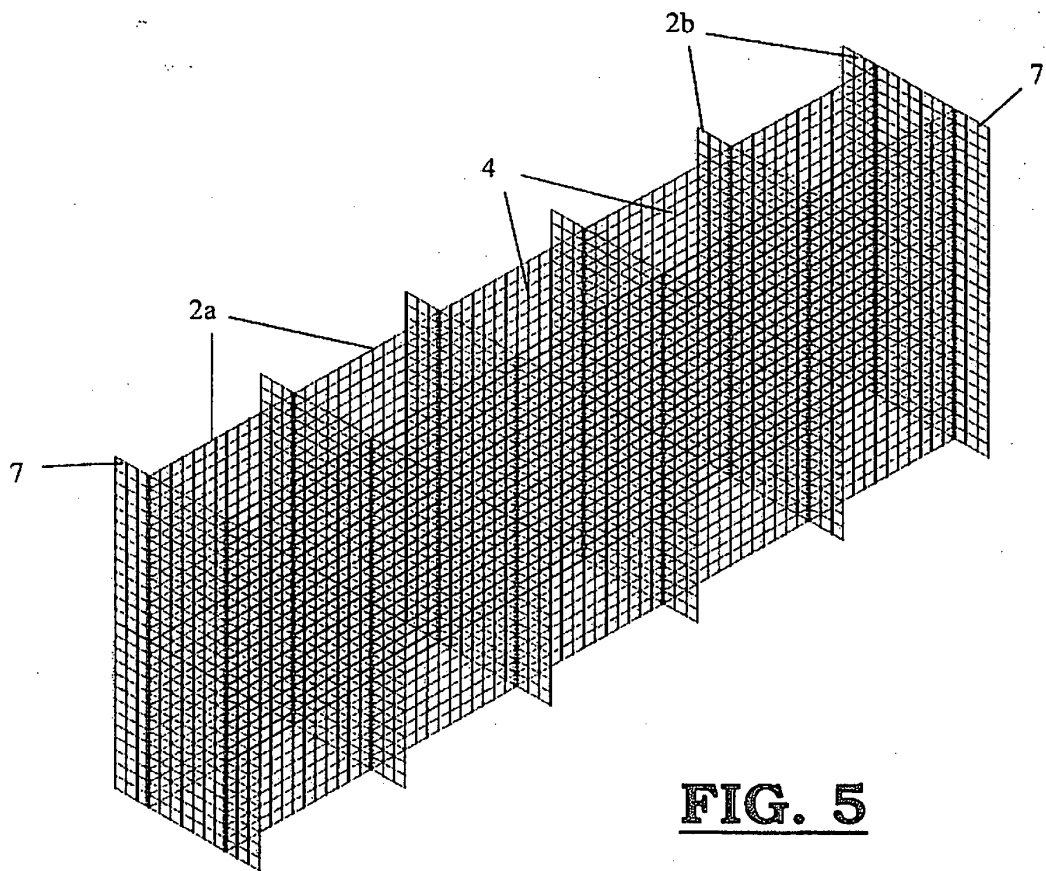
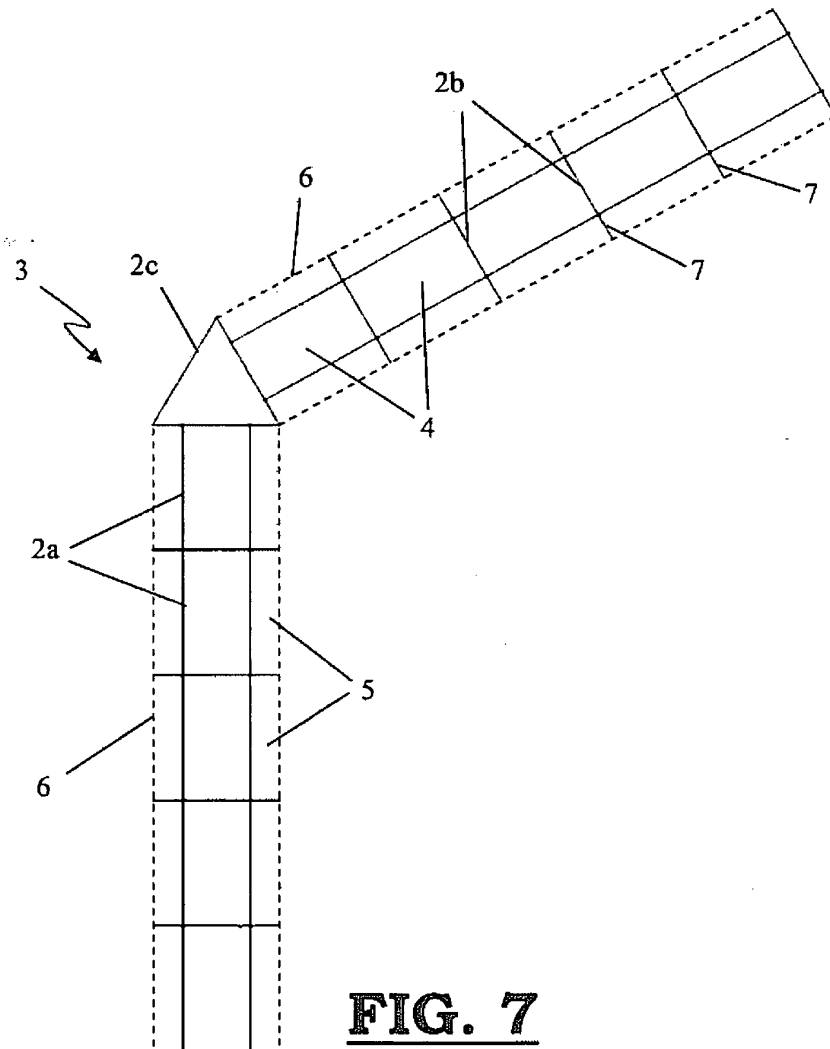
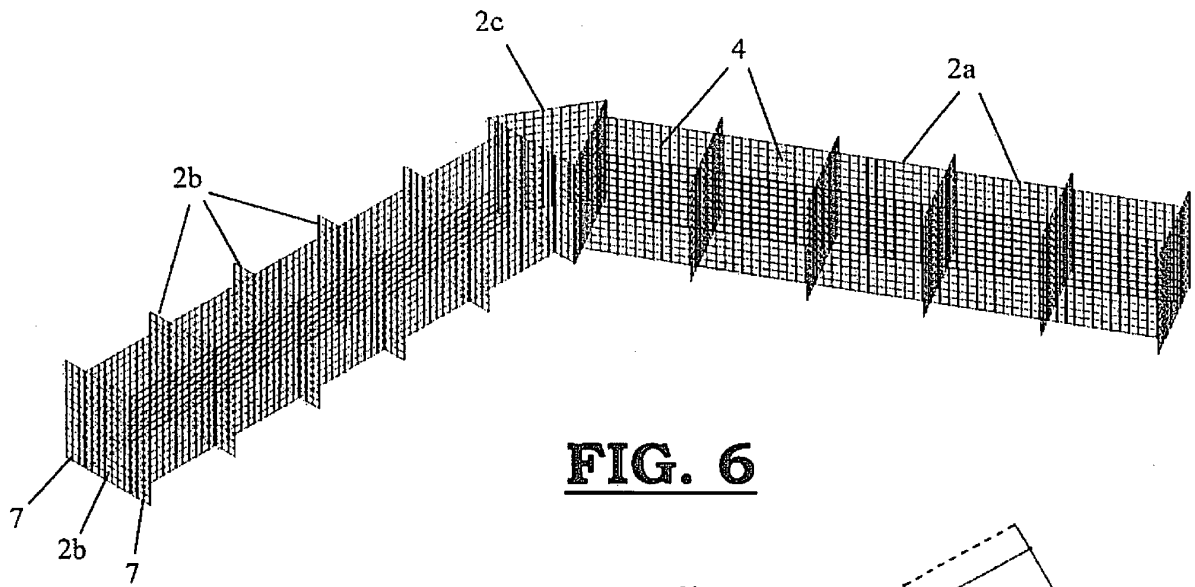
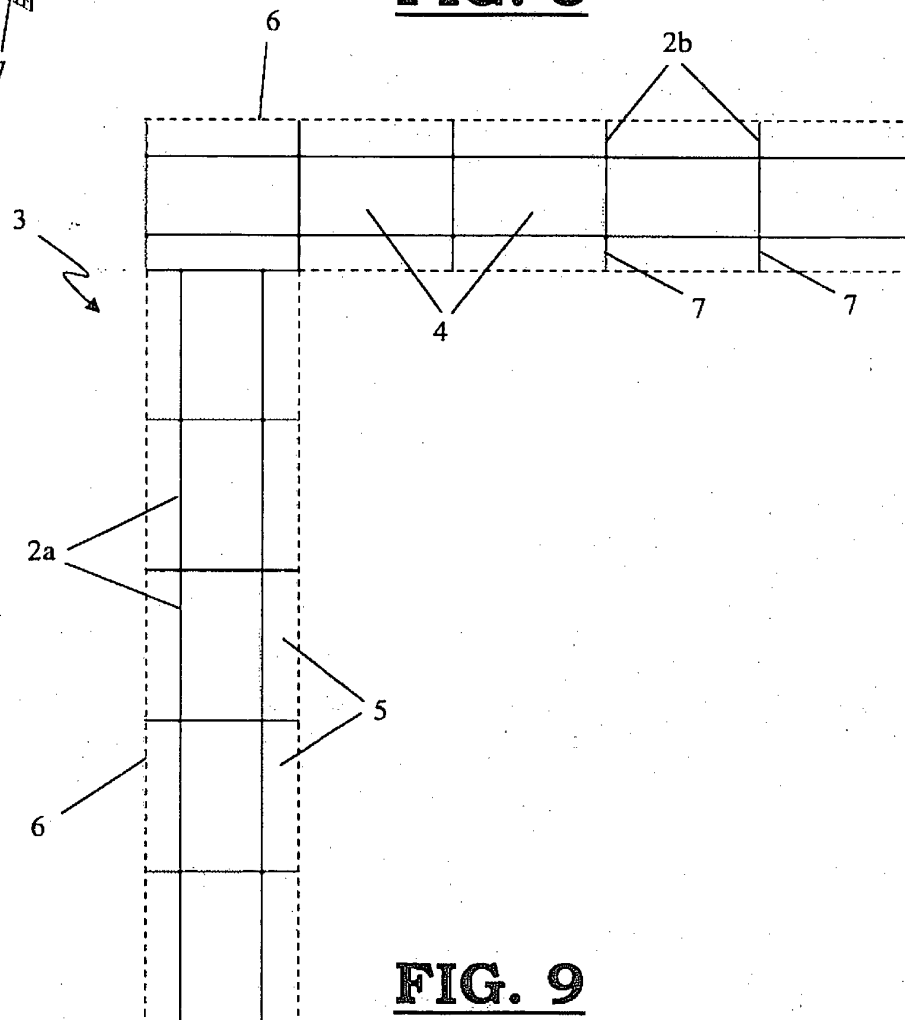
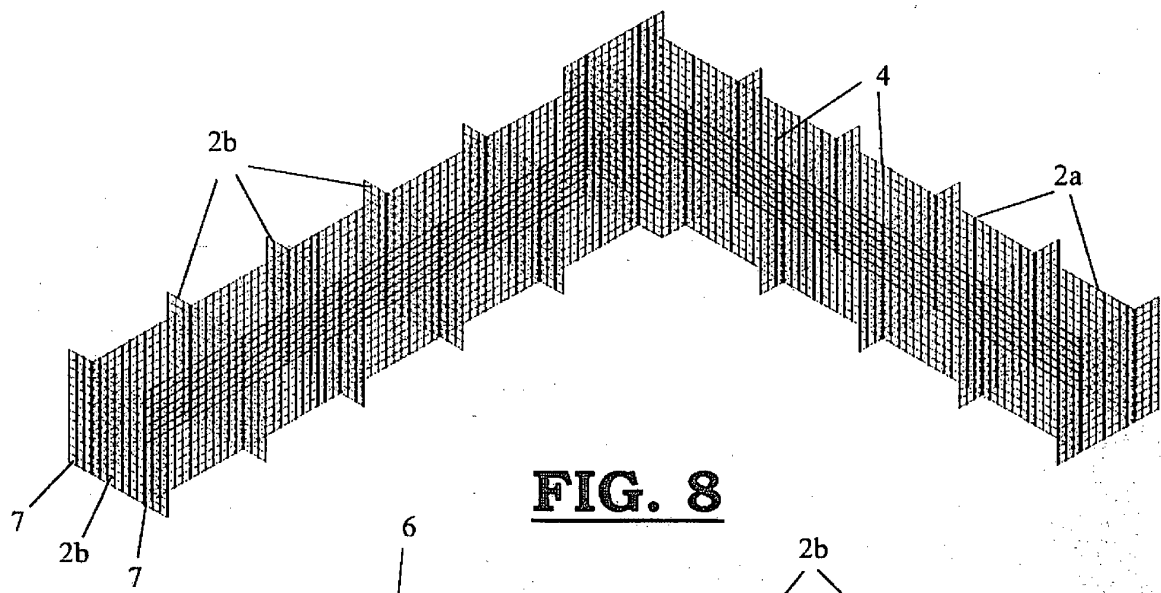


FIG. 5





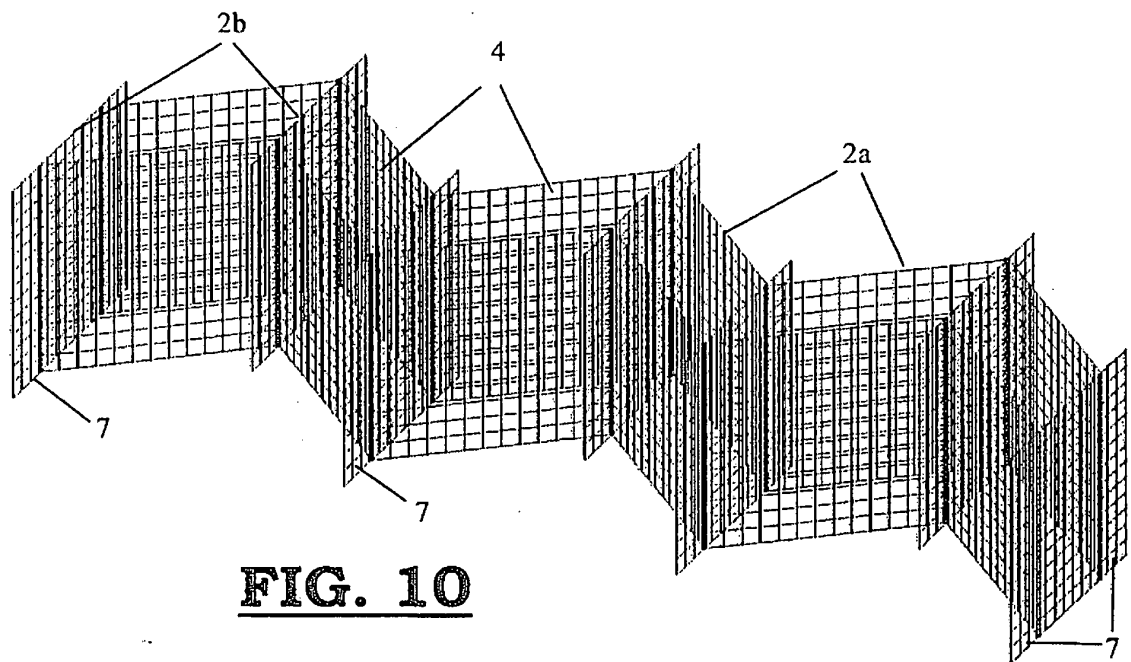


FIG. 10

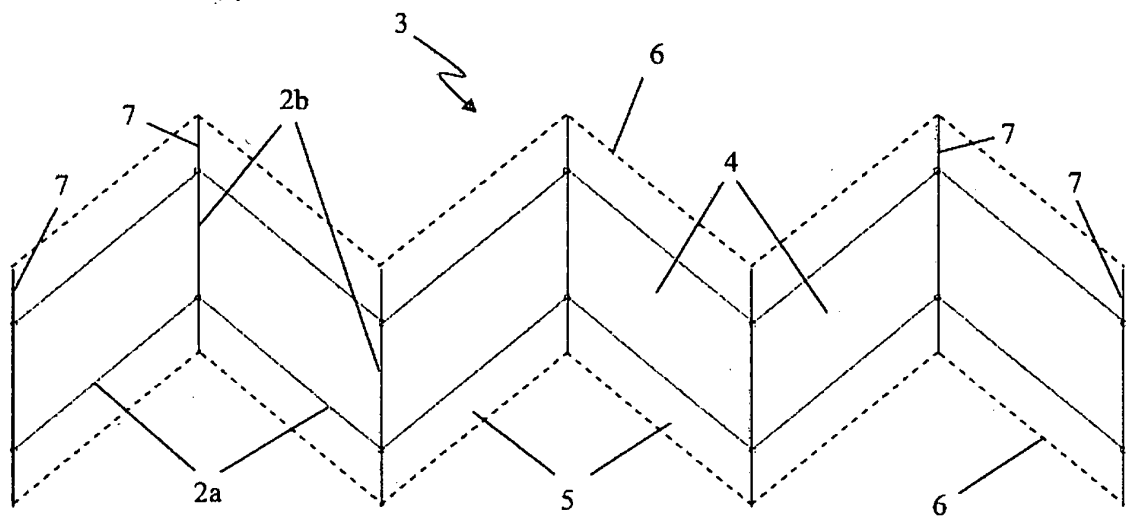


FIG. 11

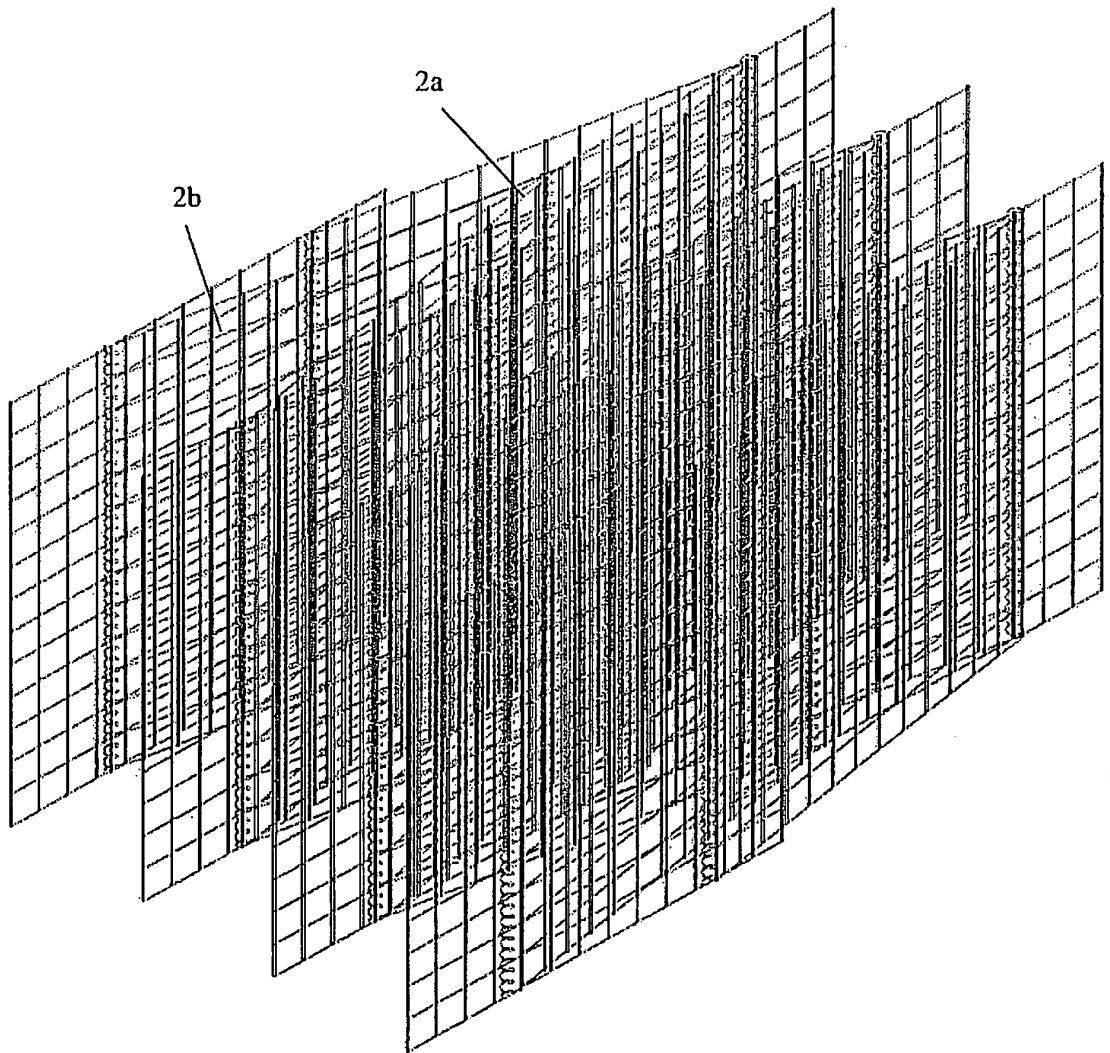


FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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