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(73) Proprietor: **Metallurgica Ledrense - Societa
Cooperativa**

38067 Ledro (TN) (IT)

(72) Inventor: **TIBONI, Fabio**

38067 Ledro (IT)

(74) Representative: **Ciceri, Fabio et al**

Perani & Partners

Piazza San Babila, 5

20122 Milano (IT)

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Description*Field of the invention*

[0001] The present invention relates to a cage for containing and carrying inert material, particularly composed of wire mesh walls, as generally known from EP 2 581 499 and as defined in the preamble of claim 1.

Discussion of the related art

[0002] In the field of building and civil works, particular baskets or cages, mainly made of metal, and adapted to be filled with substantially inert materials, such as bricks, rocks, stones and/or pebbles, are known to be used to form retaining bases/walls, embankments or means for retaining unstable banks.

[0003] These cages are installed after having been filled, on site, with inert materials, to create a flexible, permeable and monolithic structure.

[0004] Typically, these cages are composed of several substantially flat surfaces, each consisting of a wire mesh, which are connected together to form a container that will define an inner volume designed to be filled with the material, in use, and an upper opening for loading.

[0005] The cage often has the shape of a parallelepiped, with a base surface and four vertical surfaces or walls, connected to the base at their bottom and to the adjacent vertical walls at their sides, to define an inner volume and form the aforementioned upper opening.

[0006] The vertical walls are known in the art to be connected to the base in various manners.

[0007] Welding methods may be used to connect the surfaces at the adjacent sides otherwise wire elements may be suitably connected around the mesh of both surfaces at the sides.

[0008] Alternatively, various jointing methods have been suggested in which one or more of the horizontal/vertical rods of each wire mesh surface are bent to various shapes, for the bends to be anchored to the closest rods of the adjacent surface.

[0009] This is a simple method to ensure mechanical strength of the cage structure without requiring excessive complexity.

Prior art problem

[0010] Nevertheless, these methods of connecting the vertical walls to the case do not ensure adequate stability of the structure as a whole, as the inert material is being unloaded, loaded and carried.

[0011] For example, EP1505211 discloses a Z-shaped hook for connecting the vertical wall and the base, such that both the first two horizontal rods of the base are encircled.

[0012] Nevertheless, this arrangement does not ensure proper stability to the cages during unloading and assembly, and makes it difficult to stack them when form-

ing retaining walls.

SUMMARY OF THE INVENTION

[0013] The above described prior art clearly shows manufacturers of cages for containing inert material would strongly need for a structure that obviates the above mentioned problems.

Advantages of the invention

[0014] According to the present invention, this object is fulfilled by a cage for containing inert material as defined in the features of claim 1.

[0015] Within this object, it is important to determine particular shapes for the hooks located at the ends of the vertical rods of the vertical walls, which are useful for connecting the latter to the base of the cage.

[0016] As defined in claim 1 herein below, the present invention can provide a cage that is able to ensure stability of the structure during loading, unloading and transport, and also to simplify assembly of each individual cage and stacking of a plurality of cages for creating complex structures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The characteristics and advantages of the present disclosure will appear from the following detailed description of a possible practical embodiment, illustrated as a nonlimiting example in the set of drawings, in which:

- Figure 1 shows a perspective view of the cage for containing inert material according to the present invention;
- Figure 2 shows the detail of the hook for connecting the vertical walls to the base of the cage according to claim 1;
- Figure 3 shows a possible embodiment of a hook designed to allow transport of the cage of Figure 1;
- Figure 4 shows a sectional view of the hook of Figure 3.

DETAILED DESCRIPTION

[0018] Referring to the aforementioned figures, the cage of the present disclosure is generally designated by numeral 1.

[0019] The cage 1 is composed of several substantially flat surfaces, each consisting of a wire mesh, composed of horizontal and vertical rods in crisscrossed pattern.

[0020] Preferably, the horizontal and vertical rods of each surface are perpendicular to each other, to form a rectangular wire mesh.

[0021] As used herein, the term "rod" is intended to designate a reinforcing rod, bar or shaft having an elongate shape and a substantially constant, e.g. circular,

section, with a diameter ranging from 1 mm to 10 mm.

[0022] The rods are preferably made of galvanized metal, to be thus protected from galvanic corrosion.

[0023] The cage 1 has the shape of a parallelepiped, and comprises a substantially rectangular base 2 and four vertical surfaces or walls 3, each connected to the base 2 at its bottom end 3 and to the two adjacent vertical walls at its respective lateral ends 3b.

[0024] In the present embodiment, the base 2 comprises a plurality of horizontal rods 2o and a plurality of vertical rods 2v.

[0025] The vertical rods 2v are welded to the horizontal rods 2o and are placed both above and below the horizontal rods 2o to impart strength to the base 2.

[0026] Since the base 2 has a substantially rectangular shape, characterized by two long sides and two short sides, the vertical walls 3 may be also differentiated into long walls 3c and short walls 3d.

[0027] In light of the above, the cage 1 defines an inner volume that is designed to be occupied by the inert material when it is loaded, and an upper opening for loading it.

[0028] Referring to the present exemplary embodiment, the connection between each vertical wall 3 and the base 2 at the bottom end 3a is ensured by the provision of one hook 5 for each vertical rod 4 of the vertical wall 3, which may take different forms according to the relevant vertical wall.

[0029] At the short walls 3d, connection is provided by a U-shaped hook 5a, known in the art, for joining each vertical rod 4 to the first vertical rod 2a of the base 2.

[0030] Such U-shaped hook system 5a is also used to join the vertical walls 3 together; according to the present embodiment, the U-shaped hook 5a is provided at the ends of the horizontal rods of the long vertical walls 3c, for connecting each horizontal rod to the first vertical rod of each adjacent short vertical wall 3c.

[0031] Advantageously, according to one embodiment of the present invention, a J-like conformation is used for the hook 5b for connecting each vertical rod 4 of the long vertical walls 3c.

[0032] The J-shaped hook 5b comprises a first vertical portion 5c, substantially perpendicular to the base surface, and continues with a first loop 5d which encircles the first horizontal rod 2b of the base 2.

[0033] The first horizontal rod 2b is the outermost rod of all the horizontal rods in the base 2 and is followed by a second horizontal rod 2c and a third horizontal rod 2d, in this order.

[0034] The first loop 5d engages the first horizontal rod 2b and defines a curve at a substantially 90° angle.

[0035] Downstream from the first loop 5d, the hook 5d has a first straight portion 5e, substantially parallel to the support surface.

[0036] It shall be noted that the term support surface is intended to designate, for example, the area of the ground upon which the cage is designed to be placed, or the top surface of a cage upon which an additional

cage is stacked to form a barrier and/or a retaining wall.

[0037] The portion 5e extends below the base 2, reaching past the second horizontal rod 2c.

[0038] This first straight portion 5e is useful to impart proper stability to the cage 1 during unloading and assembly, i.e. when no load of inert material is present. Also, it facilitates stacking of a plurality of cages for creating complex structures.

[0039] Downstream from the first straight portion 5e, a second straight portion 5f is provided, which extends in a direction incident on the support surface, to extend above the third horizontal rod 2d.

[0040] The second straight portion 5f, according to the embodiment of Figure 2, has an imaginary projection on the plane normal to the support surface and to the long vertical wall 3c which, with reference to the trigonometric circumference, has an angular coefficient that lies in the second quadrant.

[0041] Preferably, the second straight portion 5f is inclined to the support surface at an angle α ranging from 10° e 70°.

[0042] A second loop 5g and a third straight portion 5h are provided for anchoring the long vertical wall 3c to the base 2. The loop 5g encircles the aforementioned third horizontal rod 2d.

[0043] The second loop 5g engages the third horizontal rod 2d and defines a curve at a substantially 180° angle.

[0044] The third straight portion 5h extends in a direction incident on the support surface.

[0045] The third straight portion 5h, according to the embodiment of Figure 2, has an imaginary projection on the plane normal to the support surface and to the long vertical wall 3c which, with reference to the trigonometric circumference, has an angular coefficient that lies in the second quadrant.

[0046] The third straight portion 5h is inclined to the support surface by an angle β which, according to a preferred embodiment, is equal to the aforementioned angle α , such that the second straight portion 5f and the third straight portion 5h are preferably parallel.

[0047] In light of the above, the angle β may generally assume values that can be also other (greater or smaller) than those mentioned above for the angle α .

[0048] The second loop 5g and the third straight portion 5h are designed to ensure safety of the hook 5b and impart optimized structural stability to the cage 1 during loading and transport.

[0049] Concerning transport, also referring to Figures 3 and 4, and according to a preferred embodiment, the cage 1 comprises at least two comb-like hooks 7 comprising a substantially flat quadrangular body 7a extending in a longitudinal direction, and having a top edge 7b and a bottom edge 7c.

[0050] At the bottom edge, the comb-like hook 7 comprises a plurality of comb teeth 7d, substantially extending the body 7a and bent at least partially into a U shape.

[0051] Each comb-like hook 7 also comprises a plurality of holes 7e formed in the body 7a and longitudinally

arranged along such body 7a.

[0052] Each of the two long vertical walls 3c of the cage 1 comprises, as described above, a plurality of horizontal rods 6, including a top horizontal rod 6a characterized by being the farthest rod from the base 2.

[0053] In light of the above, each comb-like hook 7 partially engages the top horizontal rod 6a by the aforementioned U-shaped comb teeth 7d, while the comb-like hook 7 is left free of rotating about the top horizontal bar 6a.

[0054] During transport, the cage 1 is lifted by hoist means, not shown, which engage the cage 1 at the holes 7e of the two comb-like hooks 7, the latter assuming thus a position transverse to the support surface.

[0055] Once the cage 1 has been positioned, it is released from the hoist means and the comb-like hooks 7 are rotated to such a position that the body 7a, substantially parallel to the support surface, will rest on the inert material itself or on a closing surface 8, if any.

[0056] Therefore, these comb-like hooks afford simple and practical transport, and can assume a position that ensures the lack of bulk transverse to the support surface once transport has been completed, thereby allowing a plurality of cages to be stacked one above the other to form complex structures such as barriers and/or retaining walls.

Claims

1. A cage (1) for containing inert material, which comprises a plurality of wire mesh surfaces composed of horizontal and vertical rods in crisscrossed pattern, said plurality of surfaces including a base (2) and vertical walls (3), each of said vertical walls (3) being connected at its bottom end (3a) to said base (2) and to the adjacent vertical walls at its respective lateral ends (3b), to thereby define a space within said cage (1) for containing the inert material, wherein each vertical rod (4) of at least one vertical wall (3) has a hook (5b) at said bottom end (3a), which hook comprises:

- a vertical portion (5c) substantially perpendicular to the support surface;
- a first loop (5d), which extends said vertical portion (5c), to wrap around a first horizontal rod (2b) of said base (2), which is the outermost rod of a plurality of horizontal rods (2o) of said base (2), proximate to an edge of said base (2);
- a first straight portion (5e), which extends said first loop (5d), parallel to a support surface and below said base (2) reaching past a second horizontal rod (2c) adjacent to said first horizontal rod (2b), and **characterized by**
- a second straight portion (5f), which extends said first straight portion (5e) in a direction incident on the support surface, to extend above a third horizontal rod (2d), adjacent to said second

horizontal rod (2c);

- a second loop (5g), which extends said second straight portion (5f) to wrap around said third horizontal rod (2d).

2. A cage (1) as claimed in claim 1, wherein said hook (5b) comprises a third straight portion (5h), which extends said second loop (5g) in a direction incident on the support surface, said third straight portion (5h) being substantially parallel to said second straight portion (5f).
3. A cage (1) as claimed in any of the preceding claims, wherein said second straight portion (5f) is inclined to the support surface at an angle α , said angle α ranging from 10° to 70°.
4. A cage (1) as claimed in claim 2, wherein said third straight section (5h) is inclined to the support surface at an angle β .
5. A cage (1) as claimed in claim 1, wherein each vertical rod (4) of at least one vertical wall (3) has an at least partially U-shaped hook (5a) at said bottom end (3a), for connecting said vertical rod (4) to a first vertical rod (2a) of said base (2), said first vertical rod (2a) being the outermost rod of the vertical rods (2v) of said base (2).
6. A cage (1) as claimed in any of the preceding claims, wherein said vertical walls (3) comprise horizontal rods (6), said horizontal rods (6) comprising a top horizontal rod (6a), said top horizontal rod (6a) being the farthest rod from said base (2) of all said horizontal rods (6).
7. A cage (1) as claimed in any of the preceding claims, **characterized in that** it comprises at least one comb-like hook (7).
8. A cage (1) as claimed in claim 7, wherein said at least one comb-like hook (7) comprises:
 - a substantially flat quadrangular body extending in a longitudinal direction, said body (7a) having a top edge (7b) and a bottom edge (7c);
 - a plurality of comb teeth (7d) extending said body (7a) at said bottom edge (7c) of said body (7a), said comb teeth (7d) having an at least partially U-shaped configuration;
 - a plurality of holes (7e) formed in said body (7a) and longitudinally arranged along said body (7a).
9. A cage (1) as claimed in claim 8, wherein said plurality of comb teeth (7d) at least partially engage said top horizontal rod (6a).

Patentansprüche

1. Käfig (1) zum Aufnehmen von inertem Material, der eine Vielzahl von Maschendrahtoberflächen umfasst, die aus horizontalen und vertikalen Stangen in einem kreuzweise angeordneten Muster bestehen, wobei die Vielzahl von Oberflächen eine Basis (2) und vertikale Wände (3) umfasst, und jede der vertikalen Wände (3) an ihrem unteren Ende (3a) mit der Basis (2) und mit den benachbarten vertikalen Wänden an ihren jeweiligen seitlichen Enden (3b) verbunden ist, um dadurch einen Raum innerhalb des Käfigs (1) zur Aufnahme des inertes Materials zu bilden, wobei jede vertikale Stange (4) von mindestens einer vertikalen Wand (3) einen Haken (5b) an dem unteren Ende (3a) aufweist, der Haken umfassend:

- einen vertikalen Abschnitt (5c), der im Wesentlichen senkrecht zu einer Stützfläche liegt;
- eine erste Schleife (5d), die den vertikalen Abschnitt (5c) verlängert, um eine erste horizontale Stange (2b) der Basis (2) einzuwickeln, wobei die erste Stange die äußerste Stange einer Mehrzahl von horizontalen Stangen (2o) der Basis (2) ist und neben einer Kante der Basis (2) liegt;
- einen ersten geraden Abschnitt (5e), der die erste Schleife (5d) parallel zu einer Stützfläche und unter der Basis (2) verlängert, wobei er an einer zweiten horizontalen Stange (2c) neben der ersten horizontalen Stange (2b) vorbeigeht,

und wobei der Haken durch:

- einen zweiten geraden Abschnitt (5f), der den ersten geraden Abschnitt (5e) in eine auf die Stützfläche auftreffenden Richtung verlängert, um sich oberhalb einer dritten horizontalen Stange (2d) neben der zweiten horizontalen Stange (2c) zu erstrecken;
- eine zweite Schleife (5g), die den zweiten geraden Abschnitt (5f) verlängert, um die dritte horizontale Stange (2d) einzuwickeln;

charakterisiert ist.

2. Käfig (1) nach Anspruch 1, wobei der Haken (5b) einen dritten geraden Abschnitt (5h) aufweist, der die zweite Schleife (5g) in eine auf die Stützfläche auftreffenden Richtung verlängert, wobei der dritte gerade Abschnitt (5b) 5h) im Wesentlichen parallel zu dem zweiten geraden Abschnitt (5f) liegt.
3. Käfig (1) nach einem der vorhergehenden Ansprüche, wobei der zweite gerade Abschnitt (5f) zur Stützfläche um einen Winkel α geneigt ist, wobei der Winkel α im Bereich von 10° bis 70° liegt.

4. Käfig (1) nach Anspruch 2, wobei der dritte gerade Abschnitt (5h) um einen Winkel β zur Stützfläche geneigt ist.

5. Käfig (1) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** jede vertikale Stange (4) mindestens einer vertikalen Wand (3) am unteren Ende (3a) einen zumindest teilweise U-förmigen Haken (5a) aufweist, um die vertikale Stange (4) mit einer ersten vertikalen Stange (2a) der Basis (2) zu verbinden, wobei die erste vertikale Stange (2a) die äußerste Stange der vertikalen Stangen (2v) der Basis (2) ist.

6. Käfig (1) nach einem der vorhergehenden Ansprüche, wobei die vertikalen Wände (3) horizontale Stangen (6) umfassen, wobei die horizontalen Stangen (6) eine obere horizontale Stange (6a) umfassen, wobei die obere horizontale Stange (6a) die am weitesten von der Basis (2) entfernte Stange aller horizontalen Stangen (6) ist.

7. Käfig (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** er mindestens einen kammartigen Haken (7) umfasst.

8. Käfig (1) nach Anspruch 7, wobei der mindestens eine kammartige Haken (7) folgendes umfasst:

- einen im Wesentlichen flachen viereckigen Körper, der sich in einer Längsrichtung erstreckt, wobei der Körper (7a) eine obere Kante (7b) und eine untere Kante (7c) aufweist;
- eine Mehrzahl von Kammzähnen (7d), die den Körper (7a) an der Unterkante (7c) des Körpers (7a) verlängern, wobei die Kammzähne (7d) eine zumindest teilweise U-förmige Konfiguration aufweisen;
- eine Vielzahl von Löchern (7e), die im Körper (7a) ausgebildet und in Längsrichtung entlang des Körpers (7a) angeordnet sind.

9. Käfig (1) nach Anspruch 8, wobei die Vielzahl von Kammzähnen (7d) zumindest teilweise mit der oberen horizontalen Stange (6a) in Eingriff steht.

Revendications

1. Cage (1) pour contenir du matériel inerte, qui comprend une pluralité de surfaces de treillis métallique composées de tiges horizontales et verticales en motif entrecroisé, ladite pluralité de surfaces comprenant une base (2) et des parois verticales (3), chacune desdites parois verticales (3) étant reliée à son extrémité inférieure (3a) à ladite base (2) et aux parois verticales adjacentes à ses extrémités latérales respectives (3b) pour définir ainsi un espace à

l'intérieur de ladite cage (1) pour contenir le matériel inerte, où chaque tige verticale (4) d'au moins une paroi verticale (3) comporte un crochet (5b) à ladite extrémité inférieure (3a), lequel crochet comprend :

- une partie verticale (5c) sensiblement perpendiculaire à la surface de support ;
- une première boucle (5d) qui prolonge ladite partie verticale (5c) pour envelopper une première tige horizontale (2b) de ladite base (2), qui est la tige la plus extérieure d'une pluralité de tiges horizontales (2o) de ladite base (2), près d'un bord de ladite base (2) ;
- une première partie droite (5e), qui prolonge ladite première boucle (5d), parallèlement à une surface de support et en dessous de ladite base (2) en dépassant une seconde tige horizontale (2c) adjacente à ladite première tige horizontale (2b), lequel crochet étant en outre **caractérisé par** :

- une seconde partie droite (5f), qui prolonge ladite première partie droite (5e) dans une direction incidente sur la surface de support, pour s'étendre au-dessus d'une troisième tige horizontale (2d), adjacente à ladite seconde tige horizontale (2c) ;
- une seconde boucle (5g), qui prolonge ladite seconde partie droite (5f) pour envelopper ladite troisième tige horizontale (2d).

2. Cage (1) selon la revendication 1, dans laquelle ledit crochet (5b) comprend une troisième partie droite (5h), qui prolonge ladite seconde boucle (5g) dans une direction incidente sur la surface de support, ladite troisième partie droite (5h) étant sensiblement parallèle à ladite seconde partie droite (5f).
3. Cage (1) selon l'une quelconque des revendications précédentes, dans laquelle ladite deuxième partie droite (5f) est inclinée par rapport à la surface de support selon un angle α , ledit angle allant de 10° à 70°.
4. Cage (1) selon la revendication 2, dans laquelle ladite troisième section droite (5h) est inclinée par rapport à la surface de support selon un angle β .
5. Cage (1) selon la revendication 1, dans laquelle chaque tige verticale (4) d'au moins une paroi verticale (3) présente un crochet (5a) au moins partiellement en forme de U à ladite extrémité inférieure (3a) pour relier ladite tige verticale (4) à une première tige verticale (2a) de ladite base (2), ladite première tige verticale (2a) étant la tige la plus extérieure des tiges verticales (2v) de ladite base (2).
6. Cage (1) selon l'une quelconque des revendications

précédentes, dans laquelle lesdites parois verticales (3) comprennent des tiges horizontales (6), lesdites tiges horizontales (6) comprenant une tige horizontale supérieure (6a), ladite tige horizontale supérieure (6a) étant la tige la plus éloignée de ladite base (2) parmi toutes lesdites tiges horizontales (6).

7. Cage (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'elle** comprend au moins un crochet en forme de peigne (7).

8. Cage (1) selon la revendication 7, dans laquelle ledit au moins un crochet en forme de peigne (7) comprend :

- un corps quadrangulaire sensiblement plat s'étendant dans une direction longitudinale, ledit corps (7a) ayant un bord supérieur (7b) et un bord inférieur (7c) ;
- une pluralité de dents de peigne (7d) prolongeant ledit corps (7a) au niveau dudit bord inférieur (7c) dudit corps (7a), lesdites dents de peigne (7d) ayant une configuration au moins partiellement en forme de U ;
- une pluralité de trous (7e) formés dans ledit corps (7a) et disposés longitudinalement le long dudit corps (7a).

9. Cage (1) selon la revendication 8, dans laquelle ladite pluralité de dents de peigne (7d) viennent en prise au moins partiellement avec ladite tige horizontale supérieure (6a).

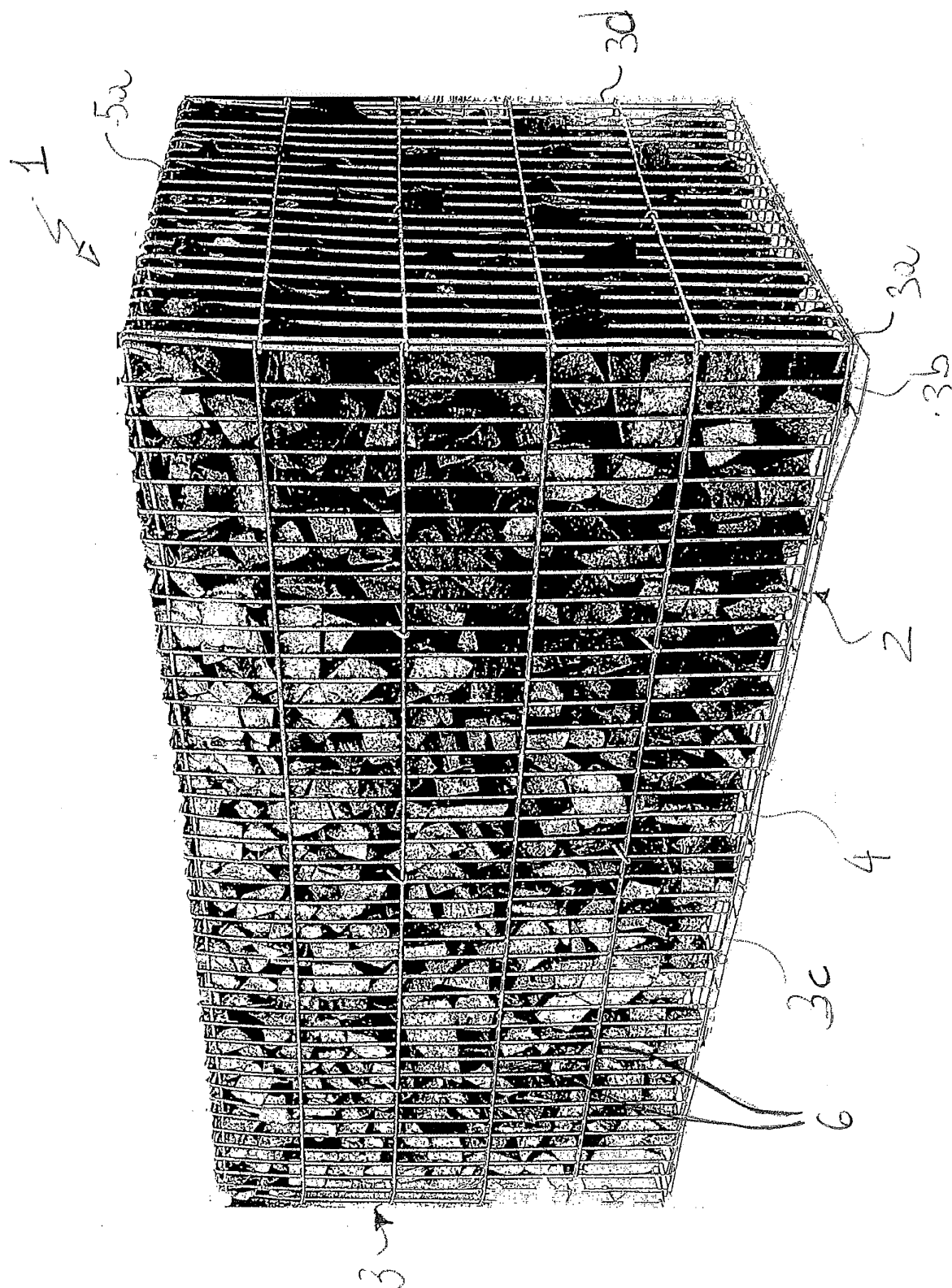


Fig. 1

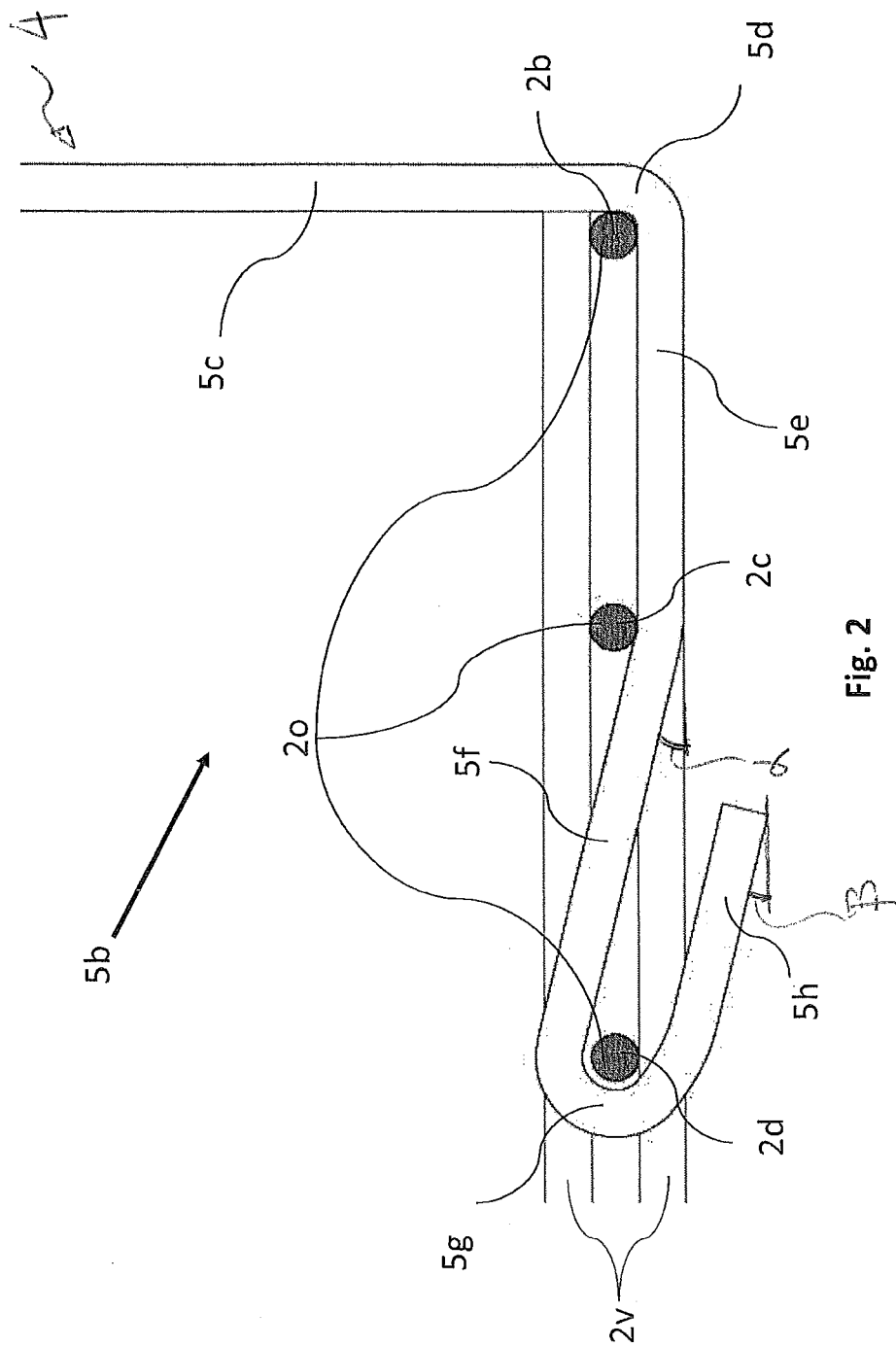


Fig. 2

Fig. 4

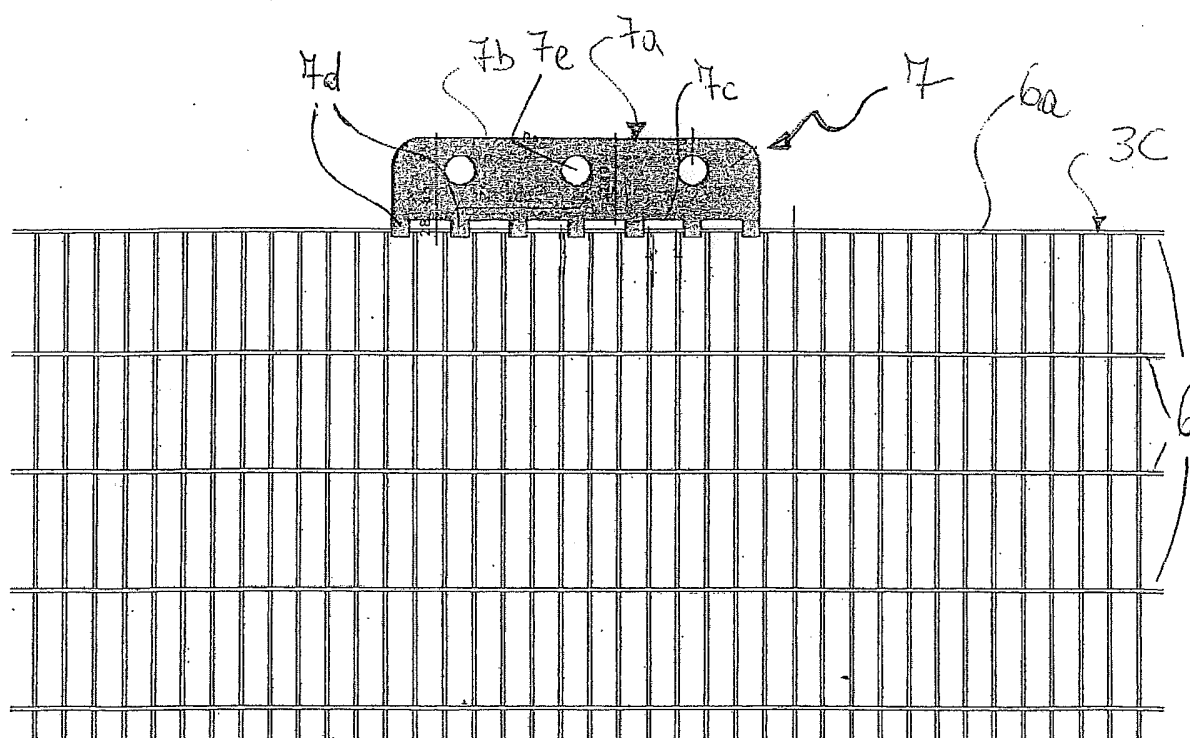
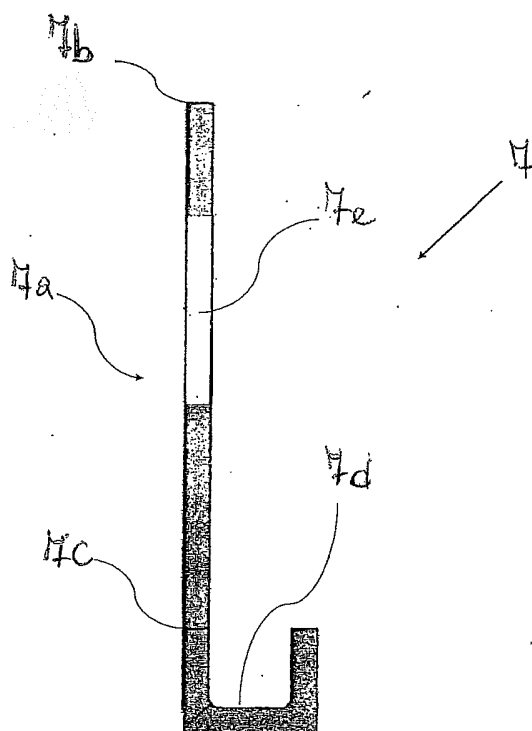


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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