

(19)



(11)

EP 2 378 032 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
22.02.2017 Bulletin 2017/08

(51) Int Cl.:
E04G 5/14 (2006.01) E04G 21/24 (2006.01)
E04G 21/32 (2006.01)

(21) Application number: **10160110.2**

(22) Date of filing: **16.04.2010**

(54) **Soft net containment**

Weichnetzschtzvorrichtung

Confinement à filet souple

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR**

(43) Date of publication of application:
19.10.2011 Bulletin 2011/42

(73) Proprietor: **Combisafe International Aktiebolag
831 34 Östersund (SE)**

(72) Inventor: **Svedberg, Joakim
832 53, Frösön (SE)**

(74) Representative: **Awapatent AB
P.O. Box 665
831 27 Östersund (SE)**

(56) References cited:
**WO-A1-98/36141 WO-A1-2007/102015
FR-A1- 2 442 320 GB-A- 2 226 591
US-A- 3 822 850 US-A- 3 920 220**

EP 2 378 032 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

FIELD OF THE INVENTION

[0001] The present invention relates to safety barriers and more specifically to a construction containment system for preventing items or persons from falling from a building being constructed and method for mounting such a construction containment system.

BACKGROUND OF THE INVENTION

[0002] US-6904720 discloses a prior art construction containment system. That prior art system comprises a plurality of brackets and frame members which are attached to a building under construction. The frame members are adapted to slidably retain an edge portion of a sheet-like enclosure panel within a channel-formed portion of the frame member. The frame members can be mounted to run either horizontally or vertically along an outer face of the building. That prior art does, however, have a number of disadvantages. For example, due to the fact that the frame members have to be mounted to the outside of the building, the mounting is hazardous and requires skilled personnel and additional safety equipment. Further, since the frame members run the full height or full width, depending on the orientation of the frame members, of the opening of the building, the enclosure panels have to be inserted into the channel from one end of the frame member. This can be very troublesome. If, for example, the accessible end of the frame member is located outside an outer wall of the building the entire enclosure panel has to be hoisted alongside the building and subsequently be inserted into the channel-formed portion of the frame member.

[0003] US-3822850 discloses a construction containment system according to the preamble of claim 1 comprising jack posts which are mountable from the inside of a building at a wall opening thereof. The jack posts are mounted between the floor and the ceiling. Fence panels are put on the floor adjacent to the posts and kept in place by means of L-shaped brackets mounted at the posts and turned downwards to clamp an upper horizontal frame member of each panel. The panels are mounted end to end. Since the jack posts extend vertically across the wall opening they could be used for a containment, but there is no such teaching in the document. Additionally, it is unclear how the rigid panels could be used for covering openings of different heights.

[0004] WO9836141 discloses a safety guardrail apparatus including extendible posts and brackets arrangeable at different heights on the posts to receive a guardrail in the brackets. It also discloses the use of a telescopic handrail as a guardrail, where the handrail has a slot extending along its length to receive the top horizontal element of a mesh panel. The slot has an opening of smaller width than the element, and an inner space of a larger width than the element. The handrail is mounted

at the posts by means of bolts which are received in a second slot of the handrail, and which in turn are mounted at the posts. However, there is no teaching about how to provide a containment solution.

5 **[0005]** GB2226591 discloses a containment system comprising a flexible sheet which is mounted at the ceiling by means of an elongate coupling element attached to the ceiling. The coupling element has a slot, generally C-shaped in cross-section, for receiving an upper bead of the sheet extending along its upper edge. The sheet is tensioned downwards by means of springs, which are arranged at a bottom edge of the sheet and anchored to the floor. This solution has an advantage of the flexible sheet, but has too low strength to fulfil the requirements of a safety containment solution.

SUMMARY OF THE INVENTION

20 **[0006]** It is an object of the present invention to provide an improved construction containment system that avoids the above-mentioned drawbacks. This object is achieved by a construction containment system according to claim 1.

25 **[0007]** This object is also achieved by a method for mounting a construction containment according to claim 13.

30 **[0008]** Thus, in accordance with an aspect of the present invention there is provided a construction containment system comprising a flexible net, a rigid elongated member adapted to be arranged at an edge of the flexible net and a post comprising upper engagement means at an upper end thereof for bringing the post into engagement with an overhead element and lower engagement means at a lower end of the post for bringing the post into engagement with an underlying element. The construction containment system comprises coupling means provided at the post for coupling of the rigid elongated member to the post. Due to the fact that the complete construction containment system can be erected from within the building, the mounting operation is less hazardous for the personnel and the amount of safety equipment can be reduced. The coupling means comprises two separate couplers provided adjacent each other in a direction substantially perpendicular to the surface of the flexible net in a mounted state.

45 **[0009]** The coupling means comprises at least one of said c-shaped member having an opening directed towards the lower end of the post and wherein an internal diameter of the c-shaped member is larger than the diameter of the rigid elongated member and wherein a width of the opening of the c-shaped member is smaller than a diameter of the rigid elongated member. This renders it possible to retain the rigid elongated member safely within the c-shaped member while at the same time allowing the flexible net to pass unhindered through the mouth of the c-shaped member. By arranging two separate couplers in this manner, it is possible to obtain an overlap of adjacent flexible nets. This is necessary in

order to avoid that gaps develop between the flexible nets.

[0010] In accordance with an embodiment of the construction containment system of the invention, the post is telescopically adjustable in length. This results in a system with a high degree of flexibility.

[0011] In accordance with an embodiment of the construction containment system of the invention, the post comprises a threaded jacking portion. By using a threaded jacking portion for clamping the post to the building, very high forces can be achieved leading to a secure engagement of the construction containment system to the building.

[0012] In accordance with an embodiment of the construction containment system of the invention, a load indicator is provided for indicating an amount of axial load exerted on the post, wherein said load indicator comprises a cup spring. By using a load indicator it can be assured that a sufficient axial force is provided upon the post for achieving a secure engagement of the construction containment system to the building.

[0013] In accordance with an embodiment of the construction containment system of the invention, the post comprises a clinometer. A clinometer is a very convenient way of assuring that the post is mounted vertical.

[0014] In accordance with an embodiment of the construction containment system of the invention, at least one of the engagement means comprises a tripod. The tripod ensures a reliable engagement with the overhead element.

[0015] In accordance with an embodiment of the construction containment system of the invention, end plugs are provided at opposite ends of the rigid elongated member, and wherein said end plugs are cone-shaped and wherein the diameter of the base of the cone is larger than a diameter of the rigid elongated member. The cone-shape of the end plugs allows for an easy insertion of the rigid elongated members into the coupling means whereas the larger diameter of the cone compared to the rigid elongated member secures the rigid elongated member to the coupling means.

[0016] In accordance with an embodiment of the construction containment system of the invention, the rigid elongated member comprises a profile having a coupling groove extending in the longitudinal direction of the profile and wherein said coupling groove comprises a bottom and a mouth and wherein a cross-section of the coupling groove enlarges from the mouth towards the bottom.

[0017] In accordance with an embodiment of the construction containment system of the invention, the coupling means comprises a retaining part having a cross section that is complimentary to the cross section of the coupling groove. This guarantees a secure coupling of the rigid elongated member to the coupling means.

[0018] In accordance with an embodiment of the construction containment system of the invention, the rigid elongated member comprises a profile having a net retaining groove extending in the longitudinal direction of

the profile and wherein said net retaining groove comprises a bottom and a mouth and wherein a cross-section of the net retaining groove enlarges from the mouth towards the bottom.

[0019] In accordance with an embodiment of the construction containment system of the invention, the flexible net comprises an edge element along an edge to which the rigid elongated member is to be arranged, wherein said edge element has a cross section which is complimentary to the cross section of said net retaining groove such that said edge element can be retained within said net retaining groove.

[0020] In accordance with an embodiment of the construction containment system of the invention, the coupling means are attached to the post by means of a clamping device. By using clamping means, the coupling means can be adjusted in height along the post which sometimes is necessary, for example when the exterior of the building to which the construction containment system is to be mounted does not permit the coupling means to be positioned at the top of the post.

[0021] In accordance with another aspect of the present invention there is provided a method for mounting a construction containment system, the method comprising the steps of arranging an elongated rigid member at an edge of a flexible net, erecting a first and a second post by clamping the posts between an overhead element and an underlying element, wherein the distance between said first and second post is less than the length of the rigid elongated members. Thereafter the rigid elongated member and the flexible net are hoisted towards the posts and the rigid elongated member is slid in a first direction into engagement with a first coupling means provided at the first post and then slid in a second, opposite, direction, into engagement with a second coupling means provided at the second post, while the rigid elongated member remain in engagement with the first coupling means. Due to the fact that the complete construction containment system can be erected from within the building, the mounting operation is less hazardous for the personnel and the amount of safety equipment can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The invention will now be described in more detail and with reference to the appended drawings in which:

Fig. 1 is a schematic front view of a first embodiment of a construction containment system according to the invention.

Fig 2 is a schematic side view of a first embodiment of a construction containment system according to the invention.

Fig 2a is a schematic side view of a detail of a first embodiment of a construction containment system according to the invention.

Fig. 3 is a schematic front view of a second embodiment of a construction containment system according to the invention.

Fig 4 is a schematic side view of a second embodiment of a construction containment system according to the invention.

Fig. 5 is a schematic front view of a third embodiment of a construction containment system according to the invention.

Fig 6 is a schematic side view of a third embodiment of a construction containment system according to the invention.

Fig. 7 is a schematic perspective view of a first embodiment of a coupling means according to the invention.

Fig. 8 is a schematic perspective view of a second embodiment of a coupling means according to the invention.

Fig. 9 is a schematic perspective view of a of a load indicator according to the invention.

Fig. 10 is a schematic and partly exploded side view of a load indicator according to the invention.

Fig. 11 is a schematic side view of a third embodiment of a coupling means according to the invention and a second embodiment of a rigid elongated member according to the invention.

Fig. 12 is schematic perspective view of a second embodiment of a coupling means according to the invention.

Fig. 13 is a schematic perspective view of a threaded jacking portion according to the invention.

Figs. 14 and 14a are schematic illustrations of a mounting tool for a flexible net according to the invention.

Fig. 15 is a schematic perspective view of an end plug according to the invention.

Figs. 16 and 17 are schematic perspective views of an end plug according to the invention mounted to a rigid elongated member.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] In a first embodiment of a construction containment system according to the invention, as shown in figures 1, 2 and 2a, a construction containment system 100 comprises a plurality of posts 103 and a number of flexible nets 101. Each flexible net 101 is provided with a rigid elongated member 102 comprising tubes of aluminium or similar at an upper end thereof. The rigid elongated member 102 provides the necessary rigidity to avoid that the flexible net 101 hang down between the posts 103 thereby causing gaps in the containment. The construction containment system 100 further comprises coupling means 106 provided at an upper region of the posts for coupling the rigid elongated members 102 and the flexible nets 101 to the posts 103. The posts 103 are clamped between upper and lower concrete slabs 10, 20 of a building by means of a threaded jacking portion 107 provided

at each of the posts 103. The threaded jacking portion 107 provides a wide span of possible jacking distance and it is possible to obtain very high jacking forces by using a suitable pitch of thread. High jacking forces are necessary in order for the posts to withstand the forces acting thereupon, e.g. wind load on the flexible nets 101 which have to be absorbed by the posts. Jacking forces about 700 kg is sometimes necessary and imply no problem for the threaded jacking portion 107 according to the invention. A load indicator 900 is provided at the post below the threaded jacking portion 107. It should be noted though, that the load indicator can be provided at other locations along the post as well, e.g. above the threaded jacking portion 107. The load indicator 900 can provide optical feedback to a user that the post 103 has been clamped to the construction with the required force, to avoid any uncertainty as to whether a post 103 has been clamped adequately or not. Each post 103 is further provided at its upper end with an upper engagement means 104 comprising a tripod 705 with sharpened tips to assure a reliable engagement with the concrete slab 10. The upper engagement means 104 can be connected to the post 103 by means of a spring loaded pin 110. At its lower end, each post 103 is provided with lower engagement means 105 comprising an anchoring element which is bolted to the concrete slab 20. Similar to the upper engagement means 104, the lower engagement means 105 can be connected to the post 103 by means of a spring loaded pin, not explicitly shown in the figures. Other engagement solutions are also possible for both upper and lower engagements means 104, 105, for example anchoring elements may be embedded in the concrete slabs 10, 20. A clinometer 109 is provided at the post at a position where a person taking part in the mounting of the post can observe it. The clinometer 109 would typically be of the air-bubble-type and could be permanently attached to the post 103 or be removable such that it can be used for mounting of other posts as well. Coupling means 106 for coupling of the rigid elongated member 102 to the posts 103 are provided at the upper engagement means 104. The coupling means 106 comprises two generally c-shaped members 701, 702 which are mounted parallel and adjacent each other in a direction substantially perpendicular to the surface of the flexible net 101. This allows for two adjacent flexible nets 101 to be mounted with an overlap, thereby minimizing the risk of any gaps occurring between the flexible nets 101. The inner diameter of the c-shaped members 701, 702 is somewhat larger than the diameter of the rigid elongated member 102 whereas the width of the downwardly directed opening of the c-shaped members 701, 702 is smaller than the diameter of the rigid elongated member 102 such that the rigid elongated member 102 can be safely retained within the c-shaped members 701, 702 while the downwardly directed opening of the c-shaped members 701, 702 allow for the flexible net 101 to pass through. The coupling means 106 can be welded, bolted, riveted or clamped to the engagement means 104 or the

post 103. Other methods of fastening evident to the person skilled in the art are also possible. Straps, not shown in the figures, can be used to tie the flexible net 101 to the posts 103 once the rigid elongated member 102 is positioned in the corresponding c-shaped members 701, 702 of two adjacent posts 103.

[0024] Commonly, the construction containment system according to the first embodiment of the invention is erected as follows: An elongated rigid member 102 is arranged at an edge of a flexible net 101, typically the elongated rigid member 102 will be arranged within a channel formed at an edge of the flexible net 101. Thereafter a first and a second post 103 are erected by clamping the posts 103 between an overhead element 10 and an underlying element 20. The distance between the posts 103 is less than the length of the rigid elongated member 102. The clamping of the posts is done by means of the threaded jacking portions 107 of each post 103. A worker will continue to thread until the load indicator 900 indicates that a sufficient axial load is applied to the post 103. When the two posts 103 are sufficiently clamped to the building the rigid elongated member 102 together with the flexible net 101 is hoisted towards the upper region of the posts 103 and slid in a first direction into engagement with a c-shaped member 701, 702 provided at the first post 103. Then, the rigid elongated member 102 and the flexible net 101 is slid in a second direction, opposite to said first direction, into engagement with a c-shaped member 701, 702 provided at the second post 103, while the rigid elongated member 102 remain in engagement with the c-shaped member 701, 702 of the first post. Thereafter, the flexible net 101 is fixed to the posts 103 by means of straps or similar.

[0025] In a second embodiment of a construction containment system 300 according to the invention, as shown in figures 3 and 4, a plurality of mesh panels 330 are provided adjacent each other at a bottom part of the posts 303. The mesh panels 330 comprise horizontal wires, vertical wires, and a foot plate 331, which is arranged at a bottom portion of the mesh panel 330. The use of mesh panels 330 can be necessary in order to prevent workers, tools and material from falling down towards the ground at an earlier stage of the building procedure, before a complete construction containment system becomes necessary. Also, a mesh panel 330 provides a more sturdy protection for a worker. The mesh panels 330 are hung up on mesh panel holders 332, 333 provided on the posts 303. These mesh panel holders 332, 333 are adjustable in height such that a mesh panel 330 can be raised if, for example, access to the outer edge of the construction is required. Commonly, the construction containment system according to the second embodiment of the invention is erected as follows: An elongated rigid member 302 is arranged at an edge of a flexible net 301, typically the elongated rigid member 302 will be arranged within a channel formed at an edge of the flexible net 301. Thereafter a first and a second post 303 are erected by clamping the posts 303 between an

overhead element 10 and an underlying element 20. Upper engagement means 304 comprises a tripod 705 with sharpened tips to assure a reliable engagement with the concrete slab 10. Lower engagement means 305 comprises an anchoring element which is bolted to the concrete slab and which anchoring element comprises a protruding portion onto which the post 303 is fitted. Instead of a bolted anchoring element, an anchoring element embedded in the concrete slab could be used. The distance between the posts 303 is less than the length of the rigid elongated member 302. The clamping of the posts is done by means of the threaded jacking portions 307 of each post 303. A worker will continue to thread until the load indicator 900 indicates that a sufficient axial load is applied to the post 303. When the two posts 303 are sufficiently clamped to the building the mesh panels 330 are mounted to the posts by means of the adjustable mesh panel holders 332, 333. Then the rigid elongated member 302 together with the flexible net 301 is hoisted towards the upper region of the posts 303 and slid in a first direction into engagement with a c-shaped member 701, 702 provided at the first post 303. Then, the rigid elongated member 302 and the flexible net 301 is slid in a second direction, opposite to said first direction, into engagement with a c-shaped member 701, 702 provided at the second post 303, while the rigid elongated member 302 remain in engagement with the c-shaped member 701, 702 of the first post. Thereafter, the flexible net 301 is fixed to the posts 303 and possibly also to the mesh panels 330 by means of straps or similar.

[0026] In a third embodiment of a construction containment system 500 according to the invention, as shown in figures 5 and 6, a plurality of mesh panels 550 are provided. This third embodiment differs from the second embodiment described above in that the post 503 is integrated with one of the vertical sides of the mesh panel 550 whereas the other vertical side of the mesh panel is free. A mesh panel of this type has the advantage of a small number of constituent parts and a reduced required number of steps involved when mounting the system. This increases the safety for the workers and reduces the working time. Since the post 503 is integrated with one of the vertical sides of the mesh panel 550 a bottom row of mesh panels 550 is automatically created when the posts 503 are erected. Since each post 503 is integrated with one mesh panel 550 a separate post 503' has to be used to finish the construction containment system 500 of the third embodiment according to the invention. Commonly, the construction containment system according to the third embodiment of the invention is erected as follows: An elongated rigid member 502 is arranged at an edge of a flexible net 501, typically the elongated rigid member 502 will be arranged within a channel formed at an edge of the flexible net 501. Thereafter a first post 503 together with the integrated mesh panel 550 and a second separate post 503' are erected by clamping the posts 503, 503' between an overhead element 10 and an underlying element 20. Upper en-

gagement means 504 of the posts 503, 503' comprises a tripod 705 with sharpened tips to assure a reliable engagement with the concrete slab 10. Lower engagement means 505 of the posts 503, comprises an anchoring element which is bolted to the concrete slab and which anchoring element comprises a protruding portion onto which the post 503 is fitted. The construction of the second post 503' is similar to those described in the previous embodiments of the construction containment system according to the invention. The distance between the posts 503, 503' is less than the length of the rigid elongated member 502. The clamping of the posts 503, 503' is done by means of the threaded jacking portions 507 of each post 503, 503'. A worker will continue to thread until the load indicator 900 indicates that a sufficient axial load is applied to the post 503, 503'. When the posts 503, 503' and the mesh panels 550 are clamped between the overhead element 10 and the underlying element 20 the free vertical side of the mesh panel 550 is fastened to the separate post 503' by means of a strap or similar, not shown in the figures. Then the rigid elongated member 502 together with the flexible net 501 is hoisted towards the upper region of the posts 503, 503' and slid in a first direction into engagement with a c-shaped member 701, 702 provided at the first post 503. Then, the rigid elongated member 502 and the flexible net 501 is slid in a second direction, opposite to said first direction, into engagement with a c-shaped member 701, 702 provided at the second post 503', while the rigid elongated member 502 remain in engagement with the c-shaped member 701, 702 of the first post 503. Thereafter, the flexible net 501 is fixed to the posts 503, 503' and possibly also to the mesh panels 550 by means of straps or similar. Unlike the mesh panel 330 described above, the mesh panel 550 according to this third embodiment cannot be adjusted in height. However, by unfastening the straps fastening a free vertical side of a mesh panel 550 the mesh panel 550 can swivel around the vertical axis of the post 503. The protruding portion of the anchoring element and the threaded jacking 507 portion of the post 503 will act as hinges in this respect. This swiveling movement of the mesh panel 550 will only have a very minor effect on the jacking force exerted on the post and besides, the load indicator 900 will indicate if the force falls below a required threshold value.

[0027] In a first embodiment of a coupling means according to the invention, as shown in figure 7, the coupling means comprises two c-shaped members 701, 702. The c-shaped members 701, 702 each comprises an opening 703, 704 which, when mounted to a post 103, is directed downwards towards the lower end of the post 103. The c-shaped member 701, 702 is dimensioned such that its internal diameter is larger than the diameter of the rigid elongated member 102 and the width of the opening 703, 704 of the c-shaped member 701, 702 is smaller than a diameter of the rigid elongated member 102. By this, the rigid elongated member 102 can be inserted laterally into the c-shaped member and the rigid elongated member

102 is prevented from any vertical movement, e.g. it cannot fall down. Yet, the flexible net 101 can pass unhindered through the opening 703, 704. The c-shaped members are attached to the tripod 705. This attachment can be done in several ways, e.g. welding, bolting or riveting. The tripod 705, comprising three sharpened tips for engagement with e.g. a concrete slab, is attached to a post by means of tube 706 having an opening 707 in it. The opening 707 can accommodate a locking device, such as a bolt or a spring loaded pin, to secure the tripod 705 and the coupling means to a post.

[0028] In a second embodiment of a coupling means according to the invention, as shown in figure 8, the coupling means comprises two c-shaped members 801, 802 attached to a clamping device 803. This solution has the advantage that the position of the coupling means can be adjusted. This is convenient for example when the exterior of the building to which the construction containment system is to be mounted does not permit the coupling means to be positioned at the top of the post 103, as is the case with the first embodiment of the coupling means according to the invention as shown in figure 7.

[0029] A load indicator 900 according to the invention, as shown in figures 9 and 10, comprises an upper flange 901, a lower flange 902, a cup spring 903 sandwiched between the upper flange 901 and the lower flange 902 and a connecting sleeve 904 connecting these three parts together. Cup springs can be manufactured with a high accuracy regarding the load at which the cup spring sets and flattens out. The construction of the load indicator 900 admits a person to take a look at the load indicator 900, preferably from the side, and if there is no gap between the upper flange 901 and the lower flange 902 he immediately realizes that the axial force applied on the load indicator, and therefore also on the post, is sufficient. If, on the other hand, there still is a visible gap, additional axial force has to be imposed. A locking bolt 905 is provided to lock the load indicator 900 to a post, this applies especially during erecting of the post to avoid that the load indicator 900 is inadvertently lost and may fall down from a building.

[0030] In a third embodiment of a coupling means according to the invention and a second embodiment of a rigid elongated member according to the invention, as shown in figures 11 and 12, the coupling means 106 comprises a generally L-shaped member 1130 and the rigid elongated member 1102 comprises a profile 1121. The L-shaped member 1130 is preferably, but not necessarily, made from metal such as aluminium or steel. The profile 1121 is preferably, but not necessarily, extruded from aluminium or plastics. Similar to the coupling means shown in figures 7 and 8, the L-shaped member 1130 of the second embodiment can be fixed to an upper part of the post, cf. figure 7, or it can be attached to an adjustable part, cf. figure 8. Even though only one L-shaped member 1130 is disclosed in figures 11 and 12, it is quite possible to mount these adjacent each other in a direction substantially perpendicular to the surface of the flexible net

1101 in order to be able to mount flexible nets 1101 with overlap, similar to the c-shaped members of the first embodiment. The L-shaped member 1130 comprises a retaining part 1133 having a cross-section that is complementary to a cross section of a coupling groove 1122 in the profile 1121. The coupling groove 1122 is open at both short sides of the profile and extends the full length of the profile 1121. The profile can therefore be slid into engagement with the retaining part 1133 of the L-shaped member 1130. The coupling groove 1122 has a width at its bottom 1123 which is somewhat larger than the width of the retaining part 1133 at its widest point whereas a mouth 1124 of the coupling groove 1122 has a width which is less than the width of the retaining part 1133 at its widest point so that the rigid elongated member 1102 can be moved in its axial direction sliding on the retaining part 1133 while being prevented from falling down. The retaining part 1133 has tapered ends to facilitate the engagement with the rigid elongated member 1102. The retaining part 1133 is followed by a leg 1132 which is adapted to pass through the mouth 1124 of the coupling groove 1122, said leg 1132 in turn is followed by a base plate 1131 provided with two bolt holes for connecting the L-shaped member to a post. In addition to the coupling groove 1122, the profile 1121 comprises a net retaining groove 1141. The net retaining groove 1141 extends the full length of the profile and comprises a base 1142, and a mouth 1143 and wherein a cross-section of the net retaining groove 1141 enlarges from the mouth 1143 towards the bottom 1142 such that an edge element 1181 of a flexible net 1101 can be retained within the net retaining groove 1141.

[0031] A threaded jacking portion 1300 of a post 103 according to the invention, as shown in figure 13, comprises a threaded rod 1301, a first threaded handle 1302, a second threaded handle 1303 and a jacking tool 1304 with a safety catch strap 1305 to avoid that a user loses the jacking tool. By turning the first threaded handle 1302 and/or the second threaded handle 1303 in suitable directions a user can adjust the length of a post and thereby increase or decrease the axial force imposed on the post 103. This can be done by hand during a first part of the mounting of a post but at some point the forces will be too high to do so. Jacking tool 1304 can be used to apply the necessary force to clamp the post 103 to a building. Compared to using a hammer, which sometimes is done, the jacking tool 1304 can apply the required force in a more controlled manner. To avoid that the threaded rod 1301 is moved too far in one axial direction, thereby jeopardizing the stability of the post 103, a suitable length of both ends of the threaded rod 1301 can be painted in a glaring color so that a user realizes that the threaded rod 1301 should be displaced in the other direction.

[0032] A flexible net 101 and a rigid elongated member 102 according to the invention can be hoisted with a mounting tool 1400 as shown in figure 14. A mounting tool 1400 comprises a telescopic shaft 1401 having a safety catch strap 1402 and a handle 1403 at one end

thereof and a hook device 1404 at the other end. To hoist the flexible net 101 and the rigid elongated member 102 two persons equipped with one mounting tool each thread the hook device 1404 over the rigid elongated member 102 and then twist the mounting tool such that the hook device 1404 firmly grasps the rigid elongated member 102. When the rigid elongated member 102 and the flexible net 101 are positioned within the coupling means, not shown in figure 14, the mounting tool 1400 is twisted in the opposite direction to disengage it from the rigid elongated member 102.

[0033] An end plug 1500 according to the invention, as shown in figures 15-17, comprises a cone-shaped member 1501 and two locking branches 1502, 1503. The base 1506 of the cone-shaped member 1501 has a diameter which is larger than a diameter of a rigid elongated member 102 to which it is attached. In order to be insertable into a c-shaped member of the coupling means, not shown in figures 15-17, the diameter of the base 1506 of the cone-shaped member 1501 must, however, be less than the width of the c-shaped member. The cone shape makes it simple to hit the c-shaped member whereas the difference in diameter between the base 1506 of cone-shaped member 1501 and the rigid elongated member 102 ensures that once the end plug 1500 mounted to the rigid elongated member 102 has been moved to pass through the c-shaped member the rigid elongated member 102 will fall down and rest against the c-shaped member and the base 1506 will act as a hard stop against the c-shaped member and prevent axial movement in a direction back through the c-shaped member. The two locking branches 1502, 1503 each comprise a locking pin 1504 which will snap into locking position in a corresponding opening in the rigid elongated member 102. A groove 1505 is provided in the base 1506 in order to prevent the flexible net 101 from creeping on the rigid elongated member thereby causing gaps in the construction containment system. An outer mesh of the flexible net 101 is positioned in the groove 1505 so that the flexible net 101 cannot move axially along the rigid elongated member. The end plug is preferably, but not necessarily, made from plastics.

45 Claims

1. A construction containment system (100, 300, 500) said construction containment system (100, 300, 500) comprising:

a flexible net (101, 1101);
 a rigid elongated member (102, 1102) adapted to be arranged at an edge of the flexible net (101, 1101);
 a post (103, 303, 503, 503') comprising upper engagement means (104) at an upper end thereof for bringing the post (103, 303, 503, 503') into engagement with an overhead element (10) and

lower engagement means (105) at a lower end of the post (103, 303, 503, 503') for bringing the post (103, 303, 503, 503') into engagement with an underlying element (20);

characterized in that the construction containment system comprises coupling means (106) provided at the post (103, 303, 503, 503') for coupling of the rigid elongated member (102) to the post (103, 303, 503, 503'), wherein the coupling means (106) comprises two c-shaped separate members (701, 702, 801, 802, 1130) provided adjacent each other in a direction substantially perpendicular to the surface of the flexible net (101, 1101) in a mounted state, wherein at least one of said c-shaped members (701, 702, 801, 802) has an opening (703, 704, 803, 804) directed towards the lower end of the post (103, 303, 503, 503') and wherein an internal diameter of the c-shaped member (701, 702, 801, 802) is larger than the diameter of the rigid elongated member (102) and wherein a width of the opening (703, 704, 803, 804) of the c-shaped member (701, 702, 801, 802) is smaller than a diameter of the rigid elongated member (102) while allowing the flexible net (101, 1101) to pass therethrough.

- 2. A construction containment system (100, 300, 500) according to claim 1, wherein the post (103, 303, 503, 503') is telescopically adjustable in length.
- 3. A construction containment system (100, 300, 500) according to claim 1 or 2, wherein the post (103, 303, 503, 503') comprises a threaded jacking portion (107, 1300).
- 4. A construction containment (100, 300, 500) system according to any of the preceding claims, further comprising a load indicator (900) for indicating an amount of axial load exerted on the post (103, 303, 503, 503'), wherein said load indicator (900) comprises a cup spring (903).
- 5. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein the post (103, 303, 503, 503') comprises a clinometer (109).
- 6. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein at least one of the engagement means (104, 105) comprises a tripod (705).
- 7. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein end plugs (1500) are provided at opposite ends of the rigid elongated member (102), and wherein said end plugs (1500) are cone-shaped and wherein the

diameter of the base of the cone is larger than a diameter of the rigid elongated member (102).

- 8. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein the rigid elongated member (1102) comprises an profile (1121) having a coupling groove (1122) extending in the longitudinal direction of the profile (1121) and wherein said coupling groove (1122) comprises a bottom (1123) and a mouth (1124) and wherein a cross-section of the coupling groove (1122) enlarges from the mouth (1124) towards the bottom (1123).
- 9. A construction containment system (100, 300, 500) according to claim 8, wherein the coupling means (106) comprises a retaining part (1133) having a cross section that is complimentary to the cross section of the coupling groove (1122).
- 10. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein the rigid elongated member (1102) comprises a profile (1121) having a net retaining groove (1141) extending in the longitudinal direction of the profile (1121) and wherein said net retaining groove (1141) comprises a bottom (1142) and a mouth (1143) and wherein a cross-section of the net retaining groove (1141) enlarges from the mouth (1143) towards the bottom (1142).
- 11. A construction containment system (100, 300, 500) according to claim 10, wherein the flexible net (1101) comprises an edge element (1181) along an edge thereof to which the rigid elongated member (1102) is to be arranged, wherein said edge element (1181) has a cross section which is complimentary to the cross section of said net retaining groove (1141).
- 12. A construction containment system (100, 300, 500) according to any of the preceding claims, wherein the coupling means (106) are attached to the post (103, 303, 503, 503') by means of a clamping device (803).
- 13. A method for mounting a construction containment system (100, 300, 500) according to any of the preceding claims to a construction, said method comprising the steps of:
 - arranging an elongated rigid member (102, 1102) at an edge of a flexible net (101, 1101);
 - erecting a first and a second post (103, 303, 503, 503') by clamping the posts (103, 303, 503, 503') between an overhead element (10) and an underlying element (20), wherein the distance between said first and second post (103, 303, 503, 503') is less than the length of the rigid elongated

member (102,1102);
 hoisting the rigid elongated member (102, 1102)
 and the flexible net (101, 1101) towards the
 posts (103, 303, 503, 503'); sliding the rigid elongated
 member (102, 1102) in a first direction into
 engagement with a first coupling means (106)
 provided at the first post (103, 303, 503, 503');
 sliding the rigid elongated member (102,1102)
 in a second direction, opposite to said first di-
 rection, into engagement with a second coupling
 means (106) provided at the second post (103,
 303, 503, 503'), while the rigid elongated mem-
 ber (102,1102) remain in engagement with the
 first coupling means (106).

Patentansprüche

1. Konstruktionsschutzvorrichtungssystem (100, 300, 500), wobei das Konstruktionsschutzvorrichtungssystem (100, 300, 500) Folgendes umfasst:

ein flexibles Netz (101, 1101);
 ein starres längliches Bauteil (102, 1102), das
 ausgelegt ist, an einer Kante des flexiblen Netzes
 (101, 1101) angeordnet zu werden;
 einen Pfosten (103, 303, 503, 503'), der obere
 Eingriffsmittel (104) an einem oberen Ende da-
 von, um den Pfosten (103, 303, 503, 503') mit
 einem darüber liegenden Element (10) in Ein-
 griff zu bringen, und untere Eingriffsmittel (105)
 an einem unteren Ende des Pfostens (103, 303,
 503, 503') umfasst, um den Pfosten (103, 303,
 503, 503') mit einem darunter liegenden Ele-
 ment (20) in Eingriff zu bringen;
dadurch gekennzeichnet, dass das Konstruk-
 tionsschutzvorrichtungssystem Kopplungsmittel
 (106) umfasst, die an dem Pfosten (103, 303,
 503, 503') bereitgestellt sind, um das starre
 längliche Bauteil (102) mit dem Pfosten (103,
 303, 503, 503') zu koppeln.
 wobei die Kopplungsmittel (106) zwei c-förmige
 separate Bauteile (701, 702, 801, 802, 1130)
 umfasst, die benachbart zueinander in einer
 Richtung bereitgestellt sind, die zu der Oberflä-
 che des flexiblen Netzes (101, 1101) in einem
 befestigten Zustand im Wesentlichen senkrecht
 ist, wobei mindestens eines der c-förmigen Bau-
 teile (701, 702, 801, 802) eine Öffnung (703,
 704, 803, 804) aufweist, die zu dem unteren En-
 de des Pfostens (103, 303, 503, 503') gerichtet
 ist, und wobei ein Innendurchmesser des c-för-
 migen Bauteils (701, 702, 801, 802) größer als
 der Durchmesser des starren länglichen Bau-
 teils (102) ist und wobei eine Breite der Öffnung
 (703, 704, 803, 804) des c-förmigen Bauteiles
 (701, 702, 801, 802) kleiner als ein Durchmesser
 des starren länglichen Bauteiles (102) ist, wäh-

rend ermöglicht wird, dass das flexible Netz
 (101, 1101) dort hindurch geht.

2. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach Anspruch 1, wobei der Pfosten (103, 303, 503, 503') eine teleskopisch verstellbare Länge aufweist.
3. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach Anspruch 1 oder 2, wobei der Pfosten (103, 303, 503, 503') einen Gewindeabdrückabschnitt (107, 1300) aufweist.
4. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, ferner umfassend eine Lastanzeige (900) zum Anzeigen einer Menge einer axialen Last, die auf den Pfosten (103, 303, 503, 503') ausgeübt wird, wobei die Lastanzeige (900) eine Tellerfeder (903) umfasst.
5. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, wobei der Pfosten (103, 303, 503, 503') einen Neigungsmesser (109) umfasst.
6. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, wobei mindestens eines der Eingriffsmittel (104, 105) ein Dreibeinstativ (705) umfasst.
7. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, wobei Endstopfen (1500) an gegenüberliegenden Enden des starren länglichen Bauteils (102) bereitgestellt sind und wobei die Endstopfen (1500) kegelförmig sind und wobei der Durchmesser der Basis des Kegels größer als ein Durchmesser des starren länglichen Bauteils (102) ist.
8. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, wobei das starre längliche Bauteil (1102) ein Profil (1121) mit einer Kopplungsnut (1122) umfasst, die sich in der Längsrichtung des Profils (1121) erstreckt, und wobei die Kopplungsnut (1122) eine Unterseite (1123) und eine Mündung (1124) umfasst und wobei sich ein Querschnitt der Kopplungsnut (1122) von der Mündung (1124) zu der Unterseite (1123) vergrößert.
9. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach Anspruch 8, wobei das Kopplungsmittel (106) ein Halteteil (1133) mit einem Querschnitt umfasst, der zu dem Querschnitt der Kopplungsnut (1122) komplementär ist.
10. Konstruktionsschutzvorrichtungssystem (100, 300,

500) nach einem der vorhergehenden Ansprüche, wobei das starre längliche Bauteil (1102) ein Profil (1121) mit einer Netzhaltenut (1141) umfasst, die sich in der Längsrichtung des Profils (1121) erstreckt, und wobei die Netzhaltenut (1141) eine Unterseite (1142) und eine Mündung (1143) umfasst und wobei sich ein Querschnitt der Netzhaltenut (1141) von der Mündung (1143) zu der Unterseite (1142) vergrößert.

11. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach Anspruch 10, wobei das flexible Netz (1101) ein Kantenelement (1181) entlang einer Kante davon umfasst, an der das starre längliche Bauteil (1102) angeordnet werden soll, wobei das Kantenelement (1181) einen Querschnitt aufweist, der zu dem Querschnitt der Netzhaltenut (1141) komplexer ist.

12. Konstruktionsschutzvorrichtungssystem (100, 300, 500) nach einem der vorhergehenden Ansprüche, wobei die Kopplungsmittel (106) an dem Pfosten (103, 303, 503, 503') mittels einer Klemmvorrichtung (803) befestigt sind.

13. Verfahren zum Befestigen eines Konstruktionsschutzvorrichtungssystems (100, 300, 500) nach einem der vorhergehenden Ansprüche an einer Konstruktion, wobei das Verfahren die folgenden Schritte umfasst:

Anordnen eines länglichen starren Bauteils (102, 1102) an einer Kante eines flexiblen Netzes (101, 1101);

Errichten eines ersten und eines zweiten Pfostens (103, 303, 503, 503') durch Klemmen der Pfosten (103, 303, 503, 503') zwischen einem darüber liegenden Element (10) und einem darunter liegenden Element (20), wobei der Abstand zwischen dem ersten und dem zweiten Pfosten (103, 303, 503, 503') geringer als die Länge des starren länglichen Bauteils (102, 1102) ist;

Hochwinden des starren länglichen Bauteils (102, 1102) und des flexiblen Netzes (101, 1101) zu den Pfosten (103, 303, 503, 503');

Verschieben des starren länglichen Bauteils (102, 1102) in einer ersten Richtung in Eingriff mit einem ersten Kopplungsmittel (106), das an dem ersten Pfosten (103, 303, 503, 503') bereitgestellt ist;

Verschieben des starren länglichen Bauteils (102, 1102) in einer zweiten, der ersten Richtung entgegengesetzten Richtung in Eingriff mit einem zweiten Kopplungsmittel (106), das an dem zweiten Pfosten (103, 303, 503, 503') bereitgestellt ist, während das starre längliche Bauteil (102, 1102) mit dem ersten Kopplungsmittel

(106) in Eingriff bleibt.

Revendications

1. Système de confinement de construction (100, 300, 500), ledit système de confinement de construction (100, 300, 500) comprenant :

un filet souple (101, 1101) ;

un élément allongé rigide (102, 1102) adapté pour être disposé sur un bord du filet souple (101, 1101);

un poteau (103, 303, 503, 503') comprenant un moyen de mise en prise supérieur (104) à une extrémité supérieure de celui-ci pour mettre le poteau (103, 303, 503, 503') en prise avec un élément supérieur (10), et un moyen de mise en prise inférieur (105) à une extrémité inférieure du poteau (103, 303, 503, 503') pour mettre le poteau (103, 303, 503, 503') en prise avec un élément sous-jacent (20) ;

caractérisé en ce que le système de confinement de construction comprend un moyen de couplage (106) fourni au niveau du poteau (103, 303, 503, 503') pour le couplage de l'élément allongé rigide (102) au poteau (103, 303, 503, 503'),

dans lequel le moyen de couplage (106) comprend deux éléments séparés en forme de c (701, 702, 801, 802, 1130) fournis de manière adjacente l'un par rapport à l'autre dans une direction sensiblement perpendiculaire à la surface du filet souple (101, 1101) dans un état monté, dans lequel au moins l'un desdits éléments en forme de c (701, 702, 801, 802) a une ouverture (703, 704, 803, 804) orientée vers l'extrémité inférieure du poteau (103, 303, 503, 503') et dans lequel un diamètre intérieur de l'élément en forme de c (701, 702, 801, 802) est supérieur au diamètre de l'élément allongé rigide (102) et dans lequel une largeur de l'ouverture (703, 704, 803, 804) de l'élément de forme de c (701, 702, 801, 802) est inférieure à un diamètre de l'élément allongé rigide (102) tout en permettant au filet souple (101, 1101) de passer à travers celle-ci.

2. Système de confinement de construction (100, 300, 500) selon la revendication 1, dans lequel le poteau (103, 303, 503, 503') est ajustable en longueur de façon télescopique.

3. Système de confinement de construction (100, 300, 500) selon la revendication 1 ou 2, dans lequel le poteau (103, 303, 503, 503') comprend une partie de soulèvement par vérin fileté (107, 1300).

4. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, comprenant en outre un indicateur de charge (900) pour indiquer une quantité de charge axiale s'exerçant sur le poteau (103, 303, 503, 503'), dans lequel ledit indicateur de charge (900) comprend un ressort à disques (903).
5. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel le poteau (103, 303, 503, 503') comprend un clinomètre (109).
6. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel au moins l'un des moyens de mise en prise (104, 105) comprend un trépied (705).
7. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel des bouchons d'extrémité (1500) sont fournis à des extrémités opposées de l'élément allongé rigide (102), et dans lequel lesdits bouchons d'extrémité (1500) sont en forme de cône et dans lequel le diamètre de la base du cône est supérieur à un diamètre de l'élément allongé rigide (102).
8. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel l'élément allongé rigide (1102) comprend un profilé (1121) ayant une rainure de couplage (1122) s'étendant dans la direction longitudinale du profilé (1121) et dans lequel ladite rainure de couplage (1122) comprend un bas (1123) et une bouche (1124) et dans lequel une section transversale de la rainure de couplage (1122) s'agrandit depuis la bouche (1124) vers le bas (1123).
9. Système de confinement de construction (100, 300, 500) selon la revendication 8, dans lequel le moyen de couplage (106) comprend un organe de retenue (1133) ayant une section transversale complémentaire à la section transversale de la rainure de couplage (1122).
10. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel l'élément allongé rigide (1102) comprend un profilé (1121) ayant une rainure de retenue de filet (1141) s'étendant dans la direction longitudinale du profilé (1121) et dans lequel ladite rainure de retenue de filet (1141) comprend un bas (1142) et une bouche (1143) et dans lequel une section transversale de la rainure de retenue de filet (1141) s'agrandit depuis la bouche (1143) vers le bas (1142).
11. Système de confinement de construction (100, 300, 500) selon la revendication 10, dans lequel le filet souple (1101) comprend un élément de bord (1181), le long d'un bord de celui-ci, sur lequel l'élément allongé rigide (1102) doit être disposé, dans lequel ledit élément de bord (1181) a une section transversale qui est complémentaire à la section transversale de ladite rainure de retenue de filet (1141).
12. Système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes, dans lequel les moyens de couplage (106) sont attachés au poteau (103, 303, 503, 503') au moyen d'un dispositif de serrage (803).
13. Procédé pour monter un système de confinement de construction (100, 300, 500) selon l'une quelconque des revendications précédentes sur une construction, ledit procédé comprenant les étapes suivantes :
- la mise en place d'un élément rigide allongé (102, 1102) sur un bord du filet souple (101, 1101) ;
- l'érection d'un premier et d'un deuxième poteau (103, 303, 503, 503') en serrant les poteaux (103, 303, 503, 503') entre un élément supérieur (10) et un élément sous-jacent (20), dans lequel la distance entre lesdits premier et deuxième poteaux (103, 303, 503, 503') est inférieure à la longueur de l'élément allongé rigide (102, 1102) ;
- le levage de l'élément allongé rigide (102, 1102) et du filet souple (101, 1101) vers les poteaux (103, 303, 503, 503') ;
- le glissement de l'élément allongé rigide (102, 1102) dans une première direction de mise en prise avec un premier moyen de couplage (106) fourni sur le premier poteau (103, 303, 503, 503') ;
- le glissement de l'élément allongé rigide (102, 1102) dans une deuxième direction, opposée à ladite première direction, pour la mise en prise avec un deuxième moyen de couplage (106) fourni sur le deuxième poteau (103, 303, 503, 503') alors que l'élément allongé rigide (102, 1102) reste en prise avec le premier moyen de couplage (106).

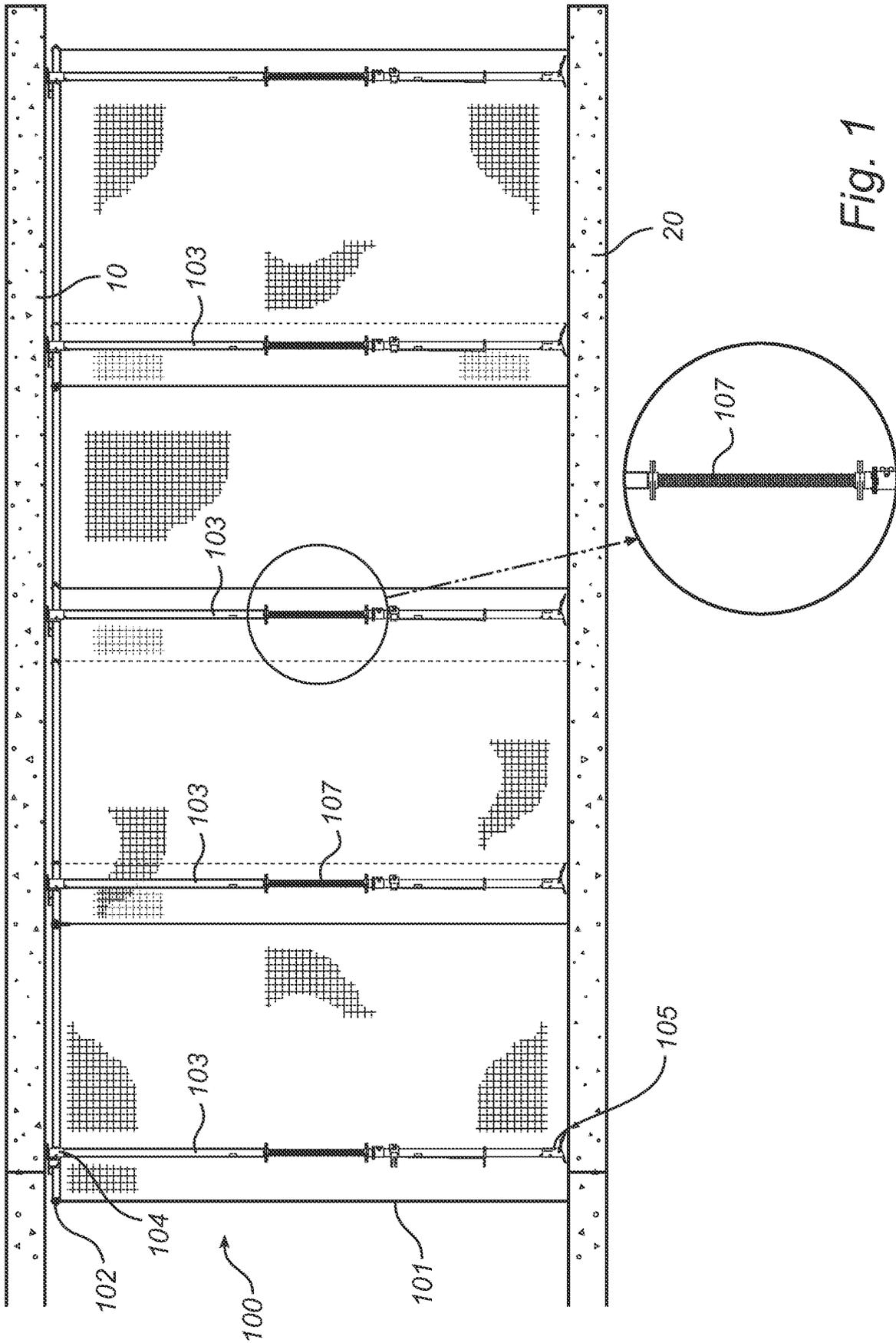


Fig. 1

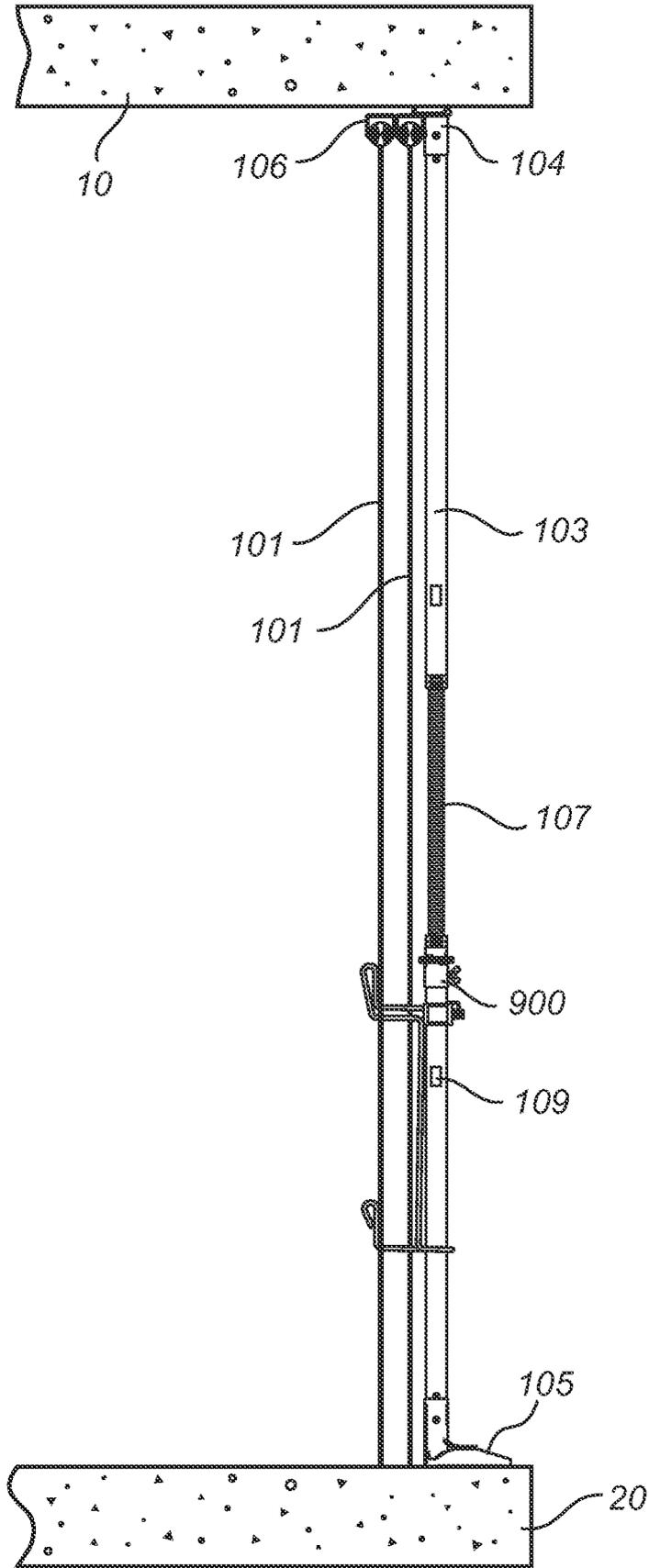


Fig. 2

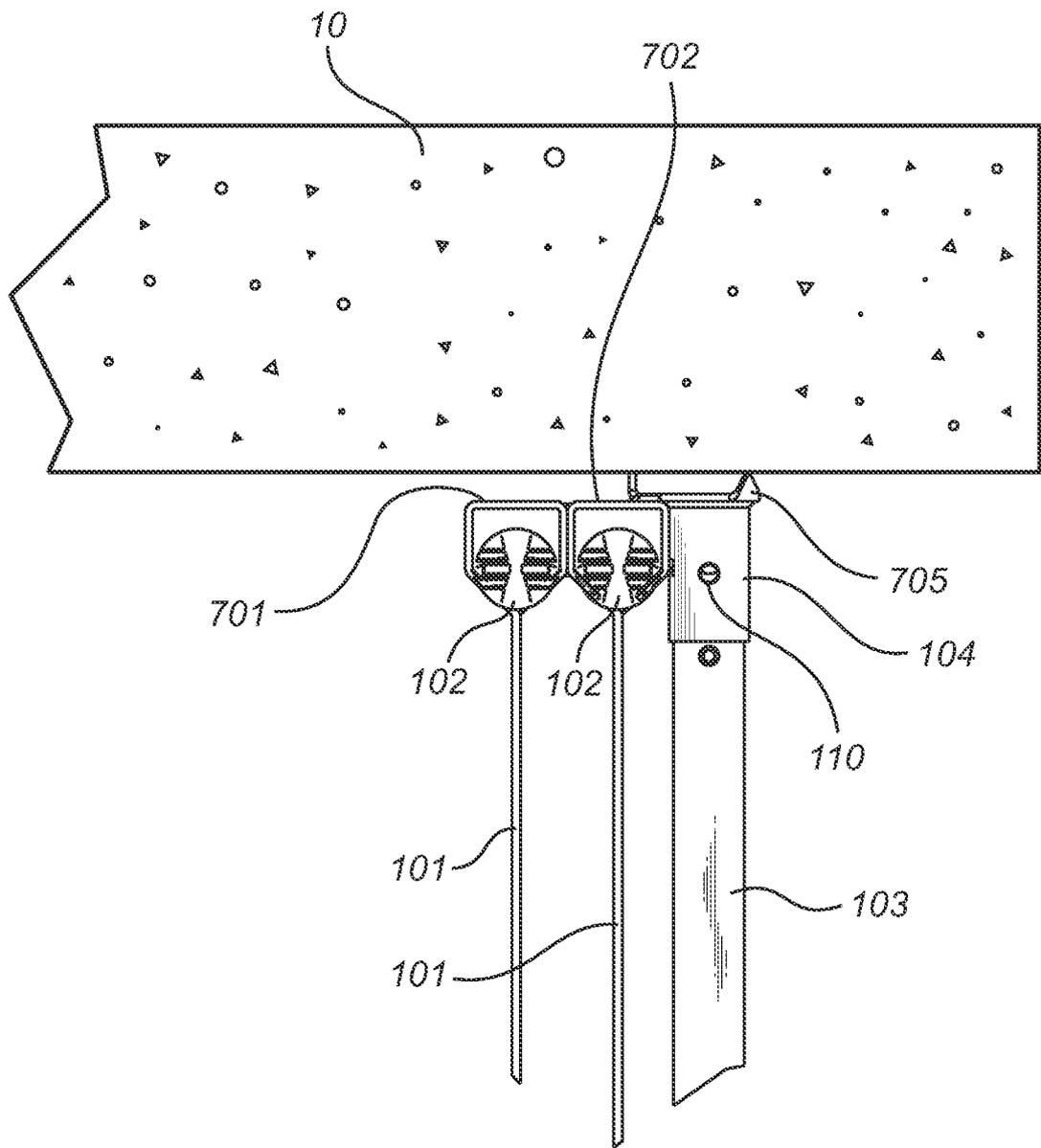


Fig. 2a

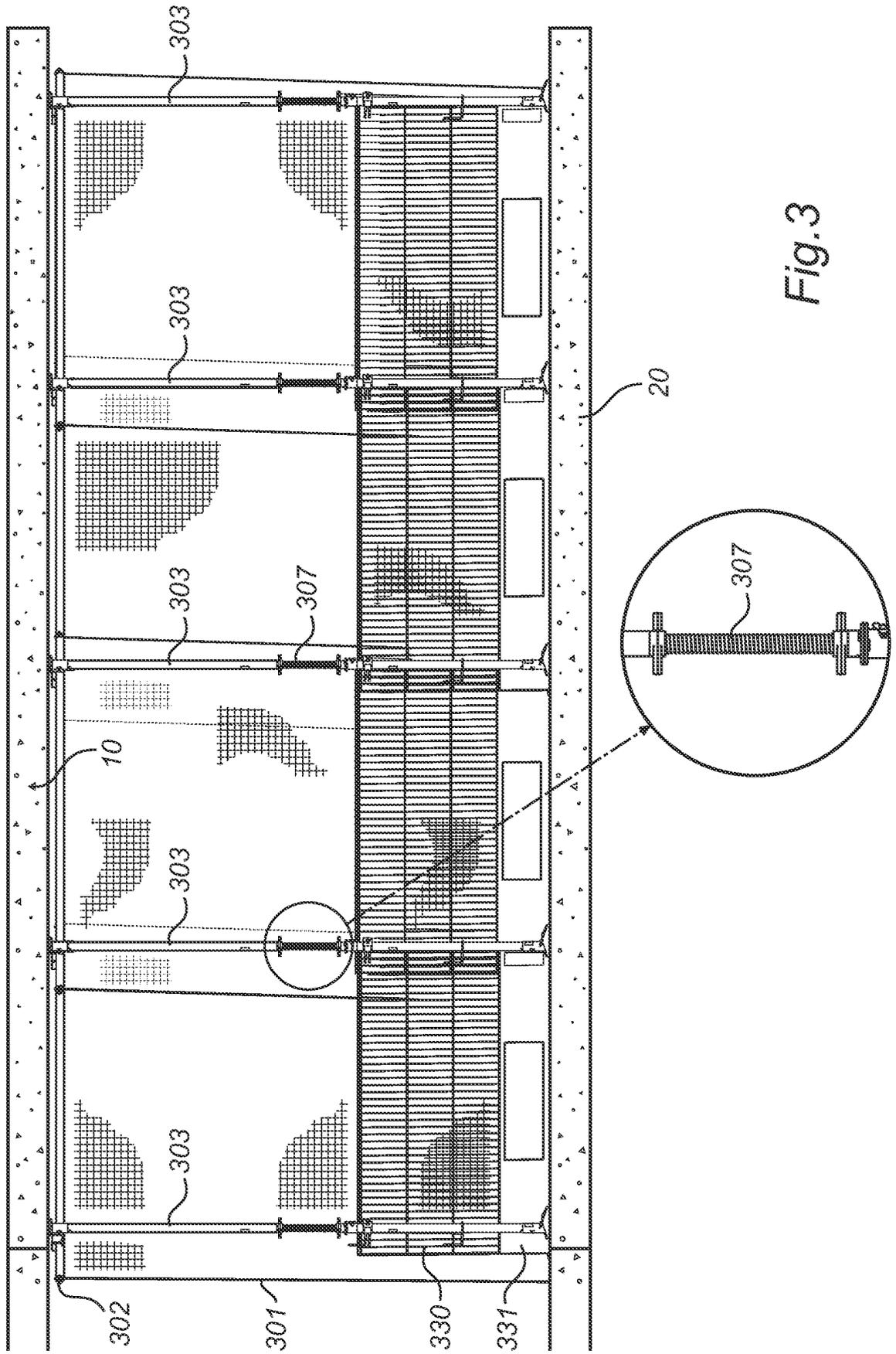


Fig.3

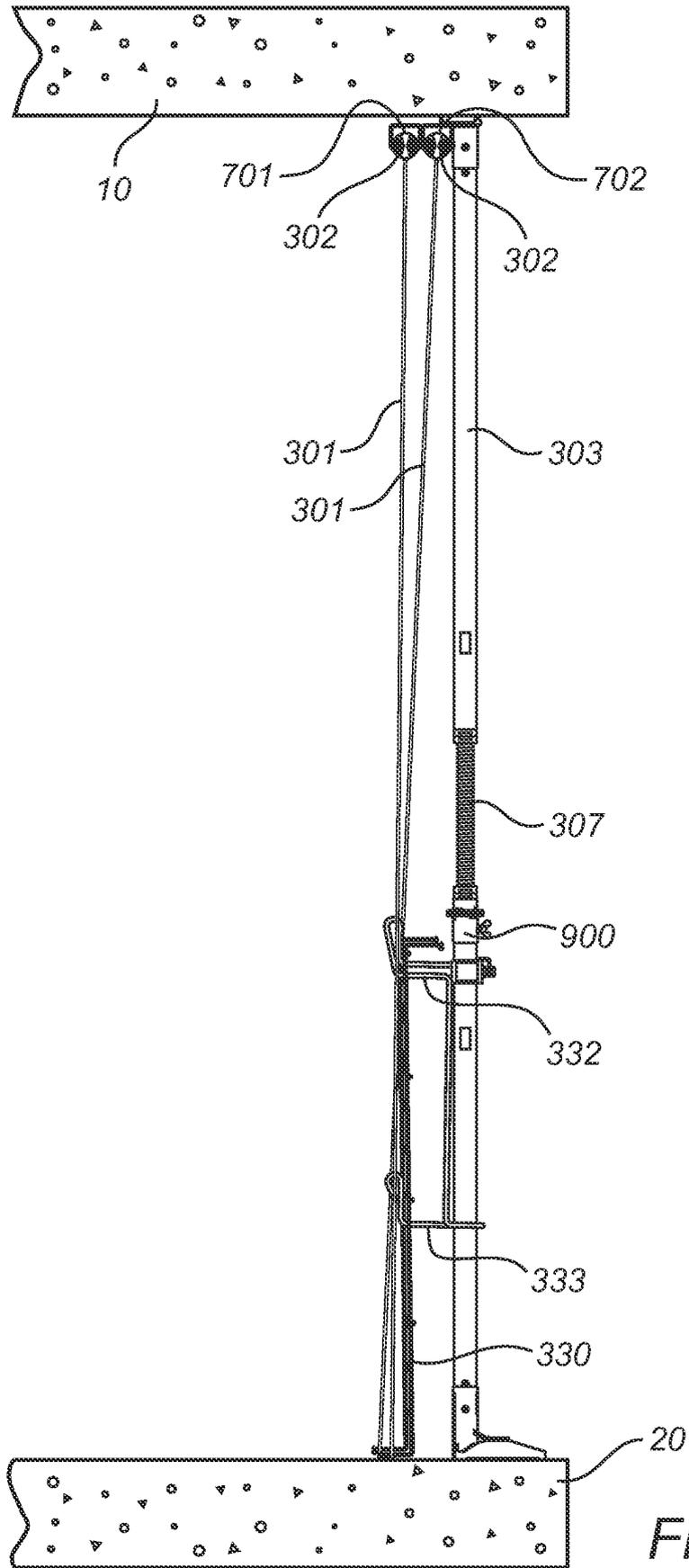


Fig. 4

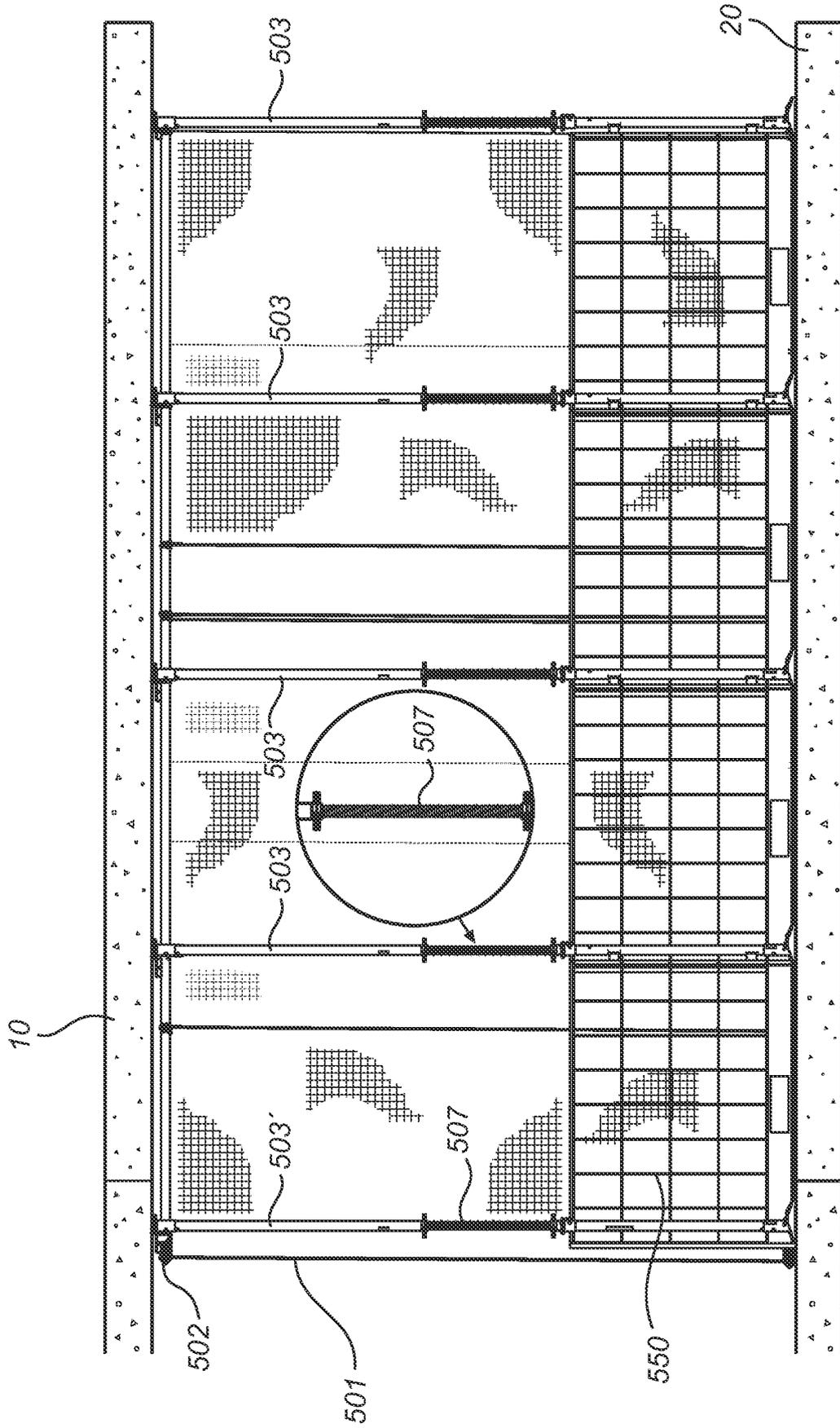


Fig. 5

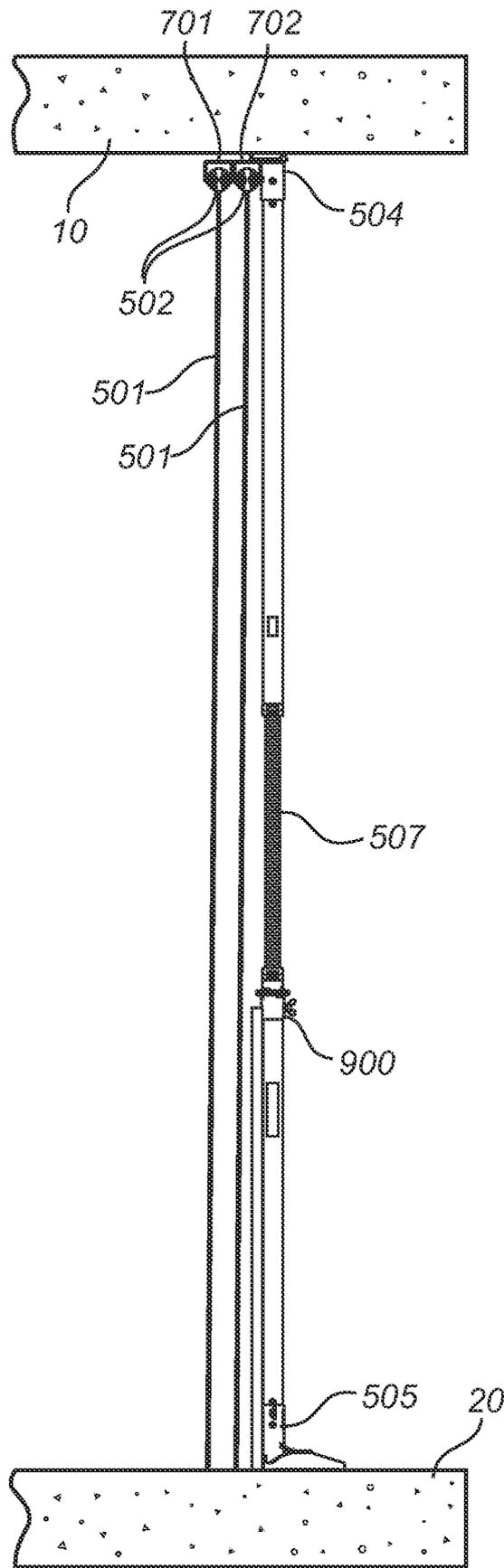


Fig. 6

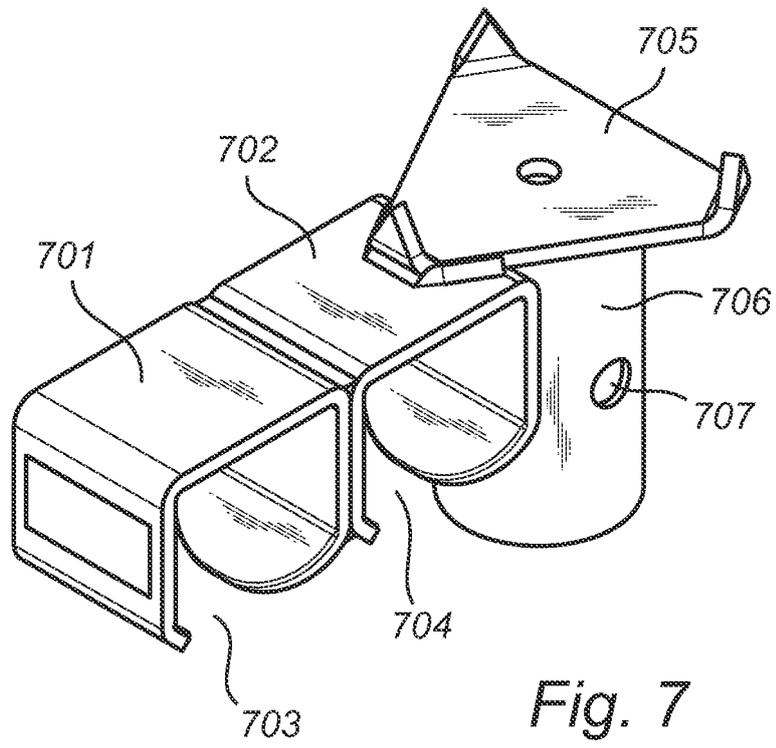


Fig. 7

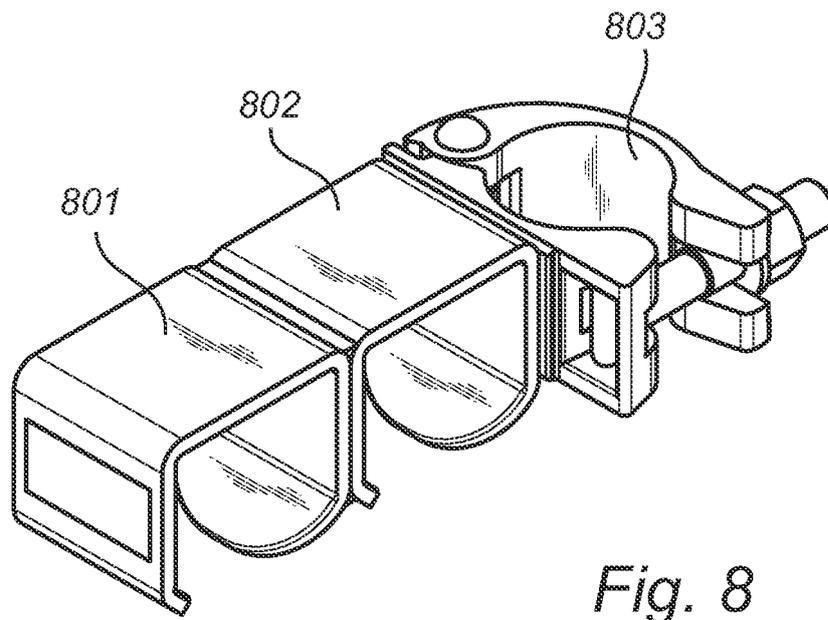


Fig. 8

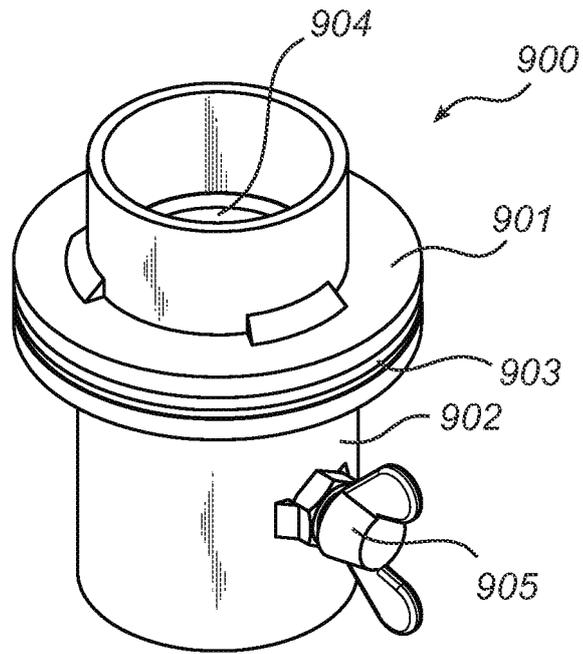


Fig. 9

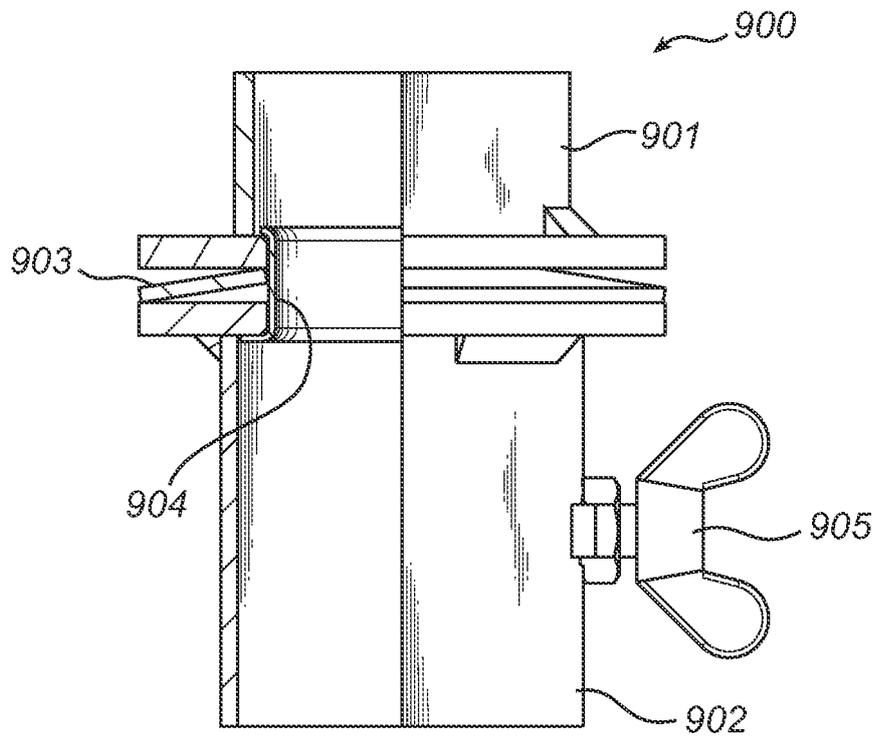


Fig. 10

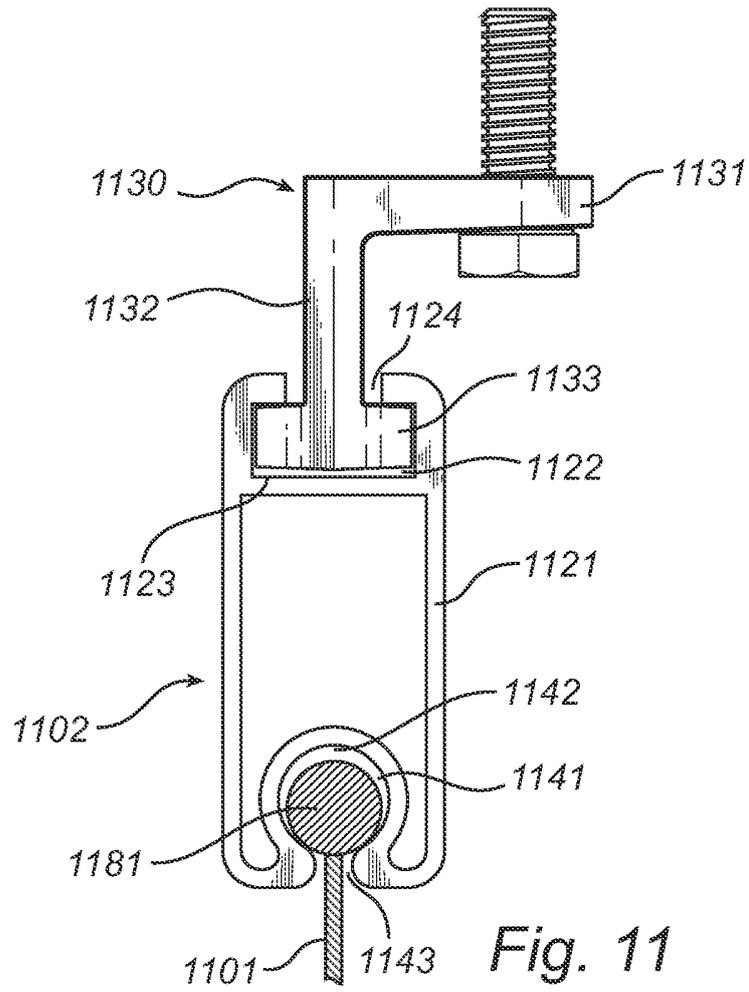


Fig. 11

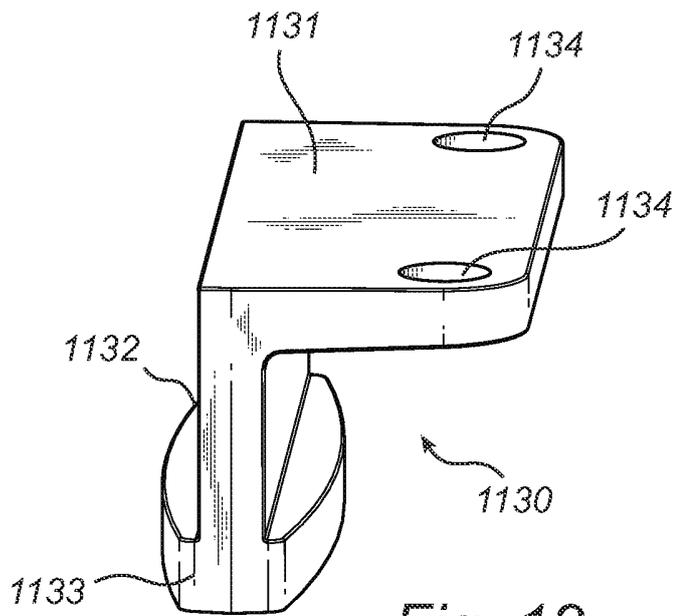


Fig. 12

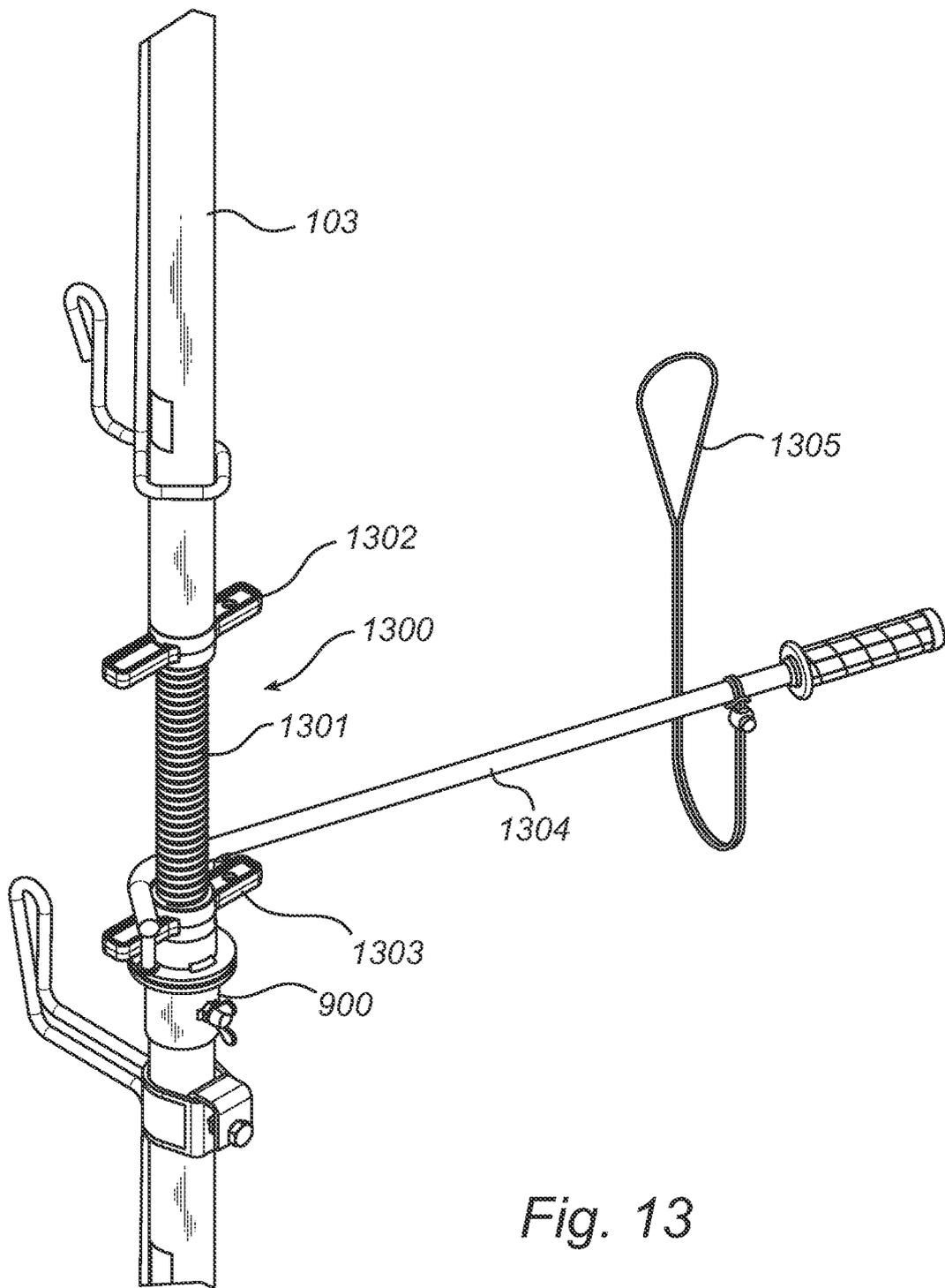
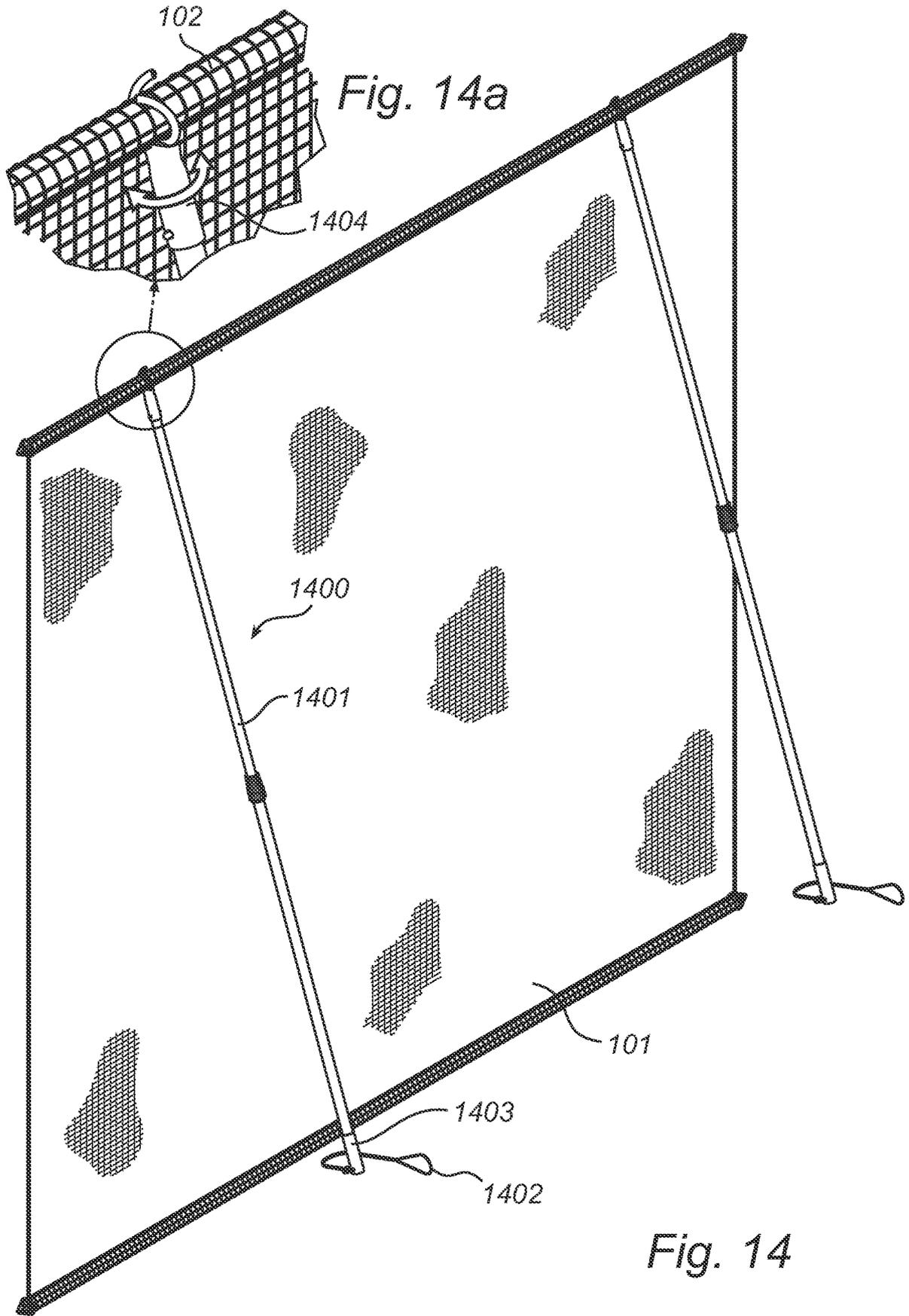


Fig. 13



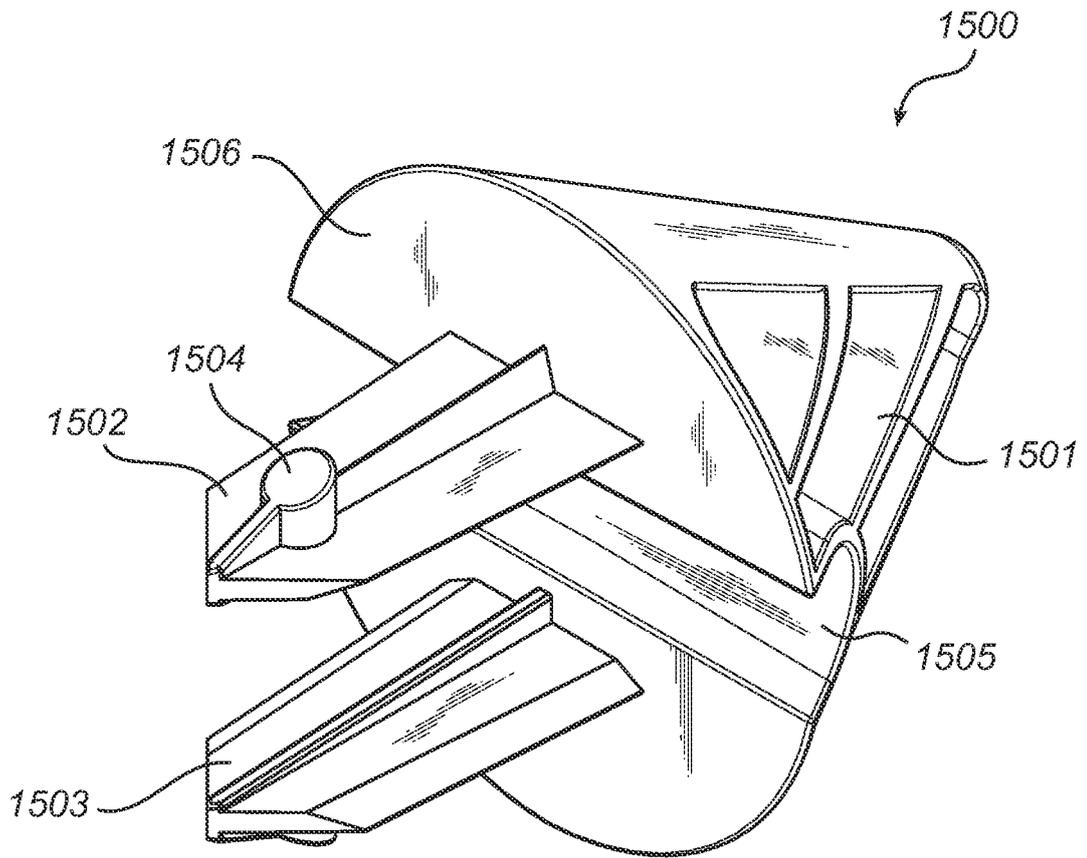


Fig. 15

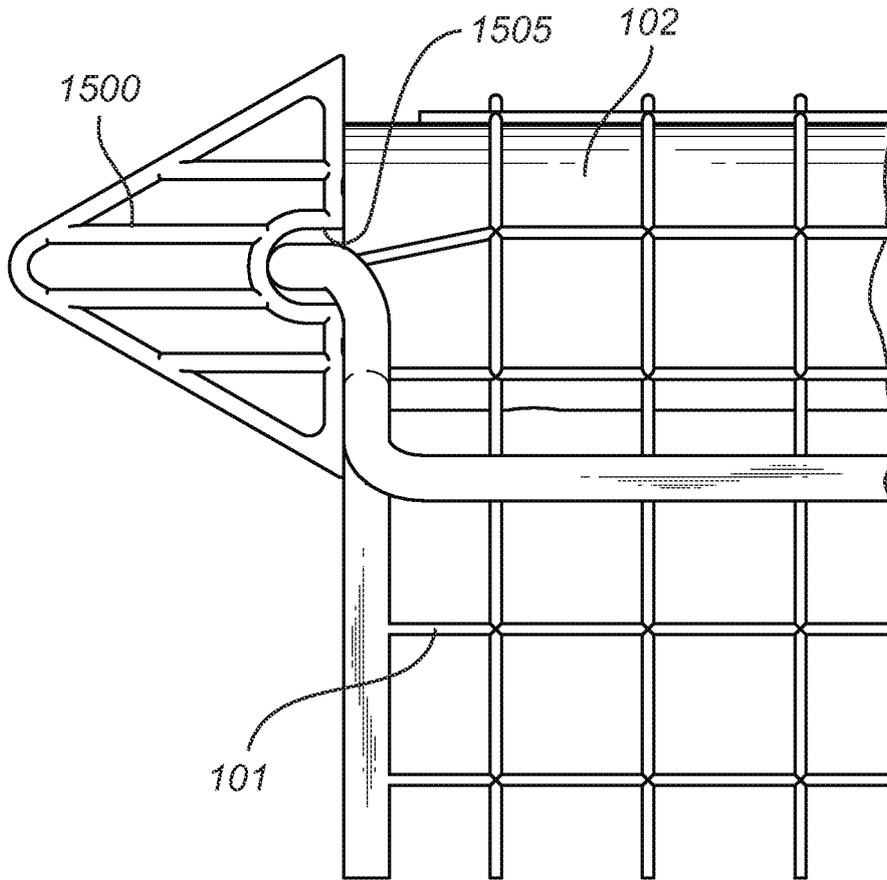


Fig. 16

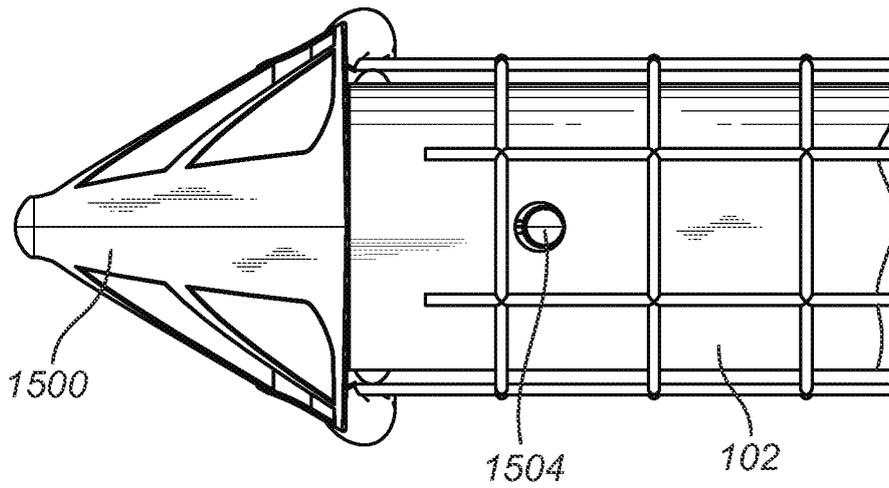


Fig. 17

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6904720 B [0002]
- US 3822850 A [0003]
- WO 9836141 A [0004]
- GB 2226591 A [0005]